

BROWN



**Catalogue of the University
for the years
1985-87**

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Foreword

Brown University is located in the City of Providence, the capital of Rhode Island, at the head of Narragansett Bay. The main campus of the University is on College Hill in a residential area overlooking the center of the city.

In the words of Dr. Henry Merritt Wriston, Brown's eleventh President (1937-55), "The central business of the University is the increase of knowledge, the inculcation of wisdom, the refinement of emotional responses, and the development of spiritual awareness." The Corporation of the University, in fulfilling this purpose, continues to follow the policy of maintaining a university-college of liberal arts, securing at Brown many of the advantages of both the small college and the large university.

In its administrative structure, Brown University is divided into the *Graduate School* and the undergraduate *College*, both co-educational. However, faculty members teach both undergraduate and graduate level courses.

The history of Brown reaches back over more than two centuries and tells of a university constantly undergoing change. Brown was established with a charter from the Colony's General Assembly in 1764 as the seventh college in America, and the third in New England. In September 1765 the first men registered at the college, then known as Rhode Island College and located in Warren, Rhode Island. In 1770 the school was moved to a hill in Providence and in 1804 its name was changed to Brown University in recognition of the contributions of Nicholas Brown.

In the 1880's graduate courses were first offered and the Graduate School was established in 1927.

The first women were admitted in 1891 when the establishment of the Women's College in Brown University marked the beginning of eighty years of a coordinate structure for educating women within the University. In 1928 the name of the Women's College was changed to Pembroke College. For many years the women had a separate campus and extracurricular life while participating in classes with the men and earning Brown degrees.

In recent years the University has grown physically to encompass the Main Campus, the Pembroke Campus and the East Campus (formerly Bryant College), as well as other sections of College Hill. The two undergraduate colleges were merged on July 1, 1971, by a vote of the Brown Corporation. In the spring of 1973, the Corporation approved a Medical Education Program leading to the degree of Doctor of Medicine.

Brown is now a coeducational institution drawing men and women from all over the United States and many foreign countries to participate in the academic and extracurricular life of an Ivy League university, with a faculty concerned about the intellectual growth of its students, and an attractive campus close to an urban center.

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University Calendar

1985-1986

Semester I

AUGUST 28	<i>Wednesday.</i> Orientation begins.
SEPTEMBER 3	<i>Tuesday.</i> Opening of the 1985-86 Academic Year (Convocation).
OCTOBER 14	<i>Monday (Columbus Day Holiday).</i> No University exercises.
OCTOBER 19	<i>Saturday.</i> Mid-semester.
NOVEMBER 27-DECEMBER 1	<i>Wednesday (noon) to Monday (8:00 a.m.).</i> Thanksgiving recess.
DECEMBER 7	<i>Saturday.</i> Beginning of Reading Period.
DECEMBER 12-20	<i>Thursday through Friday.</i> Final Examination period.
JANUARY 3	<i>Friday (noon).</i> Deadline for submission of first semester grades.

Semester II

JANUARY 22	<i>Wednesday (8:00 a.m.).</i> Classes of the second semester begin.
FEBRUARY 17-18.	<i>Monday and Tuesday.</i> Long Weekend. No University exercises.
MARCH 8	<i>Saturday.</i> Mid-semester.
MARCH 22-31	<i>Saturday to Monday (8:00 a.m.).</i> Spring Recess.
APRIL 25 -MAY 6	<i>Friday to Tuesday.</i> Reading Period.
MAY 6	<i>Tuesday (6:00 p.m.).</i> Classes of the second semester end.
MAY 7-16	<i>Wednesday to Friday inclusive.</i> Final Examination Period.
MAY 26	<i>Monday.</i> Commencement (Last Monday in May).

1986-1987

Semester I

AUGUST 27	<i>Wednesday. (Labor Day).</i> Orientation begins.
SEPTEMBER 2	<i>Tuesday.</i> Opening of the 1986-87 Academic Year (Convocation).
OCTOBER 13	<i>Monday. (Columbus Day Holiday).</i> No University exercises.
OCTOBER 18	<i>Saturday.</i> Mid-semester.
NOVEMBER 26-DECEMBER 1	<i>Wednesday (noon) to Monday (8:00 a.m.).</i> Thanksgiving Recess.
DECEMBER 7	<i>Sunday.</i> Beginning of Reading Period.
DECEMBER 12-20.	<i>Friday to Saturday.</i> Final Examination Period.
JANUARY 5	<i>Monday (noon).</i> Deadline for submission of first semester grades.

Semester II

JANUARY 21	<i>Wednesday (8:00 a.m.).</i> Classes begin.
FEBRUARY 16-17	<i>Monday and Tuesday.</i> Long weekend. No University Exercises.
MARCH 7	<i>Saturday.</i> Mid-semester.
MARCH 21-30	<i>Saturday to Monday (8:00 a.m.).</i> Spring Recess.
APRIL 24-MAY 5	<i>Friday to Tuesday.</i> Reading Period.
MAY 5	<i>Tuesday (6:00 p.m.).</i> Classes of the second semester end.
MAY 6-15	<i>Wednesday to Friday inclusive.</i> Final Examination Period.
MAY 25	<i>Monday.</i> Commencement.

Note: It is not ordinarily within the discretion of an individual member of the Faculty to determine that, for his or her particular class, a vacation period shall begin or end at a different time from that specified by the Calendar.

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 PETER R. SIMON, M.D., *Clinical Assistant Professor of Pediatrics*
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 GUS J. SLOTMAN, M.D., *Assistant Professor of Surgery*
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- BARNEY S. SPIVACK, M.D., *Instructor in Community Health*
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- SHEILA STEINER, M.D., *Clinical Assistant Professor of Surgery*
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- FRANK M. STEWART, PH.D., *Professor of Mathematics*
- ROWENA R. STEWART, B.S., *Senior Research Associate in Afro-American Studies*
- PHILLIP J. STILES, PH.D., *Professor of Physics*
- JOHANNA D. STOECKLER, PH.D., *Associate Professor of Biochemical Pharmacology (Research)*
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- ROBERT L. STOUT, PH.D., *Assistant Professor of Psychiatry and Human Behavior (Research)*

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 WILLIAM Q. STURNER, M.D., *Professor of Pathology*
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 CLARE SULLIVAN, M.A., *Clinical Instructor in Psychiatry and Human Behavior*
 DANIEL A. SULLIVAN, *Adjunct Associate Professor of Engineering*
 FRANCIS M. SULLIVAN, M.D., *Instructor in Medicine*
 FRANK W. SULLIVAN, M.D., *Clinical Associate Professor of Psychiatry and Human Behavior*
 ROBERT SULLIVAN, PH.D., *Adjunct Lecturer in English*
 SUBRAMANIAN SURESH, M.D., *Assistant Professor of Engineering*
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 VERONIQUE SUSSET, M.D., *Clinical Assistant Professor of Community Health*
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 DWIGHT A. SWEIGART, PH.D., *Associate Professor of Chemistry*
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 JOHN B. THAYER, JR., M.D., *Clinical Assistant Professor of Orthopaedics*
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 WILLIAM R. THOMPSON, M.D., *Clinical Associate Professor of Surgery*
 LESLIE THORNTON, M.F.A., *Lecturer in Semiotics*
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 JOHN T. TIERNEY, M.S.W., *Clinical Associate Professor of Community Health*
 NEIL E. TOBACK, M.D., *Clinical Instructor in Medicine*
 SANG H. TOH, M.D., *Clinical Associate Professor of Medicine*

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- RUTH TRIEDMAN, M.D., *Clinical Instructor in Medicine*
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- PAVEL VANCURA, M.D., *Clinical Assistant Professor of Medicine*
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- ZEEV VARDENY, PH.D., *Visiting Associate Professor of Engineering (Research)*
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- FRED H. VOHR, M.D., *Clinical Assistant Professor of Medicine*
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 THOMAS J. WACHTEL, M.D., *Assistant Professor of Community Health*
 SAFA F. WAGDI, M.D., *Clinical Assistant Professor of Ophthalmology*
 RAYMOND W. WAGGONER, JR., M.D., *Associate Professor of Psychiatry and Human Behavior*
 RICHARD L. WAGNER, M.D., *Associate Professor of Psychiatry and Human Behavior (Research)*
 LAWRENCE M. WALD, M.D., *Clinical Assistant Professor of Radiation Medicine (Radiology)*
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 BARBARA B. WALKER, PH.D., *Assistant Professor of Psychology (Research)*
 DONNA-JEAN B. WALKER, M.D., *Clinical Assistant Professor of Pediatrics*
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 ANTHONY A. WALSH, PH.D., *Adjunct Professor of the Child Study Center*
 HAROLD R. WARD, PH.D., *Professor of Chemistry*
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 ALAN B. WEITBERG, M.D., *Assistant Professor of Medicine*
 PAUL T. WELCH, M.D., *Clinical Assistant Professor of Neurosurgery*
 BARBARA L. WELLS, PH.D., *Instructor in Community Health (Research)*
 JOEL K. WELTMAN, PH.D., M.D., *Clinical Associate Professor of Medicine*
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 VAN R. WHITING, JR., PH.D., *Assistant Professor of Political Science*
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 MILDRED WIDGOFF, PH.D., *Professor of Physics*

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 MICHAEL C. WIEMANN, M.D., *Assistant Professor of Medicine*
 ROBERT O. WILHELM, M.D., *Clinical Assistant Professor of Family Medicine (Emergency)*
 DAVID O. WILLIAMS, M.D., *Professor of Medicine*
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 PATRICIA N. WOLD, M.D., *Clinical Assistant Professor of Psychiatry and Human Behavior*
 ALFRED W. WOLFSOHN, M.D., *Clinical Instructor in Medicine*
 WILLIAM A. WOLOVICH, PH.D., *Professor of Engineering*
 E. JONATHAN WOLSTON, M.D., *Clinical Assistant Professor of Psychiatry and Human Behavior*
 GORDON S. WOOD, PH.D., *Professor of History*
 HAROLD A. WOODCOME, JR., M.D., *Clinical Assistant Professor of Surgery (Ophthalmology)*
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 JACQUES C. WRIGHT, PH.D., *Assistant Professor of Psychology*
 PING WU, PH.D., *Assistant Professor of Medicine (Research)*
 DONNA M. WULFF, PH.D., *Associate Professor of Religious Studies*
 WILLIAM F. WYATT, JR., PH.D., *Professor of Classics*
 JIA-MO XU, *Visiting Associate Professor of Applied Mathematics (Research)*
 ISRAEL YAAR, M.D., *Assistant Professor of Medicine*
 KIKUKO YAMASHITA, PH.D., *Lecturer in Japanese*
 RONALD A. YANKEE, M.D., *Professor of Medicine*
 JAMES J. YASHAR, M.D., *Clinical Assistant Professor of Surgery (Cardiothoracic Surgery)*
 JOHN YASHAR, M.D., *Clinical Assistant Professor of Surgery (Thoracic Surgery)*
 AKIO YASUHARA, PH.D., *Assistant Professor of Economics*
 SEE-CHEN YING, PH.D., *Professor of Physics*
 HEBER W. YOUNGKEN, JR., PH.D., *Lecturer in Medicine*
 ANTHONY T. YU, M.D., *Clinical Assistant Professor of Radiation Medicine*
 AKIHIKO YUKIE, PH.D., *J.D. Tamarkin Assistant Professor of Mathematics*
 RICHARD A. YUND, PH.D., *Professor of Geological Sciences*
 SUMNER I. ZACKS, M.D., *Professor of Pathology*
 MICHAEL J. ZAJANO, PH.D., *Visiting Associate Professor of Psychology and Cognitive Science*
 ZBIGNIEW A. ZAWADZKI, M.D., *Associate Professor of Medicine (Research)*
 STANLEY M. ZDONIK, JR., PH.D., *Assistant Professor of Computer Science*
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 STEVEN B. ZIPIN, M.D., *Clinical Assistant Professor of Medicine*
 LI ZIYUAN, PH.D., *Visiting Associate Professor of Physics*
 JOSEPH M. ZUCKER, M.D., *Clinical Assistant Professor of Psychiatry and Human Behavior*
 ALAN S. ZUCKERMAN, PH.D., *Professor of Political Science, Professor of Judaic Studies*

List of Officers of Instruction who did not appear in the 1983-1985 Catalogue

ROY L. ADLER, PH.D., *Visiting Professor of Applied Mathematics, November 1, 1984-December 31, 1984*
 LAWRENCE J. ALQUIST, PH.D., *Instructor in Radiation Medicine, November 1, 1984-March 1, 1985*
 GUNNAR E. ANDERSON, M.D., *Visiting Assistant Professor of Pediatrics, January 1, 1985-June 30, 1985*
 KENNETH BAKER, B.A., *Visiting Lecturer in Art, September 1, 1984-December 31, 1984*
 FRANCOISE BASCH, PH.D., *Visiting Associate Professor in the Pembroke Center, September 1, 1984-May 31, 1985*
 ELLISON BERNS, M.D., *Instructor in Medicine, July 1, 1983-June 30, 1984*
 JAY W. BONNER, M.A., *Adjunct Instructor in English, January 1, 1985-May 31, 1985*
 ROGER M. BOWLEY, PH.D., *Visiting Associate Professor of Physics, January 1, 1984-May 31, 1984*
 IRENE Q. BROWN, PH.D., *Visiting Assistant Professor of Pembroke Center, September 1, 1983-June 1, 1984*
 CLAIRE L. BURKERT, M.A., *Adjunct Instructor of English, September 1, 1984-December 31, 1984*
 LUIZ CARVALHO, PH.D., *Visiting Assistant Professor of Applied Mathematics (Research), September 1, 1983-June 30, 1984*
 ALBERTO CECCHI, PH.D., *Visiting Assistant Professor of Engineering (Research) September 1, 1984-November 30, 1984*
 YUN-SHYONG CHOW, PH.D., *Visiting Assistant Professor of Applied Mathematics (Research), February 1, 1984-April 30, 1984*
 SUCK J. CHUNG, PH.D., *Visiting Associate Professor of Physics, November 1, 1983-October 31, 1984*
 FRITZ COLONIUS, PH.D., *Visiting Assistant Professor of Applied Mathematics, September 1, 1984-May 31, 1985*
 MARIA CORTI, PH.D., *Visiting Professor of Italian Studies, August 1, 1984-January 31, 1985*
 CHRISTINA CROSBY, PH.D., *Visiting Associate Professor of the Pembroke Center, July 1, 1984-May 31, 1985*
 ANTOINE D'AUTUME, PH.D., *Visiting Assistant Professor of Economics, January 1, 1984-June 30, 1984*
 MARCIA DALBY, M.F.A., *Visiting Assistant Professor of Art, January 1, 1985-May 31, 1985*
 MARGARET M. DAY, PH.D., *Adjunct Lecturer in Education, September 1, 1984-June 30, 1985*
 ANTONIO DE LECEA, PH.D., *Visiting Assistant Professor of Economics, January 1, 1984-August 31, 1984*
 YASMINE ERGAS, PH.D., *Visiting Associate Professor of the Pembroke Center, June 1, 1984-May 31, 1985*
 MARK I. FAGAN, M.D., *Instructor in Medicine, July 1, 1983-June 30, 1984*
 SAMY FARIED, PH.D., *Adjunct Associate Professor of Engineering, January 25, 1984-May 31, 1984*

- DONALD GEMAN, PH.D., *Visiting Professor of Applied Mathematics, January 1, 1984-June 30, 1984*
- ALESSANDRO GIACALONE, PH.D., *Visiting Assistant Professor of Computer Science, July 1, 1985-July 31, 1985*
- GARY G. GILBERT, PH.D., *Visiting Associate Professor of Psychiatry and Human Behavior, January 1, 1984-July 31, 1984*
- PATRICIA E. GRIEVE, PH.D., *Visiting Assisting Professor of Hispanic Studies, July 1, 1984-June 30, 1985*
- ANDREA HAIRSTON, A.M., *Visiting Assistant Professor of Theatre Arts and Afro-American, July 1, 1984-December 31, 1984*
- JOHN B. HEALY, M.D., *Visiting Clinical Associate Professor of Medicine, May 14, 1984-July 28, 1984*
- JAMES J. IFFLAND, PH.D., *Visiting Associate Professor of Hispanic Studies, February 1, 1984-May 31, 1984*
- CHARLOTTE IKELS, PH.D., *Visiting Assistant Professor of Anthropology, September 1, 1984-December 31, 1984*
- HARRIET S. IWAMOTO, PH.D., *Visiting Assistant Professor of Pediatrics (Research), October 1, 1983-September 30, 1984*
- SUSAN A. KAPLAN, M.A., *Adjunct Lecturer in Education, September 1, 1984-June 30, 1985*
- NILA KAPOR-STANULOVIC, M.D., *Visiting Associate Professor of Community Health, September 1, 1984-June 30, 1985*
- MICHAEL KARPLUS, M.D., *Visiting Assistant Professor of Pediatrics, September 1, 1984-August 31, 1985*
- ABRAHAM KUTEN, M.D., *Visiting Associate Professor of Radiation Medicine, January 1, 1984-June 30, 1984*
- CHUL LEE, M.D., *Visiting Assistant Professor of Pediatrics, July 1, 1984-August 31, 1985*
- PHILIP LEVINE, M.S.A., *Visiting Professor of English, January 1, 1985-May 31, 1985*
- XUNJING LI, *Visiting Professor of Applied Mathematics, September 1, 1984-October 31, 1984*
- JOHN M. LOVE, PH.D., *Adjunct Lecturer in Education, September 1, 1984-June 30, 1985*
- PETER L. MANUAL, PH.D., *Visiting Assistant Professor of Music, January 1, 1985-June 30, 1985*
- WAYNE NAGATA, PH.D., *Visiting Professor of Applied Mathematics (Research), September 1, 1984-July 31, 1985*
- STEVEN C. NARDONE, PH.D., *Adjunct Assistant Professor of Engineering, January 16, 1984-May 31, 1984*
- MAUREEN F. O'MEARA, PH.D., *Visiting Assistant Professor of French Studies, July 1, 1984-June 30, 1985*
- ELIZABETH OAKES, PH.D., *Visiting Lecturer in Afro-American Studies, January 25, 1984-May 31, 1984*
- RICHARD R. OLSON, A.M., *Adjunct Instructor of Population Biology and Genetics, January 1, 1984-May 31, 1984*
- EUGENE W. OUTERBRIDGE, M.D., *Visiting Associate Professor of Pediatrics, September 1, 1984-August 31, 1985*
- IVANO PACCAGNELLA, PH.D., *Visiting Associate Professor of Italian Studies, January 1, 1985-June 30, 1985*
- NYRNA PEARSON, PH.D., *Visiting Professor of Environmental Studies, July 1, 1984-June 30, 1985*
- MICHAEL POLLAK, PH.D., *Visiting Professor of Engineering (Research), January 1, 1984-May 31, 1984*
- DRAGAN POPOVIC, PH.D., *Visiting Assistant Professor of Physics, August 1, 1983-July 31, 1984*
- CLAUDE PUECH, SC.D., *Visiting Assistant Professor of Computer Science, May 1, 1985-May 31, 1985*
- RAMA V. RAMACHANDRAN, PH.D., *Visiting Associate Professor of Economics, July 1, 1984-June 30, 1985*
- JANET H. RANDALL, PH.D., *Visiting Assistant Professor of Linguistics, January 1, 1985-May 31, 1985*
- CARL RAPP, PH.D., *Visiting Associate Professor of English, January 1, 1984-June 30, 1985*
- ARDEN REED, PH.D., *Visiting Assistant Professor of English, January 1, 1984-June 30, 1985*

- DAVID A. ROCHEFORT, PH.D., *Visiting Assistant Professor of Political Science, January 2, 1984-May 31, 1984*
- MARIEVE RUGO, M.A., *Adjunct Instructor of English, January 1, 1985-May 31, 1985*
- WOLFGANG RUNGALDIER, PH.D., *Visiting Professor of Applied Mathematics (Research), January 1, 1985-August 31, 1985*
- JOHN M. SAPINSLEY, M.A., *Visiting Associate Professor of Engineering Economics, January 16, 1984-May 31, 1984*
- PAUL SCHALOW, PH.D., *Visiting Lecturer in Linguistics, July 1, 1983-June 30, 1984*
- LEON H. SEITELMAN, PH.D., *Visiting Professor of Industrial and Applied Mathematics, January 1, 1985-May 31, 1985*
- SURESH P. SETHI, PH.D., *Visiting Professor of Applied Mathematics (Research), March 15, 1985-May 31, 1985*
- ZHAO SHI-LI, A.M., *Visiting Professor of Population Studies, September 10, 1984-September 25, 1984*
- ERNEST SIGMUND, *Visiting Associate Professor (Research), February 25, 1985-March 31, 1985*
- KATHLEEN SMITH, M.S., *Adjunct Lecturer in Economics, January 16, 1984-May 31, 1984*
- SUSAN SONTAG, M.A., *Visiting Professor of English, January 1, 1984-May 31, 1984*
- JORGE SOTOMAYOR, PH.D., *Visiting Professor of Applied Mathematics (Research), September 1, 1984-November 30, 1984*
- MILAN STANULOVIC, M.D., *Visiting Associate Professor of Pediatrics, September 1, 1984-June 30, 1985*
- JACOB E. STEINER, PH.D., *Visiting Professor of the Child Study Center, January 15, 1985-August 31, 1985*
- JOHN F. STEVENSON, PH.D., *Adjunct Associate Professor of Psychiatry and Human Behavior, July 1, 1984-June 30, 1985*
- VALERIE Y. SUSLOW, PH.D., *Visiting Assistant Professor of Economics, January 1, 1984-June 30, 1984*
- DOMOKOS VERMES, PH.D., *Visiting Assistant Professor of Applied Math (Research), September 1, 1984-July 31, 1985*
- DONALD H. WEINGARTEN, PH.D., *Adjunct Professor of Physics, September 1, 1983-August 31, 1984*
- LEO WEINSTOCK, PH.D., *Visiting Assistant Professor of Judaic Studies, September 1, 1984-May 31, 1985*
- KEITH D. WHITE, PH.D., *Visiting Associate Professor of Psychology (Research), June 16, 1984-July 31, 1984*
- HARRIET WHITEHEAD, PH.D., *Visiting Associate Professor of the Pembroke Center, July 1, 1984-May 31, 1985*
- GILBERT WHITTEMORE, M.A., *Visiting Instructor in History, February 15, 1985-March 31, 1985*
- NANCY C. WILKIE, PH.D., *Parker Visiting Professor of World Archaeology and Art, September 6, 1983-November 21, 1983*
- F.I. WILLIAMS, PH.D., *Visiting Associate Professor of Physics, February 15, 1984-December 1, 1984*
- JEAN A. WISGIRDA, M.D., *Instructor in Obstetrics and Gynecology, July 1, 1983-June 30, 1985*
- PETER WOLLEN, PH.D., *Visiting Professor of Semiotics, January 1, 1984-June 30, 1984*
- LYNN WOODBURY, PH.D., *Adjunct Assistant Professor of English, September 1, 1983-December 31, 1983*
- HENG ZHOU, *Visiting Professor of Theoretical Fluid Mechanics, January 25, 1985-March 24, 1985*
- SIMING ZHU, *Visiting Associate Professor of Applied Mathematics, April 30, 1985-August 3, 1985*

General Regulations

Course Registration and Enrollment

General Information

Instructions about enrollment will be sent prior to the opening of each semester to all students. To complete enrollment, all requirements of the pertinent administrative offices of the University must be met, including registration for courses, payment of accounts, and arrangements for housing as appropriate. Fees will be charged for failure to meet established deadlines.

All students must complete enrollment in order to be eligible to remain at the University.

Enrollment Without Academic Credit

Auditing. An auditor is a student who is registered in a course without credit under the following conditions: (1) the student must be properly registered for it; (2) the student must pay the usual course fee except as indicated in the next paragraph; (3) the student is entitled to all instruction in the course, including conferences, the criticism of papers, tests, and examinations.

Any student registered on a full-time basis may be permitted to audit additional courses in any semester without charge. The total number of course registrations, including audits, may not exceed five courses.

With the concurrence of the instructor, the fact that a course has been audited shall be entered on the permanent record of any student electing this privilege. The status of a course in which a student has been registered as an auditor may not be changed from audit to credit after mid-semester.

Vagabonding. A "vagabond" is a student who, with the permission of the instructor involved, visits a given course occasionally or regularly without payment of fee. It is understood that such a student shall be entitled to participate in classes and activities, including discussions, conferences, and papers, *only* at the pleasure of the instructor.

Attendance, Grading, Examinations

Attendance

It is in the interest of every student to attend all sessions of the classes in which registered, and each student has an obligation to contribute to the academic performance of all by full participation in the work of each class; however, within such limits as are necessary for the general welfare, a student benefits also from exercising discretion and assuming responsibility for his or her educational progress.

Accordingly, unless the instructor imposes attendance requirements, students are not limited with respect to the number of absences from a course. When, in the instructor's opinion, a student is abusing the privilege of voluntary attendance, the appropriate Dean's Office should be notified so that appropriate action may be taken.

A student is always fully responsible for any course work missed because of absences and will be assigned failing grades in examinations missed without excuse from the office of the Dean or the University Health Service.

No student organization shall make any appointment for undergraduates which conflicts with college exercises unless permission has been obtained from the Dean.

Grading System

At the end of each semester final grades are given in semester courses. A tentative grade is given at the end of the first semester in year courses (indicated by a dash between course numbers); at the end of the second semester examinations in such courses cover the work of the two semesters, and a final grade for both is assigned at that time.

In all courses a student may, in consultation with the advisor, elect to be graded on a basis of either *Satisfactory/No Credit* or *A, B, C/No Credit*. A student must for every course taken indicate by the end of the fourth week of the semester which basis for grading is elected.

Any student regularly enrolled in a course, no matter whether for *A, B, C/No Credit* or for *Satisfactory/No Credit*, may request from the Instructor a more detailed written evaluation of his or her work. Such supplemental evaluations are intended primarily for the information of the student and do not replace departmental evaluations.

No Credit is given when courses are not satisfactorially completed or are dropped. The notation *No Credit*, and the description of the course in which it is given, are not entered on the transcript.

1. All Modes of Thought courses will be graded on a *Satisfactory/No Credit* basis only. Instructors of MT courses will be responsible for providing Course Performance Report forms to all students who request them.
2. Other courses may be designated to be graded on a *Satisfactory/No Credit* basis for all students enrolled on the initiative of the instructor. The designation of a course by an instructor to be graded *Satisfactory/No Credit* only must be announced no later than the first day of classes and entails the responsibility for providing Course Performance Report forms to all students who request them. An asterisk shall accompany the listing on the transcript of any course that has been designated by the instructor to be graded on the basis of *S/NC* only, with an appropriate explanation of the symbol provided.
3. In exceptional circumstances, a course may be left incomplete (except for a regularly scheduled final examination — see paragraph 6 below), with the instructor's consent. In such cases, a grade of *I* will be assigned provided that the student has filed a request for extension of time to complete the work of the course and the instructor has consented to such a request (forms for this purpose are available from the Registrar's Office and departmental offices). Unless an earlier date is specified by the instructor, grades of *I* must be made up as follows: for Semester I, by mid-semester of Semester II; for Semester II, by the first day of the following semester. Extensions beyond these dates for any period of time up to but no more than one year from the end of the semester in which the course left incomplete was taken may be granted by the instructor who will indicate this in writing to the Registrar.

A course not completed by the designated time will be assigned a grade of *NC* unless the instructor indicates that sufficient work has been completed to justify course credit by submitting, as appropriate, a grade change from *I* to *A, B, C*, or *S*. A grade of *NC* assigned in accordance with these procedures may be changed subsequently, but no later than one calendar year after the end of the semester in which the course was taken.

4. If a student is absent from a regularly scheduled final examination for a course, the instructor will assign a grade of *ABS*. If the absence from the examination is excused by the Dean, the student will be permitted to take a Special Examination. The Special Examination will be administered by the Registrar in accordance with the provisions in the Faculty Rules for such examinations, unless other arrangements are agreed to by the instructor and the student, and communicated to the Registrar. If the absence from the final examination is not excused by the Dean, the student will receive no credit for the course.
5. A grade of *I, ABS* will be assigned if appropriate and will be resolved in accordance with the provisions of No. 5 and No. 6 above.

Course Performance Reports. Students who elect to take a course on a *Satisfactory/No Credit* basis may request the instructor to complete a Course Performance Report form. This request has to be made prior to mid-semester. The instructor may decline to submit such a form if it is believed he or she has inadequate information to do so. Particular consideration should be given to requests from students for whom the course is part of their concentration program. Copies of Course Performance Reports will be made available to: (1) the student, (2) the Dean's Office, and (3) the student's concentration advisor. While not part of the official record, Course Performance Reports may be sent out of the University at the student's request as information on his or her work at Brown University. In such cases, the student must provide copies of all material to be enclosed at the time the transcript is requested.

Concentration Evaluations. Undergraduate students may request a written evaluation of performance in concentration, which will consist of the student's own statement and an evaluation prepared by an appropriate faculty member. The following points may be included in such an evaluation: any special characteristics of the concentration program; information on the student's official transcript, such as the interest and motivation of the student, the probable capacity for more advanced work, the ability to conduct research, and so forth; and a comment describing the bases on which the evaluation was prepared. If the student elects to have a concentration evaluation prepared, a concentration evaluation form, available from the Registrar, should be submitted to the concentration advisor by the end of the first week of the student's final semester.

Examinations

Final Examinations. A final, written examination (at the end of each semester) shall be given in each course numbered under 200 unless the instructor of a particular course decides to use some other mode of final evaluation. If the written examination is not to be used, the mode of final examination which is to be used shall be made known to the students in the course no later than mid-term and, in addition, the Department and the Educational Policy Committee shall be informed.

Special Examinations. These examinations are given only with the approval of the Dean to students absent from final examinations. A fee of \$5 is charged for each examination; it may be waived, however, for any student submitting a medical excuse satisfactory to the Dean.

Special examinations on the work of the first semester are given during a special examination period, in the fifth week of the second semester. A student eligible for such a special examination must file an application with the Registrar, *not later than the second Wednesday of the second semester.*

Special examinations on the work of the second semester are given in the week preceding the opening of the academic year. A student eligible for such a special examination must file an application with the Registrar, *not later than August 15.*

Placement and Achievement Tests in Foreign Languages. Placement tests in the foreign languages are given during Orientation Program in the fall and during the first week of classes in each semester.

All students, before taking college courses in a foreign language in which they have presented entrance credit, must take either a placement test at Brown University or, preferably, a College Board Language Achievement Test in secondary school. Students with outstanding performance on these tests, or on the Advanced Placement Tests of the College Entrance Examination Board, may be admitted to advanced courses without the usual course prerequisites.

Discipline

Academic Discipline

All cases of academic dishonesty among undergraduates, as defined in the Academic Code at Brown University, shall be referred to the Dean of the College or his or her designated representative. A student accused of such an offense shall be notified in writing as soon as possible of the specific charge or charges against him or her before his or her case is considered. The student shall be given the opportunity of a hearing before the designated representative of the Dean of The College at which all relevant facts may be presented. A student shall have the right to appeal to the Dean of The College any decision, within five business days after the decision has been rendered. For definitions of offenses against the Academic Code, procedures, policies, and a list of penalties, see the pamphlet issued by the Office of the Dean of The College, the Academic Code of Brown University.

Non-Academic Discipline

In order to protect personal and academic freedom, Brown University seeks through appropriate policies and regulations to encourage mature and responsible behavior on the part of all students within the University. All students (undergraduate, graduate, or medical) are expected to conduct

themselves in a manner compatible with the University's function as an educational institution and with the right of all members of the University community to attend, make use of, and enjoy the facilities and functions of the University without interference or disruption. Failure to do so may result in withdrawal of the student's privilege of attending the University, the suspension of specific privileges, or the imposition of other penalties.

Non-Academic disciplinary cases are administered by the University Council on Student Affairs. Specific policies are contained in the *Student Handbook*.

Academic Freedom

Consonant with Brown's tradition concerning academic freedom, the Faculty and Corporation, in 1966, adopted the following statement of principles:

Academic freedom is essential to the function of education and to the pursuit of scholarship in universities.

Therefore, Brown University, mindful of its historic commitment to scholarship and to the free exchange of ideas, affirms that faculty and students alike shall enjoy full freedom in their teaching, learning, and research.

Brown University also affirms that faculty and students shall have freedom of religious belief, of speech, of press, of association and assembly, of political activity inside and outside the University, the right to petition the authorities, public and University, to invite speakers of their choice to the campus, and that students and faculty as such should not be required to take any oath not required of other citizens. The time, place, and manner of exercising these rights on campus shall be subject to reasonable regulation only to prevent interference with the normal functions of the University.

The Faculty Executive Committee is responsible for assisting in the implementation of these principles. The group shall receive charges and, if necessary, institute formal proceedings in accordance with regulations voted by the Faculty. A charge may be brought by a student, an association of students, a member of the teaching or research staff, faculty member, or the President.

The Family Educational Rights and Privacy Act of 1974

The Family Educational Rights and Privacy Act of 1974 (P.L. 93-380) extends to a student the right of access to his or her education records maintained at the University. The Deans of The College, the Graduate School, and Medical Affairs, and the Registrar maintain these records for enrolled students. Information and notification as to the type of record; the accessibility of and policies for maintaining, reviewing and expunging the record; and the procedure for inspecting, reviewing, obtaining copies of, or challenging the record are established and promulgated by the appropriate officers. A copy of the University's FERPA policy may be obtained from the Office of the Registrar.

Parents or guardians of students who are dependent for federal income tax purposes may (at the option of the University) be granted access to the student's record. A student who is not claimed as a dependent by his or her parents for federal income tax purposes (Section 152 of Title 26 of U.S. Code) may declare at the beginning of each semester by signing a "statement of independence from parents," available at the Registrar's Office. A student who does not submit this notification will be presumed to be dependent and his or her parents may then be kept informed of the student's status, including academic standing, violations of the Academic Code, disciplinary violations, and facts relating to the status of the student.

Equal Employment Opportunity

Brown University does not discriminate on the basis of sex, race, color, handicap, status as a veteran, national or ethnic origin in administration of its educational policies, admissions policies, scholarship and loan programs, or other school-administered programs.

The University also affirms that judgments about admissions, education, and employment at Brown are based on merit, qualifications, and performance and not on personal attributes or convictions unrelated to academic or job performance.

The College

Admission

Requests for applications for admission to undergraduate study should be addressed to:

Admission Office — The College
Brown University
Providence, Rhode Island 02912
(401) 863-2378

The application deadline for the regular admission process is January 1 of the year of desired entrance to Brown. An Early Action Plan is available for students who wish to receive December notification. Candidates must apply as early in the fall of the senior year of high school as possible but in any case before November 1.

Subject Requirements

From the University's commitment to fostering a liberal education it follows that a candidate for admission will profit most from pursuing a comprehensive college preparatory program. The foundations of a liberal education are laid in secondary school. A strong background in English (both literature and writing), foreign languages, mathematics, science, and history will enable students to benefit from the intellectual opportunities offered by Brown University. Brown considers the programs listed below to be a desirable secondary school preparation.

- English —four years with significant emphasis on writing, continued through the senior year;
- Mathematics —at least three years of college preparatory mathematics, preferably continued through the senior year;
- Foreign Language —at least three years, preferably continued through the senior year;
- Laboratory Science—at least two years of laboratory science above the freshman-year level. Prospective science or engineering students should take both physics and chemistry and as advanced a level of mathematics as possible;
- History —at least two years, including American History;
- The Arts —at least one year of study in music or art;
- Elective Subjects —at least one year of elective academic subjects; familiarity with a computer programming language is recommended.

Note: Exceptions may be made. The Board of Admissions encourages the growth of innovative programs and welcomes applications from students of varying educational backgrounds who have shown outstanding intellectual promise. Exceptionally able students who are well prepared to enter college before completion of secondary school may also be admitted.

College Entrance Examination Board Tests

Each applicant must take the Scholastic Aptitude Test and at least three Achievement Tests of the College Board no later than January of the senior year. Scores for the examinations administered through the American College Testing Program may be submitted in lieu of those of the CEEB. It is the responsibility of each candidate to take the appropriate tests and to see that they are officially reported to the Board of Admission at The College before February 15. A final decision on the application cannot be made until the official scores have been received.

Advanced Placement

Brown participates in the Advanced Placement Program of the College Entrance Examination Board. The Program's aims are "to give able students challenging educational experiences in school, and to increase for these able students the opportunity to take advanced work in college." Students enrolled in secondary schools participating in this program may take the appropriate exam-

inations given in May and have the scores sent to the Office of the Dean of Freshmen and Sophomores. Course credit and/or placement is determined by the appropriate academic department of Brown University, which may review the examination booklets and other materials. Policies on credit and/or placement vary from department to department. Students will be notified of such credit upon matriculation at Brown. Subjects in which course credit may be granted include American History, Art History, Biology, Chemistry, European History, French, German, Latin, Mathematics, Music, Physics, and Spanish.

Advanced Placement credits may not be applied to the minimum 28 courses needed to earn a Brown degree.

Advanced Standing

By the end of the second week of their fifth semester, students must declare to the Registrar's Office whether or not they wish to use their AP credits for acceleration. To use AP credits for acceleration, students may request one semester of Advanced Standing (and tuition credit) for 3—6 AP credits or two semesters of Advanced Standing (and tuition credit) for 7—10 AP credits. Students not requesting Advanced Standing (and tuition credit) from the Registrar by this deadline may not do so subsequently, except through petitioning the Committee on Academic Standing.

Transfer Admission from Other Colleges

Only a limited number of students can be accepted each year. A maximum of two years of study elsewhere is transferable; extension or correspondence courses are not transferable, nor are courses outside the realm of defined academic disciplines (nursing, radio electronics and/or broadcasting, or business administration, to name a few). Students who wish to be considered as transfer candidates should write or call the Admission Office for additional information, application forms, and procedures.

Special and Guest Students

Each year a number of students enrolled at other colleges spend a semester or a year as “visitors” at Brown to pursue course work (toward credit at their own college) not offered at their own institution. Other students are accepted on a non—matriculated basis for a limited number of courses and are classified as special students.

Resumed Education Program

The Resumed Undergraduate Education program at Brown University enables a person who has interrupted his or her formal education for five or more years, or who is twenty—five years or older, to enroll as a fully matriculated student and to study at a full or part—time rate. Some applicants have completed college work already; others have interrupted their education after completing high school. A Board of Admission for Resumed Education goes beyond the traditional bases of secondary school grades and college board scores in making its admission decisions and considers a number of criteria including experience, maturity, commitment, and future potential.

Interested people should call or write Resumed Undergraduate Education Program, College Admission Office, Box 1876, Brown University, Providence, Rhode Island 02912. The telephone is (401) 863-2382.

Academic Status

Warning, Serious Warning, Dismissal

A student must maintain the minimum standards set by the Faculty and Corporation for graduation. A student whose grades fall below these standards will be subject to dismissal from college.

Undergraduates who, in the judgment of the Committee on Academic Standing, have an unsatisfactory scholastic record will be placed in one of three categories — Warning, Serious Warning, Dismissal.

Action by the Committee will depend on the extent of the student's deficiency as determined by academic performance in the most recently completed semester or semesters and/or the cumulative record to date. To remain in good academic standing, a student must complete successfully at least seven courses in each consecutive two semesters.

Warning serves to caution students that their record is below the standard for graduation.

Serious Warning notifies a student that, unless the record improves, he or she will be subject to dismissal at the end of the semester.

Dismissal may be ordered when the Committee finds that a student's academic record is unsatisfactory and there is no reasonable expectation of significant improvement.

Students on Warning and Serious Warning may be required to seek special academic advising by the Dean.

Advising and Counseling

Brown is rich in resources for academic advising and personal counseling. At entrance, each student is assigned to a residential counseling unit composed of approximately 35 freshmen and 3 or 4 upperclass Counselors. In addition, each incoming freshman is also assigned a faculty or staff member who serves as freshman Academic Advisor for Liberal Education. Most often the advisor functions within the Curricular Advising Program wherein the advisor is also the instructor in one of the freshman's courses. Otherwise, an effort is made to assign a student an Advisor from an academic area in which the student has indicated an interest. Through general discussions and individual meetings with both faculty and upperclass student counselors, residential and not, each freshman is expected to formulate a program of study best suited to his or her intellectual needs, capacities and goals.

Other resources for personal, career, and academic counseling and advice are available through a broad network of services, including the University Health Services, Chaplains, Deans, Faculty Fellows, the Resource Center, the Sarah Doyle Women's Center, the Third World Center, Career Planning Services, Randall Counselors, in addition to a host of student groups including Minority Peer and Women counselors, and other peer groups. At the outset of each academic year, the Orientation Program for freshmen is a major early resource. Throughout the year, both the Offices of the Dean of the College and the Dean of Student Life provide academic, career, and personal counseling to all students who request it.

When a student begins a concentration program, no later than the end of his or her fourth semester, advice and counsel is also available from members of individual departments and programs in which the concentration has been elected.

Student Support Program (SSP)

Students at Brown have available to them a composite student support system, called SSP, intended to improve the transition from secondary school to college and to help students take advantage of academic and cultural resources at Brown. SSP begins with the Third World Transition Program, just prior to the Orientation Program, and includes varied individual tutorial services, reading and study skills programs, a drop-in Writing Center, tutorial sections for certain courses, Minority Peer Counselors, and multi-cultural activities of many kinds at the Third World Center in Churchill House.

Additional support components are the Math Center, and services for dyslexic students administered by a dean of the College.

Requirements for Baccalaureate Degree

At Brown University, education for the undergraduate has as purposes the fostering of the intellectual and personal growth of the individual student. The student, ultimately responsible for his or her own development in both of these areas, must be an active participant in framing his or her education. A central aspect of this development is the relationship of the student with professors and

fellow students and with the material they approach together. Structures, rules, and regulations of the University should facilitate these relationships and should provide the student with the maximum opportunity to formulate and achieve his or her educational objectives. Accordingly, the following curricular structure reflects these purposes. See section on the Graduate School for advanced degree requirements.

Baccalaureate Degrees Offered

Two baccalaureate degrees are awarded — the *Bachelor of Arts* and the *Bachelor of Science*. The *Bachelor of Science* degree recognizes a science concentration that demonstrates both breadth and depth in science beyond the minimum required for the *Bachelor of Arts* degree in the same field. A *Bachelor of Science* program normally will follow these guidelines:

1. The concentration program, with the exception of Engineering, shall require no more than ten courses in any one department. The total number of concentration courses required shall not exceed twenty (twenty-one for Engineering).
2. At least one semester course of independent study, research, or design in the concentration discipline must be included.
3. Additional electives must be chosen to meet the quantity requirement for all baccalaureate degrees.

Presently there are standard concentration programs leading to the *Bachelor of Science* degree in Applied Mathematics, Applied Mathematics-Biology, Applied Mathematics-Economics, Applied Mathematics-Psychology, Aquatic Biology, Biochemistry, Biology, Biophysics, Chemistry, Cognitive Science, Computer Science, Engineering, Geological Sciences, Mathematics, Mathematics-Computer Science, Neural Sciences, Physics, and Psychology.

Quantity and Progress Requirements

Each student is normally expected to enroll in four courses in each of 8 semesters for a total of 32 courses. (Tuition payments, by decision of the Corporation, are based on the norm of 32 courses and 8 semesters of full-time residence at Brown.)

To encourage risk-taking in the planning of educational programs, or to provide a degree of flexibility in individual programs, the minimum number of courses that must be successfully completed for graduation has been set at twenty-eight. The maximum number that may be completed in eight semesters (without extra tuition payments) is forty. A student may choose to take a minimum of three to a maximum of five courses in a particular semester.

To remain in good academic standing, a student must complete successfully at least seven courses in each two consecutive semesters. A student may not be enrolled in fewer than three (3) courses in any semester without written permission from the Dean of the College for short-work.

Academic standing is determined only on the basis of courses completed at Brown. Neither transfer credit nor A.P. credit will figure in the determination of academic standing. Transfer credit for courses taken at other institutions, either in this country or abroad, may be granted by the Committee on Academic Standing on the recommendation of a department and, in the case of courses qualifying for concentration credit, on the recommendation of the student's concentration advisor. Summer school courses are not acceptable for transfer credit.

Students who apply transfer credits towards completion of the requirements for their Brown baccalaureate degree, must complete successfully at least 14 courses and 4 full-time semesters of course work at Brown (effective for students entering The College in Semester I, 1983-84, and after). For any semester to count as a full-time semester of residence, a minimum of 3 courses must be taken. Resumed Education students may study either on a part-time or full-time basis.

A.P. credits may only be used as full-time semester equivalents above and beyond the 28 minimum course requirements (effective for students entering The College Semester I, 1983-84, and after); i.e., semester equivalent tuition credits will be awarded for advance placement (A.P.) credits; however, A.P. credits, although carrying academic course credit, may not be applied to the minimum requirement of satisfactory completion of 28 courses.

Residence Requirement

Every candidate for a baccalaureate degree, except those enrolled in the Resumed Education Program, must be enrolled for at least four semesters as a full-time student and must complete satisfactorily a minimum of fourteen courses at Brown. Students in the Resumed Education Program must complete satisfactorily a minimum of fourteen courses at Brown and be in residence not less than four semesters. Resumed Education students may study either on a part-time or full-time basis. Every student must spend sufficient time in concentration studies to permit faculty evaluation of his or her concentration.

English Requirement

Since its founding, Brown has stressed the importance of writing. Competence in reading and writing is required for all degrees. Beyond competence, Brown seeks to develop the quality of writing in courses throughout the University.

In general, the entering student is expected to have demonstrated the ability to write by superior performance in secondary school or college courses. Students who, in the opinion of the Dean, have not clearly demonstrated such competence will be directed by the Dean to enroll during their first semester in a designated course that requires significant reading and writing.

As they continue at Brown, all students are expected to pursue a high level of performance in their writing. Students who, in the opinion of their instructors, fail to maintain an appropriate level of competence in reading or writing, should be referred to the Dean for placement in a course offering the opportunity to improve their abilities. If students do not complete such a course satisfactorily and/or are judged by the Dean to be incompetent in writing, they will be refused registration by the Committee on Academic Standing until they meet the responsibilities for the completion of the writing requirement.

Concentration Requirement

Concentration¹ is the focal point for a student's undergraduate educational experience. It is an in-depth study centering on the unit provided by a discipline or disciplines, a problem or a theme, or a broad question. Study in depth aids intellectual development by encouraging conceptual and methodological learning on a sophisticated level. Study in depth also allows students to gain a command of an area of knowledge sufficient to enable them to engage in meaningful creative efforts in that area. The unity of the subject area encourages the ability to utilize concepts and methods in a coherent manner.

In concentration students will be undertaking an extensive inquiry into an area which is significant to them. They will be forced to integrate the large amounts of material with their personal experience. The very nature of a long and pains-taking inquiry will aid students in assessing their capabilities and limitations.

Concentration should be undertaken in ways which will maximize students' contact with individual professors who will guide them and work with them, and with their fellow students who are working in related areas.

Concentration may coincide in some ways with specific prerequisite training for professional goals, but professional training is not the central aspect of the concentration process. Concentration is designed to carry out the processes of intellectual and personal development which are at the center of the undergraduate educational experience.

Students are expected to devise, in consultation with an appropriate faculty member, a concentration program centered on a discipline or disciplines, problem or theme, or broad question; they may also select a standard departmental concentration. A written proposal presenting a statement on the major objectives of the concentration program and a list of the specific courses to be taken will be signed jointly by the student and faculty advisor, and submitted to the Educational Policy Committee for approval (forms for this purpose are available in the Office of the Registrar). Standard concentration programs require only the approval of the appropriate department or committee. The number and nature of courses constituting any proposed concentration program submitted to the Educational Policy Committee should be fully consistent with the objectives stated in the proposal.

¹ See also the section on Interdepartmental Concentration Programs, page 75.

The faculty advisor for an approved concentration program will be responsible for meeting regularly with the student throughout the period of concentration, to provide guidance as well as to assess, with the student, progress made toward attaining the goals embodied in the concentration program. This essential relationship will form a central feature in the terminal evaluation of a student's performance in concentration (see paragraph below regarding evaluation requirement and also page 63 for concentration evaluation).

At the discretion of the Educational Policy Committee, minor changes in concentration programs may be arranged with the approval of the faculty advisor. Major alterations in concentration programs, involving either changes in courses or in faculty advisors, will require the approval of the Committee.

Departments and interdepartmental groups of faculty may establish, subject to the approval and periodic review by the Educational Policy Committee, standard programs of concentration, thereby eliminating the need for individual approval. Faculty advisors designated by the department and interdepartmental groups will serve in the guidance of students undertaking approved standard programs of concentration.

Standard departmental concentration programs for the Bachelor of Arts degree shall require no fewer than eight semester courses and no more than ten. Concentration programs for the Bachelor of Science degree, with the exception of Engineering and standard interdepartmental Bachelor of Arts programs shall require no more than ten courses in any one department. The total number of concentration courses required for the Bachelor of Science degree and for standard interdepartmental Bachelor of Arts programs shall not exceed twenty (twenty-one for Engineering). None of these limits need preclude a reasonable number of pre- or co-requisites, but when passing upon any concentration requirement the Educational Policy Committee shall also review the number of these pre- or co-requisites.

In the case of independent concentrations which overlap with areas of study covered by departmental or interdepartmental programs, the Educational Policy Committee shall inform the appropriate departmental officer(s) of all substantive actions taken on submitted proposals. An active exchange of opinion between these components of the University is desirable from two viewpoints: first, a clear statement of the Committee's reasons for arriving at specific judgments should assist the departments and interdepartmental groups in the continuing evaluation of their standard concentration programs; second, the comments transmitted by the departments and interdepartmental groups to the Educational Policy Committee should be of considerable value to its members in the review of future proposals.

All students must declare a field of concentration by filing an appropriate concentration program form with the Registrar, no later than the end of Semester IV. No student will be permitted to register for his or her fifth semester unless a declaration of concentration has been filed. Students failing to complete registration on time because of the failure to file a concentration declaration will be subject to the same action taken by the University for all cases of late registration. The student and concentration adviser shall review the concentration at regular intervals. These reviews should take place no less than once in Semester V and once before midsemester of Semester VII.

Changes in declaration are permissible in accordance with the above procedure. The form will consist of three parts: (1) a statement by the student of his reasons for selecting his field of concentration and his plans for completing it; (2) a list of the courses the student plans to take in order to fulfill his purpose; (3) a statement from a faculty member approving the student's program.

All courses in the concentration program must be completed satisfactorily.

A student who satisfactorily completes more than one concentration program may have the fact indicated on his or her permanent record card. In order to accomplish this, the student must have filed a concentration program form with the Registrar for each concentration. Sponsorship and authorization of each concentration program shall follow the usual procedures.

Prior to the awarding of a baccalaureate degree, each candidate must have accumulated credit for the payment of eight semesters of tuition or the equivalent. The eight-semester tuition requirement is separate from and in addition to any other degree requirements.

Honors Program. The University, at graduation, grants Honors to students whose work in the field of concentration has demonstrated superior quality and culminated in an Honors Thesis of dis-

inction. The designation "Honors" is included on the student's transcript and diploma. No distinctions are made among quality levels of Honors work. Students considering Honors work should consult their departmental or independent concentration advisor. If the advisor accepts the student as an Honors candidate, the advisor will request the Registrar to record that fact.

The Educational Policy Committee administers the Honors Program. It:

- a. assumes overall responsibility for the Program;
- b. arranges to issue timely procedural reminders to students and to departmental and independent concentration advisors;
- c. acts on recommendations for Honors awards.

(It does *not*: file or specify formats for Honors theses; or maintain records of Honors candidates).

Recommendations for Honors awards are submitted to the Educational Policy Committee and include an evaluation of (1) the student's overall performance in concentration, and (2) the quality of the Honors Thesis and of the oral examination, if any.

- a. For students pursuing a standard concentration in a department, the Honors recommendation is made by the department.
- b. For students in an interdepartmental program of study, the Honors recommendation originates in the appropriate committee.
- c. For students pursuing an independent concentration, the Honors recommendation is made by the student's sponsor with the approval of two other faculty members familiar with the work.

Requirements for Combined Degree Programs

Combined Five-Year Program Leading To A Bachelor Of Arts Degree And A Bachelor Of Science Degree

Students who wish to earn both a Bachelor of Arts degree and a Bachelor of Science degree may do so in a five-year program in which the work for both degrees proceeds concurrently. Programs of students who elect this five-year plan will usually be arranged so that those who wish may change to either degree candidacy alone prior to the fourth year.

The specific requirements for this degree program are as follows:

1. Satisfactory completion of:
 - (a) The Sc.B. requirement for a standard concentration program in life sciences or physical science and mathematics, or an approved independent Sc.B. program spanning one or more of these areas.
 - (b) The A.B. requirement for a standard or independent concentration in the humanities or social studies.
2. A minimum of 36 courses passed. Transfer credits to conform to general University regulations governing other undergraduate programs.
3. At least three years in residence.
4. Declaration of intent either by indicating degree candidacy on admission, or by change of degree status no later than the fifth semester.

Tuition Requirement

Prior to the awarding of these combined degrees, each candidate must have accumulated credit for the payment of ten semesters of tuition or the equivalent. The ten-semester tuition requirement is separate from and in addition to any other degree requirements. See Student Charges, page 102, for details concerning required tuition payments.

Combined Program Leading To A Baccalaureate Degree And A Masters Degree

Subject to the prior approval of the department involved, and the Graduate Council, and the Committee on Academic Standing, exceptionally capable students may be permitted, in their junior year,

to enter a graduate program of study leading to the earning of both a baccalaureate and master's degree at the end of eight or nine semesters. Students who are granted this permission will be expected to complete the specific requirements for both degrees, although some courses may be used for credit toward both degrees. The candidate will complete a *minimum* of thirty-two courses within eight or nine semesters. Normally, no more than two courses counted toward the undergraduate concentration may be used to fulfill the requirements of the graduate degree. The program will include at least two 200-level courses, not including any 200-level courses counted for the independent project or thesis.

In cases where the requirements for an advanced degree are partially completed by students in meeting the requirements for a baccalaureate degree, graduate credit for such work may be allowed under the following conditions: (1) formal admission to the Graduate School, be applied for and granted, (2) the Graduate Council shall, in consultation with the department involved, determine the remaining requirements to be satisfied for the advanced degree.

The Committee on Academic Standing has adopted certain guidelines which it will follow in considering for approval requests for admission to this combined degree program. Interested students should obtain a copy of these guidelines at the Office of the Registrar prior to filing an application.

Integrated Five-Year Baccalaureate Master's Degree Program

Departments may submit to the Graduate Council for its approval proposals to establish integrated programs leading to the successive awards of the Bachelor's degree and the Master's degree. Such programs shall, as the name suggests, articulate the work of the undergraduate years with that of the graduate. In these programs, all the academic requirements for each degree must be separately met.

A student to whom no Integrated Program is available may draw up plans for such a Program and submit them to the Graduate Council through the Graduate Representative of the Department in which the student proposes to do advanced study.

A student must make application to study in an Integrated Program not later than the end of the third week of his or her penultimate semester of undergraduate study. Admission to the Graduate School for the fifth year will ordinarily be a matter of course; however, such admission must be applied for at the proper time and decided on in the regular way.

As many as two graduate-level courses taken by a student during undergraduate study at this University in an Integrated Bachelor-Master's Degree Program may be offered in partial fulfillment of the requirements for the Master's degree if not already used to meet specific requirements for the Bachelor's degree. However, the equivalent of at least six semester courses must be taken in-residence as a graduate student at Brown University.

Full-time Enrollment

Each full-time undergraduate degree candidate is required to take from three to five courses each semester. Four courses per semester is considered the normal course load.

Permission of the Dean is required to take fewer than three courses in any semester. Students who at the beginning of their senior year lack less than six semester courses of completing their course requirement may obtain permission to distribute their work over the last two semesters.

Degrees with Distinction

Baccalaureate degrees may be awarded *magna cum laude* to the upper 20% (approximately) of the graduating class. The Registrar will provide an opportunity for students to indicate that they do not wish to be considered for a degree with distinction, and will convey this information to the Committee on Academic Standing. The Committee on Academic Standing will draw up a list of those graduating seniors who are eligible to receive the bachelor's degree *magna cum laude*, taking into account for this purpose the student's cumulative academic record, faculty recommendations and any other information pertaining to a student's scholastic record that it deems relevant and useful.

Guidelines for Study Elsewhere

Study at other U.S. Institutions

Students who wish to study at other U.S. institutions for transfer credit toward their Brown degree may do so with *prior* approval of the appropriate departments and the Committee on Academic Standing. The CAS delegates to a specific Dean of the College the authority to approve petitions for such programs.

Students planning study elsewhere in this country should obtain an instruction sheet and a preliminary transfer credit approval form from the Dean responsible for off-campus study. The student should then work out a program and present it to his or her concentration advisor and other appropriate faculty members for approval. When the preliminary transfer credit form is returned to the Dean, that Dean will approve it on a tentative basis for the CAS or advise the student to petition the CAS, in which case instructions for that petition will be made available.

Students returning from study elsewhere may receive up to eight course credits for work undertaken during one academic year, but normally no more than four concentration credits may be awarded. Credit cannot be granted until the student has successfully completed the work and has had an official transcript sent to the Registrar.

Validation of credit will be carried out on a course-by-course basis. If the nature and the quality of a student's work in a specific course cannot be sufficiently determined on the basis of the available documentation, the department may give the student an oral or written validating examination. Validation should be completed as soon as possible after the student's return to Brown, normally no later than mid-semester.

Students who take a semester or year for off-campus study are granted a Leave of Absence and are asked to write the Dean responsible for off-campus studies about returning to Brown. Such notification should be received no later than December 1 for return for the spring semester and no later than June 1 for return for the fall semester.

In exceptional cases, credit may be awarded for summer study elsewhere, particularly for language study. Students considering specific programs should confer with the appropriate Dean.

Foreign Study

The Office of Foreign Study at Brown University will coordinate all foreign study undertaken by Brown students either on Brown sponsored programs or on Brown approved programs. At present Brown sponsors programs in the Peoples Republic of China, France, Italy, The German Democratic Republic, The Federal Republic of Germany, Denmark, Sweden, Poland, Spain, The United Kingdom, Egypt, Tanzania, Singapore, Japan, and Brazil. Additional programs are under consideration. The Foreign Study Office is staffed by Professor Duncan Smith, Director and Associate Dean for Foreign Study Programs; John Eng-Wong, Associate Director; Gisela Belton Program Officer; and Dean Robert Lee. Students interested in study abroad should check with this office as far in advance of any intended study as possible.

Information about foreign study opportunities is available at the foreign study office. Counselling about foreign study is done by the Foreign Study Office staff and student peer counsellors working in the Foreign Study Resource Center as well as by departmental advisors.

Students planning to study abroad must be in good academic standing. They must be able to demonstrate competency in a foreign language if one is involved in the foreign study opportunity. Prior approval of the Committee on Academic Standing is required for all students intending to study abroad on non-Brown programs for transfer credit toward their Brown degrees. In some instances prior approval of departments must also be secured.

Students planning to study abroad should obtain an instruction sheet from the Office of Foreign Study. The student should work out her or his program and present it to her or his concentration advisor and other appropriate university officers for approval. When the preliminary transfer credit form is returned to the Foreign Study Office it will be approved for CAS for students on non-Brown programs or the student will be advised to petition the CAS in which case instructions for that petition will be given.

Students returning from study abroad may receive up to eight course credits for work undertaken during one academic year. Normally no more than four concentration credits will be allowed. Credit cannot be obtained until the student has successfully completed the work and obtained documentation of what has been accomplished.

For Brown sponsored programs credit will be recorded after consultation with the Office of Foreign Study. Credit for academic work completed on Brown programs abroad can be granted when the student presents appropriate evidence to the Foreign Study Office of successful completion of the particular program. For concentration credit the student on Brown programs will have to obtain approval from the appropriate departmental concentration advisor. This credit is usually granted after the student presents documentation including evidence of work completed in the course(s) to the department, including concentration advisor. Forms for this purpose are available in the Foreign Study Office.

Official transcripts should be sent to the Registrar. When evaluations and/or other documentation are to be used, these should be brought by the student to the Foreign Study Office. Students on Brown approved but not Brown sponsored programs may be asked to take such materials to faculty advisors for review and final approval.

For students on Brown approved but not Brown sponsored programs validation of credit may be carried out on a course by course basis. If the nature and quality of a student's work in a specific course cannot be sufficiently determined on the basis of the available documentation, the department in question may give the student an oral or written validating examination. Validation should be completed as soon as possible after the student returns to Brown, normally no later than mid-semester.

Students on Brown sponsored programs are considered to be students in residence. Those studying through Brown approved programs are registered on leave of absence and asked to write to the Foreign Study Office about returning to Brown. Such notification should be received no later than December 1 for return in the spring semester and no later than June 1 for return for the fall semester.

In exceptional cases credit may be awarded for summer study abroad particularly for language study. Student considering this option should consult with the Foreign Study Office.

Standard Interdepartmental Concentration Programs

In addition to standard departmental concentration programs, several standard interdepartmental concentration programs are available. These standard interdepartmental concentration programs are subject to approval and periodic review by the Educational Policy Committee in the same manner as standard departmental concentration programs, thereby eliminating the need for approval by that Committee of programs for individual students. The standard interdepartmental programs which have been approved to date are as follows:

I. AMERICAN CIVILIZATION

Concentration requires ten courses. These must normally include: (1) two sections of American Civilization 190; (2) two semesters in American History (e.g. History 51, 52; 121, 122; 151, 152; 160, 161, 162; 169, 170; 173, 174; 175, 176; 185, 186); (3) two semesters in American Literature (e.g. English 41, 42; 141, 142; 143, 144; 122; 140; 171; 172; 187; 192; 193; 194); and (4) four electives chosen in consultation with the undergraduate advisor from more than one hundred relevant courses offered by various university departments. In order to add greater flexibility the Program makes available a number of different seminars in American Civilization 190 for juniors and seniors, any of which satisfy the requirement. The topics for these seminars change frequently and the student should consult the Course Announcement to determine which of the 190 seminars are available from year to year.

A rare exception to this standard pattern may be made in favor of an individually constructed concentration reflecting distinctive interests. A written description of the individually constructed concentration should be submitted to the undergraduate advisor no later than the second semester of the sophomore year. Such a concentration must retain American Civilization 190, but it may substitute a coherent program reflecting alternative disciplinary interests for other required courses.

Honors: In addition to the courses required of all concentrators, candidates for honors must complete the honors seminar (American Civilization 180) and an honors project (American Civilization 192). Candidates must enroll in American Civilization 180 in the first semester of their junior year. Enrollment in American Civilization 180 and admission to the honors program is on the recommendation of the director of the honors seminar, the undergraduate advisor, and another faculty member from whom the student has taken a course for concentration credit.

2. ANCIENT AND MEDIEVAL CULTURE

For a listing of concentration requirements contact Professor Gerald Toomer, History of Mathematics.

3. ANCIENT STUDIES

Standard concentration patterns: Ancient History, Ancient Religion, Languages and Literatures of Greece and the Ancient East.

Requirements: Ancient Studies 1, 2 (listed as F13, F14). (Ancient History pattern) 4 courses from: Classics 121, 122, 131, 132, Egyptology 143, 144, History of Mathematics 143. (Ancient Religion pattern) 4 courses from: Religious Studies 15, 16, 51, 63, 71, 72, 81, 82, 161, 164. 4 other related courses. Recommended electives are: Art 42, 43, 143; Classics 54, 55, 57, 58, 113, 114, 116, 118, 121, 122, 129, 131, 132, 135, 151, 157; History of Mathematics 143, 144, 152, 153; Egyptology 131, 132, 143, 144, 143A, 143B; Judaic Studies 111, 112; Philosophy 125, 180; Engineering 94F.

Honors: (Ancient History and Ancient Religion). As above, except that only 3 other related courses are required. In addition, the candidate for honors must have passed one intermediate-level course in an ancient language (Egyptian, Hebrew, Aramaic, Sanskrit, Greek or Latin) and composed an honors thesis (Ancient Studies 191, 192).

Languages and Literatures of Greece and the Ancient East (available only as an honors concentration):

Requirements: Ancient Studies 1, 2.

2 100-level courses requiring knowledge of Greek, plus 2 courses in classical literature or culture.

2 100-level courses requiring knowledge of one of the languages Egyptian, Hebrew, Aramaic or Sanskrit, plus 2 courses in the literature or culture associated with that language.

Honors Thesis (Ancient Studies 191, 192).

Concentration advisor: Mr. Boegehold.

4. ANTHROPOLOGY-LINGUISTICS

This interdisciplinary concentration primarily combines courses from the fields of anthropology and linguistics to provide systematic study of language in its social and cultural context. The concentration is built around a core of courses designed to situate this core of knowledge in a cross-disciplinary and cross-cultural context. Students will be able to relate their studies toward a relevant third discipline such as speech communication, philosophy, or social psychology through the inclusion of courses from departments other than anthropology and linguistics by arrangement with their concentration advisor.

The concentration consists of the following: 1) designated courses: a) at least two of the following anthropology courses: 20, 80, 131, 180, b) Linguistics 22, 121, 131; 2) Elective courses : a) Anthropology 132 or 133 or another course dealing with analysis of social structure, Anthropology 111, 112, 113, 114, 115, 116, or another course dealing with the ethnography of a particular world area; one to four additional courses to be drawn from Anthropology and Linguistics, or from relevant courses in other disciplines such as Sociology 40, 42; Psychology 152, 180; English 7, 21, 22; Engineering 93B; Philosophy 55, 155, 163, 177. Students will be encouraged to write honors theses in consultation with members of the anthropology and linguistics departments. Honors theses will be prepared in consultation with two faculty members from two different departments, one of which must be Anthropology or Linguistics.

5. APPLIED MATHEMATICS-BIOLOGY

This standard Sc.B. concentration program is designed as preparation for graduate study in applied mathematics or a biomathematics program in biology or for employment in a research environment where mathematical modeling of health care systems or biosystems is useful.

Requirements:

- a. Applied Mathematics 35, 36, 165 and one of 117, 118 or 120. (AM 33, 34 may sometimes be substituted for AM 35, 36.)
- b. Biomed 110, and any 3 other Biomed courses to be agreed upon by the student and his or her advisors.
- c. Mathematics 9, 10, 18 and 52 (or the Applied Algebra course in Applied Mathematics if appropriate).
- d. Chemistry 3, 11 (recommended for certain concentrators). In addition: Chemistry 12, 113, and Biomed 126.
- e. Physics 3, 4 or 5, 6.
- f. Two additional courses in Applied Mathematics, Biomedical Sciences, Chemistry, Mathematics, or Physics.
- g. The Sc.B. requirement of one semester of an independent study course (e.g. AM 193, 194, Biomed 195, 196 or an approved equivalent) must be fulfilled.

6. APPLIED MATHEMATICS — COMPUTER SCIENCES

The standard program for the Sc.B. degree with concentration in Applied Mathematics and Computer Science is sponsored jointly by the Division of Applied Mathematics and the Department of Computer Science. The concentration is designed to lay a foundation of basic concepts and methodology of mathematical analysis and computing and to build on this foundation with courses that bring together aspects of computer science and mathematics. The emphasis is on applied mathematics courses that use computers or that develop the mathematics of computing and on computer science courses that include a substantial component of mathematical analysis.

Prerequisites: Mathematics 9, 10.

Requirements: Applied Mathematics 35, 36 or Mathematics 25, 26 (AM 33, 34 may sometimes substitute for AM 35, 36.) Computer Science 11 or 4, 12, 21, 152, 153; Applied Mathematics 117 or 118, 116 or 121, 165; Computer Science 191 or Applied Mathematics 193 or 194; seven additional courses, approved by the concentration advisors, from the courses offered by Computer Science and Applied Mathematics. Of the unspecified courses, at least four shall be 100-level or higher level. Concentrators are reminded that many 100-level and higher-level Computer Science courses presume a background in discrete mathematics at the level of Computer Science 52. Students who have not acquired this background elsewhere are encouraged to consider Computer Science 52 when choosing courses to fulfill the quantity requirement of the concentration. Courses from other departments may be substituted for the unspecified Applied Mathematics and Computer Science courses if such courses stress the use of mathematical or computer models and if the advisors approve of the substitution.

Suggested courses: This list of suggested courses is intended to give ideas of courses that may be used to adapt the standard program to meet individual needs. It does not aim to list all courses that are suitable for the concentration program.

Computer Science 141 — Introduction to Artificial Intelligence.

Computer Science 159 — Introduction to Computational Complexity.

Computer Science 224 — Computer Graphics

Computer Science 253 — Analysis of Algorithms.

Computer Science 254 — Mathematical Analysis of Algorithms.

Computer Science 256 — Applied Theory of Computation.

Computer Science 274 — Programming Language Theory.

Applied Mathematics 120 — Operations Analysis: Probabilistic Models.

Applied Mathematics 151 — Applied Modern Algebra.

Applied Mathematics 166 — Statistical Inference II: Regression and Analysis of Variance.

Applied Mathematics 167 — Statistical Inference III.

Applied Mathematics 170 — Introduction to Automatic Language Analysis.
 Applied Mathematics 255, 256, 257, 258 — Numerical Analysis.
 Engineering 163 — Digital Electronics Systems Design.
 Engineering 164 — Computing Systems.
 Engineering 252 — Pattern Recognition and Computer Vision.
 Engineering 253 — Digital Signal and Image Processing.
 Mathematics 153 — Abstract Algebra.

7. APPLIED MATHEMATICS-ECONOMICS

Standard program for the Sc.B. degree. The program is designed for students preparing for graduate study in applied mathematics, economics, business or law.

Prerequisites: Mathematics 9, 10.

Course Requirements: Applied Mathematics (8 courses) 35, 36, 4 or 116 or Computer Science 4 or 11 (AM 33, 34 may sometimes substitute for AM 35, 36); Applied Mathematics 165, 166; Mathematics 52 or Applied Mathematics 151, and two other approved courses; Economics (8 courses) 111 or 113, 121, 122, 163, 164, 181 and/or 186, and two other 100-level economics courses. Concentrators are encouraged to consider Mathematics 54 as an alternate to 52. The Sc.B. requirement of one semester of an independent study course must be fulfilled by taking Applied Mathematics 193, 194, or an approved equivalent.

Standard program for the A.B. degree. Designed to give a background in economic theory and application plus the mathematical tools needed to thoroughly understand the theory and adapt it to particular economic applications. Emphasis is on applied theories.

Prerequisites: Mathematics 9, 10.

Course Requirements: Applied Mathematics 35, 36, 4 or 116 or Computer Science 4 or 11, Applied Mathematics 165, 166 (AM 33, 34 may sometimes substitute for AM 35, 36); Economics 111 or 113, 121, 122, at least two courses from Economics 163, 164, 181, and 186, and two other 100-level economics courses.

8. APPLIED MATHEMATICS-PSYCHOLOGY

Standard program for the Sc.B. degree

This program is designed to cover the fundamental theories, principles, and methods of psychology and to provide background in the basic mathematical models applied to problems in psychology.

Prerequisites: Mathematics 9, 10 and Psychology 1.

Applied Mathematics: (1) 35, 36, (33, 34 will sometimes be accepted as substitute), (2) Two one semester courses in computer science. Recommended: (a) Applied Mathematics 4, 193A; (b) Applied Mathematics 4, Psychology 17, 18 or 181; (c) Applied Mathematics 4, Linguistics 170; (3) Two one semester courses in probability and statistics. Recommended: Applied Mathematics 116, 120, 165, 166 or Mathematics 161, 162.

Psychology: Six approved one-semester courses in Psychology. The student is expected to elect as many laboratory courses and advanced courses as possible. For example, if a student were to specialize in physiological psychology he or she might choose among the following courses — Comparative (50), Introduction to the Nervous System (91, 92), Psychological (102), Sensory (119), Human Information Processing (180), and a graduate seminar such as Neural Foundations of Behavior (229) or Vision (237). An interest in Cognition and/or Psycholinguistics would suggest the following courses — Measurement (104), Human Information Processing and Cognition (152), Quantitative Aspects of Cognition (181, 182), Selective Attention (183), Theories of Behavior (187) and a graduate seminar such as Cognition (233) or Perception (212). Students interested in Child Development and Learning would probably find the following courses most appropriate — Child (81), Educational (113), Conditioning and Simple Learning (120), Human Information Processing and Cognition (152), Advanced Abnormal Child (136), Selective Attention and Cognitive Development (183), Infant Learning and Development (184), and a graduate seminar such as Developmental (234) or Learning (232).

Other sciences: four approved courses from other fields selected to reflect the student's area of specialization.

Independent research: A one-semester course in Independent Research.

Recommended: Psychology 197 or 199; or Applied Mathematics 193 or 194. This research effort should be considered during the Spring of the Junior Year for implementation during the Senior year and is expected to result in a paper of some substance or an Honors Thesis.

9. AQUATIC BIOLOGY

Standard Program for the Sc.B. degree

Program:

1. Chemistry 21, 22, 25, or 31, 35, 36; Physics 3, 4 (or 5, 6 or 7, 8); Mathematics 9, 10 or 17.
2. Three additional courses in Physics, Chemistry, Mathematics, Applied Mathematics or Geological Sciences.
3. Seven courses in Biomed: i) Four of the following group: Biomed 41, 111, 118, 143, 144; ii) and three additional Biomed courses; highly recommended are Biomed 11, 12, 42, 44, 46 or 47, 143.
4. Three out of the following group of related science courses (or substitutions as approved by the Concentration Advisor); Geological Sciences 110, Oceanography; Geological Sciences 112, Historical Oceanography; and Geological Sciences 11, Fossil Record; or Geological Sciences 28, Pollution and the Environment.
5. Biomed 195-196 (may be taken for one or two concentration credits). Reading knowledge of one of the following languages is recommended: French, German or Russian.

10. BIOCHEMISTRY

Two concentration programs in biochemistry are offered with the cooperation of the Department of Chemistry and the Division of Biological and Medical Sciences. They are coordinated by a Biochemistry Concentration Committee whose members are drawn from both departments.

Standard program for the A.B. degree

The concentration is designed to provide an understanding of basic principles and concepts of modern biochemistry and molecular biology as well as a background for medical school, research or graduate studies in biochemistry or molecular biology. It is administered by a Concentration Advisor in the Division of Biology and Medicine.

Program: Chemistry 21, 22, 25, 26 or 31, 35, 36 and 113 (or equivalent), Physics 3 and 4 (or equivalent), Mathematics 9 and 10 (or equivalent), plus eight courses in the area of concentration including: Biomed 126, one course in molecular biology (currently chosen from B105, B127 or B151), one additional advanced course requiring B126 (biochemistry) as a prerequisite (C124, C127, B105, B121, B127, B130, B151, B156, B220, B225, B254, B256), one semester of independent study or research (Chemistry 97 or 98 or Biomed 195 or 196), and 4 additional courses in chemistry or biology approved by the concentration advisor.

Concentration Advisors: K. Bostian for the class of 88; W. Bowen for the class of 87; D. Brautigan for the class of 86.

Standard Program for the Sc.B. Degree

- A. Twenty semester courses in Biology, Chemistry, Mathematics, and Physics with a minimum of four semester courses in Biology (generally including Biomed 126 and a course in molecular biology, e.g., Biomed 151, 127 or 105), seven semester courses in Chemistry (generally including Chemistry 21, 22, 25, 26 (or 31, 35, 36), 113, 124, and 127), three semester courses in Mathematics or Applied Mathematics, two semester courses in Physics, and one (preferably two) independent study courses (Biomed 195, 196 or Chemistry 97, 98).
- B. Foreign Language: A reading knowledge of one or more modern languages. German, Russian, or French are recommended. The requirement may be satisfied by: (1) presenting two years of high school credit upon entrance or (2) passing a 3-level course in one of these languages or (3) passing a 1R-2R sequence in one of the languages.

C. Students are advised to take at least six courses in the humanities and social studies.

Concentration Advisors: J. E. Lusk and P. H. Rieger.

11. BIOMEDICAL ETHICS

The concentration in Biomedical Ethics focuses on interdisciplinary exploration of ethical problems associated with recent advances in biology and medicine and their impact on the individual as well as on contemporary social and political life. The concentration is intended not only for students interested in a career in the life sciences, but also for those with a general interest in ethical issues arising from biomedical practice and research.

Each student in consultation with at least one member of the Committee on Biomedical Ethics devises a concentration program. The student presents for approval by the Committee a written statement of the objectives of the program and a list of component courses. The program is expected to have a firm foundation in ethics and in the biomedical sciences. Each concentration program must have a total of 10 courses including: 1) at least two courses in ethics selected from Philosophy 19, 20, 45, 50, 164, and Religious Studies 22, 125, 128; at least one of these must be Philosophy 50, or 164 (preferably by the end of the sophomore year); 2) at least two courses in biomedical science selected from Biomedical Sciences 46, 47, 108, 109, 117, 122, 124, 125, 126, 127, 128, 129, 130, 131, 132, 141, 142, 146, 148, 151, 158; one of these courses may be 11, 12, 81, 91, or 92; 3) at least two advanced courses in Biomedical Ethics. Students are also strongly urged to take at least one related course in the social sciences, such as Sociology 155, Political Science 182J, or Economics 136. Other recommended courses include Philosophy 159, 165, 178; Religious Studies 123, 138, and Anthropology 281, and University 123. With the approval of the Committee other relevant courses in psychology and the social sciences, independent and group study projects, or graduate seminars may be used as part of the concentration program. A concentration in Biomedical Ethics with Honors requires, in addition, an Honors thesis (Biomedical Ethics 192, during one semester of the senior year) directed by a member of the Committee on Biomedical Ethics. Students interested in this concentration should contact Mr. Ladd in the Department of Philosophy.

12. BIOPHYSICS

Biophysics is the important area of modern biology concerned with understanding of biological mechanisms in terms of the physical and physicochemical principles by which they operate. The Sc.B. normally leads to postgraduate and professional training for careers in biology, medical sciences, and medicine.

Standard program for the Sc.B. degree.

The biophysics curriculum is designed to provide an integrated background in the fundamentals of biology, physics, mathematics, and chemistry, and especially to permit advanced electives in the physical sciences and mathematics. By fourth or fifth semester, concentrators are expected to have achieved sophomore competency in integral calculus, ordinary and partial differential equations, and linear algebra; classical mechanics, electricity and magnetism, and elements of modern physics; organic and physical chemistry; and foundations of biology. In the last two years students take cell physiology and biophysics, upper level electives such as biochemistry, molecular biology, thermodynamics, statistical mechanics, quantum mechanics, probability and statistics, computer science, and electronics, and one or two semesters of independent study.

Requirements:

- A. Physics 5, 6 (or 7, 8), 47, 50.
- B. Chemistry (4 courses): 31, 35, 36 or 21, 22, 25 or 113, 115 and Physics 152.
- C. Mathematics (3 courses): 10, 12, and 25, 26 or AM 33, 34.
- D. Biology (3 courses) Biomed 110 and any two other 100-level Biomed courses. Biomed 11, 12 are recommended for those who lack rigorous high school biology.
- E. Three additional intermediate or advanced level courses, chosen from the biological, physical and technological sciences and mathematics.
- F. At least one semester of independent study, research or design.

13. COGNITIVE SCIENCE

The undergraduate programs in Cognitive Science are designed to provide an interdisciplinary approach to the study of thinking and the nature of intelligent systems by combining course work primarily from Computer Science, Linguistics, and Psychology. Relevant courses in related disciplines such as Anthropology, Applied Mathematics, Engineering, Neuroscience and Philosophy are also encouraged.

The A.B. program is primarily for students interested in language and human cognition with only secondary interest in computer science and artificial intelligence. Any Cognitive Science A.B. program which focuses mainly on language and human cognition along the lines of the earlier psycholinguistics program will receive, with the mutual consent of the student and Center Executive Committee, the concentration designation cognitive science — PsychoLinguistics.

The Sc.B. program is intended for students who have a strong interest in artificial intelligence and the experimental aspects of Cognitive Science.

Standard program for the A.B. degree

Prerequisites: Psychology 1, Linguistics 22, a computer science course (CS4, CS11, LI170, or an approved alternative), a statistics course (PY9, AM165, MA161-162).

Requirements: A total of ten courses including:

- 1) Linguistics 141, Psychology 152, and Cognitive Science 100;
- 2) A laboratory course (PY153, or an approved substitute);
- 3) Four courses from those designed "Cognitive Science" courses below;
- 4) Two courses from among those designed "related courses" below.

Standard program for the Sc.B degree

Prerequisites: Computer Science 11 (or 4), CS21 (or CS12), and CS52 (or a course in logic, e.g., PH55, or an approved substitute). Psychology 1, Linguistics 22, and a statistics course (PY9, AM165, MA161-162).

Requirements: A total of twelve courses including:

- 1) Computer Science 141, Linguistics 141, Psychology 152, and Cognitive Science 100;
- 2) A laboratory course (PY153, or an approved substitute);
- 3) Four courses from among those designed "Cognitive Science" below;
- 4) Two courses from among those designed "related courses" below;
- 5) Independent study, Cognitive Science 198.

Cognitive Science courses:

Anthropology 20, 22, 80, 131, 180, and 225;

Computer Science (if not used as an Sc.B. prerequisite) 12, 21, 52, 141, 159, 224, 227, 242;

Linguistics 111, 113, 114, 121, 122, 123, 124, 126, 131, 141, 142, 143, 144, 145, 146, 148, 165, 166, 172;

Psychology 21, 27, 74, 75, 81, 100, 103, 104, 119, 153, 175, 177, 181, 182, 183, 185, 187, 192;

Related Courses: Engineering 122, 157, 158, 163, 164, 252, 253, 255;

Neural Sciences 1, 2, and related physiological courses;

Philosophy 55, 159, 175, 177, 188.

Other related courses may be offered if they fit into an integrated program, but such substitutions must be approved by the Concentration Advisor.

Independent Study: Independent study is encouraged for the A.B. degree and required for the Sc.B. degree. Students in either program should sign up for Cognitive Science 198 with an advisor who is a member of the Center for Cognitive Science. Arrangements should be made in the Spring of the student's junior year so that preliminary reading can be carried out before the Fall of the senior year.

Honors Work: Students interested in Honors should sign up with the Honors Advisor by the Spring semester of their junior year. An Honors student must write a thesis and is expected to spend his or her entire senior year working on it. Therefore, CG198 may be taken for two terms if a stu-

dent is doing Honors work. Although no specific grade-point average has been set for acceptance into the Honors program, only students with a good record and an advisor willing to work with them will be allowed into the Honors Program. The Executive Committee of the Center for Cognitive Science will make the final decision. Honors students will defend their thesis work in an oral examination during the final examination period.

14. DEVELOPMENT STUDIES

Development Studies is designed to provide a comparative perspective on the long-term social, political, and economic changes which have accompanied industrialization and the growth of the modern state in Asia, Africa, Latin America and in the historical experience of European countries. Courses must be taken in at least three of the five social science disciplines in order to provide an interdisciplinary approach to these processes of change. Ten courses are chosen from among the following: Afro-American Studies 15, 16, 21, 103, 121; Anthropology 13, 104, 105, 115, 117, 135, 137; Economics 111,¹ 113,¹ 106A,² 121,¹ 125, 151, 158; Engineering 94B; History 90, 118, 121, 122, 127, 143, 144, 145, 147, 148, 149, 155; Political Science 121, 128, 129, 130, 135, 145, 182K;² Sociology 15, 20, 120, 130, 160, 170, 187B, 187D, 187J; University Course 107. Qualified student may substitute appropriate graduate seminars or individual reading and research projects for one or more of the above courses with the approval of one of the concentration advisors. Other substitutions must be approved by the Committee as a whole and justified in terms of both course content and relation to the student's overall concentration program.

All concentrators must also take the Senior Seminar (Development Studies 198) and complete a thesis in their senior year which serves to integrate the work done in the concentration. Two faculty members from different departments will give advice for this paper and evaluate it.

Concentrators are encouraged to spend part of their junior year in a developing country if appropriate arrangements can be made. Early acquisition of appropriate foreign language skills is strongly encouraged. Concern with at least two of the three major areas of the developing world (Asia, Africa, Latin America) should be reflected in the selection of courses. Concentrators are also encouraged to consider enrolling in the BA/MA program in Development Studies.

In order to design a coherent program of studies with clearly-stated goals, concentrators should discuss their entire program with one of the concentration advisors as well as individual faculty members teaching the courses listed. For further information see Peter Evans (Chair), Department of Sociology; John Casterline, Department of Sociology; Dwight Heath, Department of Anthropology; Louis Putterman, Department of Economics; Jerome Grieder, Department of History; or Van Whiting, Department of Political Science.

15. ENGINEERING AND ECONOMICS

The Engineering portion of this program will include at least eight semester courses, including 3, 4 and at least two 100-level Engineering courses, one a design course. The Economics portion includes at least six semester courses. Economics 111 or 113, 121, and 122 are required and a minimum of three additional courses should be chosen from other 100-level Economics courses.

16. ENVIRONMENTAL STUDIES

The Center for Environmental Studies has developed a standard concentration in environmental studies. The program requires a minimum of fifteen courses for a concentration, including Environmental Studies 11, 191, 192, 195 and/or 196. One course in Biomedical Science, Economics 111 or 113 and one course in values or ethics. The remaining eight courses are selected from the sciences or policy related courses.

Science Focus: Six science courses in addition to one course in Biomedical Science and thesis research; two policy related courses, one of which lies outside the field of economics.

¹ These courses may be counted as part of the major only by concentrators who also take at least one of the other listed economics courses.

² Research seminars and special topics courses change in numbering from year to year. Whether or not such a course may be counted toward the concentration depends on its content.

Policy Focus: Six policy courses in addition to Economics 111 or 113 and thesis research; two science courses, one of which should be in the physical sciences.

Thesis Requirement: Each student must register for ES 195/and or 196 and must submit a thesis proposal to the CES concentration committee no later than two weeks prior to the start of the semester in which the thesis preparation is to begin. Students are urged to begin the development of their thesis topic as part of Environmental Studies 191 and to begin the thesis research no later than the seventh semester.

Students with environmental interests should visit the Center or see Mr. Ward in the Urban Environmental Laboratory, 135 Angell Street.

17. GEOLOGY-BIOLOGY

Standard program for the A.B. degree

This program provides more specific emphasis on the evolution and history of life. Recommended for students who wish an understanding of the origin and development of life as interpreted from the geologic record. Fourteen semester courses are required, six from geology, five from biology, one from chemistry, and two from mathematics or physics. Students planning further work in this area should consult the departmental advisor. Required courses: Geological Sciences 2, 3, 11, 24, and two of the following: 41, 45, 102, 109; Biomed 11, 12, and three other courses such as 42, 52, 61, having the approval of the concentration advisor; Chemistry 21 or 31; two of the following: Mathematics 9, 10, Physics 5, 6 (or equivalent).

Standard program for the Sc.B. degree

This program is recommended for those intending graduate work or a career in this field. Program consists of 19 courses:

- A. 6 courses in Geological Sciences: 2, 3, 11, 24, and two of the following: 41, 45, 102, 109.
- B. 5 courses in Biology: 11, 12, and three other courses such as 42, 52, 61, having the approval of the concentration advisor.
- C. 2 courses in Mathematics: 9, 10.
- D. 1 course in Chemistry: 21 or 31.
- E. 4 courses from mathematics and supporting sciences, including upper level Biology and Geological Sciences courses. The selection of these courses must have the approval of the departmental concentration advisor.
- F. 1 Independent Study course, Geological Sciences 191 or 192.

A reading knowledge of Russian, German or French is recommended.

18. GEOLOGY-CHEMISTRY

Standard program for the A.B. degree

This program provides more specific emphasis upon chemical processes and phenomena on and within the earth. Recommended for students who wish an application of physical-chemical principles toward an understanding of earth history and earth processes. Fourteen semester courses are required from geology, chemistry, physics, and mathematics. Students planning further work in this area should consult the departmental advisor. Required courses: Geological Sciences 2, 3, 24, 41, 45, 102; Mathematics 9, 10; Physics 5, 6 (or equivalent); Chemistry 21 or 31, 114, plus two of the following: Chemistry 25 or 35, 50, 106, 115.

Standard program for the Sc.B degree

This program is recommended for those intending graduate work or a career in this field. Program consists of 20 courses.

- A. 7 courses in Geological Sciences: 2, 3, 24, 41, 45, 102, 109
- B. 4 courses in Chemistry: 21 or 31, 50, 114, 115
- C. 2 courses in Mathematics: 9, 10
- D. 2 courses in Physics: 5, 6, (or equivalent)

E. 4 courses from mathematics and supporting sciences and upper level Chemistry and Geological Sciences courses. These courses must have the approval of the departmental concentration advisor.

F. 1 Independent Study course, Geological Sciences 191 or 192.

A reading knowledge of Russian, German, or French is recommended.

19. GEOLOGY-PHYSICS/MATHEMATICS

Standard program for the A.B. degree

This program provides more specific emphasis upon physical processes and phenomena on and within the earth. Recommended for students who wish an application of physical and mathematical principles toward an understanding of the earth. Fourteen semester courses required from geology, physics, and mathematics. Students planning further work in this area should consult the departmental advisor. Required courses: Geological Sciences 2, 3, 45, 63, and 41 or 161 or 109; Physics 5, 6 or 7, 8 and 47, 50 or Engineering 52, 137; four math courses including either Mathematics 29, 52 or Applied Mathematics 33, 34; Chemistry 21 or 31.

Standard program for the Sc.B. degree

This program is recommended for those intending graduate work or a career in this field. Program consists of 20 courses.

A. 7 courses in Geological Sciences, either option (1) or (2).

Option (1): 2, 3, 45, 63, 161, 162, plus one from 41, 109, 116.

Option (2): 2, 3, 41, 45, 63, 109, plus one from 116, 161, 162.

B. 4 courses in Physics: 5, 6 or 7, 8 and 47, 50 or Engineering 52, 137.

C. 4 courses in Mathematics, including Applied Mathematics 33, 34.

D. 1 course in Chemistry: 21 or 31.

E. 3 additional math and science courses having the approval of the departmental concentration advisor.

F. 1 Independent Study course, Geological Sciences 191 or 192.

A reading knowledge of Russian, German or French is recommended.

20. HEALTH AND SOCIETY

Health and Society is an interdisciplinary concentration program that examines health policy, health care, and the social structure through which health services are delivered and received. The program will enable the student to pursue a systematic course of study that will focus on health-related behavior and the organization of health care from a variety of scholarly and professional perspectives. The range of courses will demonstrate the relevance of the social and behavioral sciences in examination of the health care system. The program will also present the basic methodological tools necessary for problem solving in the areas of health care research and planning.

Prerequisites: Biology 6 or more advanced course, one introductory course in either sociology or anthropology, and one statistics course, either Sociology 110, Psychology 9, or the equivalent.

Required Courses: Biomed/Community Health 31, 132 and 191; Biomed 195, Sociology 154 and 155, and four additional elective courses. Electives are to be selected from courses relevant to one of the following areas of interest: Evaluation and Methods, Health Care Organization and Policy, Culture and Health, International Health, Health and The Life Cycle.

Concentration Advisor: Lois A. Monteiro.

21. HISTORY AND CHINESE LANGUAGE

A joint concentration in History and Chinese Language. This program includes eight courses in History (only two of which — e.g., 41, 42 — may be at the introductory level) and six courses in Chinese (e.g. Chinese 1, 2, 3, 4, 5, 6, or Chinese 1, 2, 5, 6, 7, 8) or their equivalents. It is expected that the majority of the history courses will be related to East Asia. Programs for individual students

must be planned in consultation with and be approved by concentration advisors who are historians in the East Asia Language and Area Center.

22. HUMAN BIOLOGY

An interdepartmental program offered by the Division of Biology and Medicine together with the Departments of Psychology, Sociology, and Anthropology. The uniting theme of this program is the study of the evolution of man and of those environmental forces (including social, biological, and physical factors) which affect man's evolutionary development. Students may elect Program A which interrelates areas of biology and psychology, Program B which interrelates areas of biology with sociology and anthropology, or alternate approved student constructed course patterns.

Background Courses: Psychology 1; Anthropology 50 or 151, or an approved substitute; Mathematics 9 (Calculus); Chemistry 21, 22 or 31, 35.

Program A (Biology/Psychology): Five courses in the Biomedical Sciences, including one in morphology (Biomed 32, 81, or 185), one in genetics of higher organisms (Biomed 46 or 47), at least one approved 100-level course, and Biomed 190 (Human Biology Seminar) which is usually taken in Semester VIII; Biomed 11, 12 are strongly recommended but are not required for concentration; for statistics, Psychology 9 or AM 165 or Soc. 110; one elective course in Psychology approved by the concentration advisor; at least two of the following Psychology courses, at least one of which must have a laboratory: 74, 103, 119, 120 152, 153; plus one additional elective selected from approved Biomed or Psychology courses.

Program B (Biology/Sociology/Anthropology): Five courses in the Biomedical Sciences including Biomed 32, 81 or 185, 46 or 47, 190, and at least one approved 100-level course; Biomed 11, 12 are strongly recommended but are not required for concentration; for statistics, Sociology 110 or Psychology 9 or AM 165; three electives in Sociology or Anthropology which often include the recommendation of Sociology 120 and Anthropology 10; plus one additional elective selected from approved courses in Biomedical Sciences, Sociology, or Anthropology. Only one Sociology course from among those numbered 1-21 may count for Concentration credit.

Student Constructed Course Pattern: Students are permitted to construct their own programs in the concentration but must submit a written statement of their programs and the courses they wish to take for the advice and approval of the Human Biology Concentration Advisor no later than the beginning of the second semester of their junior year. Normally, student constructed programs should interrelate either Biology and Psychology or Biology and Sociology/Anthropology. The program must be a carefully integrated and coherent set of related courses which provide the opportunity for study in depth of a significant area or aspect of Human Biology. In addition to the specified background courses for concentration in Human Biology, the student constructed program should consist of at least nine courses plus the senior seminar (Biomed 190).

23. INTERNATIONAL RELATIONS

This interdepartmental concentration introduces the student to perspectives and methods from History, Economics and Political Science which contribute to understanding of international relations. It also provides the student with opportunity to give emphasis to a particular approach, issue, or area.

Prerequisites: History 1, 2, or 41, 42; Economics 111 or 113; Knowledge of a foreign language is also required, to be attained concurrently with the concentration program if not previously achieved (through the 4 level as a minimum; levels 19 and 51 strongly recommended).

Program: at least one Economics course from among 125, 151, 154, 155, 158; History 123, 124 or 159, 160; Political Science 40 or 141; Political Science 142 (to be taken in the senior year); at least four additional courses to be chosen from a list of possible electives, at least two of which must advance non-Western or Third World materials and perspectives.

24. LATIN AMERICAN STUDIES

The purpose of this concentration is to allow a student to pursue an interdisciplinary study of the cultures, history, and present-day problems of Latin America. Through this broad interdisciplinary approach, the student will obtain some knowledge of the various factors which have interacted to produce the Latin American societies and cultures of today and perhaps understand the directions they will take in the future.

Prerequisite: Language proficiency in Spanish or Portuguese to level of course 19.

Program: Hispanic Studies 13 or 137, or Portuguese Studies 31, 32, 150D or E; also one of the following senior courses in directed reading and research leading to the completion of a senior project: Anthropology 193 or 194; Economics 199; Hispanic Studies 198; History 197H or 197I; Political Science 142, 191/2, 193/4; Sociology 190 or 191; plus five additional courses to be chosen from among the following: Afro-American Studies 21, 22, 121, 122; Anthropology 112, 210 (with permission); History 121, 122, 127, 155; Hispanic Studies (various, if suitable topic); Political Science 121, 128, 145, 182K; Portuguese 31, 160F, G, I; Sociology 187J. At the end of the second semester of the sophomore year, the interested student should consult with the concentration advisor and/or the Director of Latin American Studies. Two advisors, chosen from the above participating departments, will assist the student in selecting an individual program of background courses from the various departments. At that time the student may also make arrangements, subject to the approval of the Committee on Academic Standing, to spend part of his or her junior year abroad in a Latin American institution. Research in the Latin American community in Rhode Island is also encouraged as part of the student's first-hand experience with the peoples and cultures of Latin America.

25. LAW AND SOCIETY

The honors concentration in Law and Society, sponsored by the Center for Law and Liberal Education, permits students to subject legal phenomena to the questions and modes of analysis which are appropriate to a liberal university.

The following courses must be completed not later than the end of the 6th semester: Economics 111; History 109 or 152; or Law and Society 151 or 155; Philosophy 50 or Political Science 101; Sociology 142. Political Science 116 must be completed during the sophomore year. Law and Society 185 is taken during the junior year. A senior tutorial (Law and Society 191) and either a senior thesis (Law and Society 193, 194) or a senior project (Law and Society 192) are required. Each concentrator will design a cognate field of at least three courses at the 100 level or above, in one or more departments, to be completed by the end of the 8th semester.

Enrollment in this Concentration is limited to 15 members of the junior class.

26. LITERATURE AND SOCIETY

For complete standard concentration description see listing in Modern Literature and Society section.

27. MATHEMATICS-COMPUTER SCIENCE

Standard program leading to the B.S. degree

Prerequisites: Mathematics — three semesters of calculus, through Mathematics 29 or equivalent; one semester of linear algebra, Mathematics 52 or 54; Computer Science 11, 12, 21.

Program: Mathematics 153 (which satisfies the need for CS52); two additional 100+ level mathematics courses; two 100+ level Computer Science courses chosen from one of the four programs, (1) software — CS26 or 128, 191, 224, (2) hardware — Engineering 163, 164, (3) Artificial Intelligence, CS 141, Psychology 152 or 182, (4) theory — CS152, 153; two additional 100+ level courses chosen from Mathematics, Computer Science, Applied Mathematics, or related areas, and approved by the concentration advisor; one semester independent study, CS198 or MA197.

It is essential that the concentration be more than the simple union of the Mathematics and Computer Science A.B. programs; the program of study should involve an area in which the two fields

are clearly related, e.g. computer graphics analysis of mathematical phenomena, mathematical models used in artificial intelligence, mathematical analysis of algorithms. The independent study should be used to produce a final project relating mathematics and computer science.

Students considering graduate programs in mathematical science are strongly urged to develop reading proficiency in one or more of French, German, or Russian. All concentrators are expected to develop writing competency in the methodical expression of complicated ideas.

28. MATHEMATICAL ECONOMICS

Designed to give a background in economic theory plus the mathematical tools needed to analyze and develop additional theoretical constructions. Emphasis is on the abstract theory itself.

Program: Economics 111 or 113, 121, 122, 162, 186 and one other 100-level economics course. Mathematics: Calculus with differential equations (i.e. through Mathematics 29 or its equivalent); linear algebra (Mathematics 52 or 54); and probability and statistics (Mathematics 161, 162 or, under exceptional circumstances and with approval of concentration advisor, Applied Mathematics 165 plus a 100-level mathematics course such as Mathematics 111).

29. MATHEMATICS AND PHYSICS

Prerequisites: Mathematics 9, 10 or 17; Physics 3 or 5 or 11.

The required mathematics courses are Mathematics 18 or 29 or 35 and 52 or 54; or 25 and 26; 111; and at least one of the following: 106, 112, 161. The required physics sequence consists of Physics 4 or 6 or 12; 47; 50; 56; and at least two of the following: 141, 142, 151, 152.

Concentrators are required to take at least one upper level course in Mathematics and one in Physics in each of their last two semesters.

30. MEDIEVAL STUDIES

The Committee on Medieval Studies sponsors a concentration aimed at understanding the civilizations which gave rise to the modern world. The concentration combines interdisciplinary perspectives with depth of study in one or two disciplines. There are no strict chronological limits, since the Middle Ages are perceived as beginning and ending at different times in different cultures, but the millenium from 500 to 1500 is a useful general framework. While medieval studies have traditionally focused on Western Europe, students are also encouraged to do work in other areas, for example, Byzantine, Islamic, Judaic, or Slavic cultures.

Requirements: ten courses approved by the Committee on Medieval Studies, including two courses in medieval history and one 100 or 200 level course in which primary texts in a medieval language other than English are used. Interested students should discuss their plans with a member of the Committee. A concentration proposal should be prepared in consultation with the faculty advisor and submitted to the Committee for approval.

Honors: requirements are the same as those for the regular concentration with the addition of one course credit of Independent Study for preparation of the Honors thesis in the department of the thesis advisor.

Prospective concentrators are encouraged to take the introductory course, Medieval Perspectives, during their freshman or sophomore year.

The Committee on Medieval Studies includes the following members: Professors Bossy (French Studies), Bonde (Art), Crossgrove (German), Kirk (English), Lenz (Philosophy), Levitsky (Slavic Languages), Lyon (History), Mathiesen (Slavic Languages), McIlwain (Biology and Medicine), Oldcorn (Italian), Pingree (History of Mathematics), Russom (English), Schaffer (Spanish), Terras (Slavic Languages), Warnock (German), Wilmeth (Theatre Arts).

31. NEURAL SCIENCES

The program in Neural Sciences is an interdisciplinary concentration sponsored by the Center for Neural Sciences in conjunction with faculty from several departments. The concentration provides a firm foundation in the sciences important to an understanding of brain function and the mechanisms

underlying the control of behavior. The concentration minimizes formal requirements in order to enhance flexibility in the design of individual programs.

The core program includes Neural Science 1, 2 and 192. The general science courses for the Sc.B. include Biomed 11 or 12, Mathematics 9, 10, Physics 3, 4 and two Chemistry Courses plus one course in Computer Science or Engineering. Two Neural Science Laboratory courses, three electives and one seminar course complete the concentration. Honors programs and independent studies are encouraged.

32. OPERATIONS RESEARCH-ECONOMICS

Designed to cover the decision-making tools of operations research plus the economic problems and analysis that form much of the motivations for the tools and a major area for applications. *Prerequisites:* Mathematics 9, 10. *Courses:* Applied Mathematics 33, 34, 165, 120, 121; Engineering 131; Economics 111 or 113, 121, 163, 186, and a 100-level Economics elective.

33. ORGANIZATIONAL BEHAVIOR

Complex, formal organizations are a dominant feature of modern society in both private and public sectors. This concentration brings together the perspectives of the various social sciences (economics, history, political science, psychology, and sociology), those of engineering and applied mathematics and computer science. Such questions are considered as the effect of organizations on the behavior of their members, the development of organizations to accomplish goals, and the management of business, government agencies, or service organizations. Economics 111 or 113, Engineering 9, Sociology 150 and a course in History or Political Science, chosen from the list below are required courses. In addition, six more courses will be chosen, with the approval of the concentration advisor, from the following: Applied Mathematics 165, 166; Computer Science 4, 11, 12; Economics 71, 132, 141, 145, 146, 148, 149, 161, 165, 177, 178; Engineering 90, 94E, 131; History 126, 161, 162, 197A, 197P; Political Science 10, 14, 22, 60, 111, 113, 115, 118, 145, 182G; Psychology 21, 173; Sociology 110, 120, 140, 142, 154, 158; Theatre Arts 22. An 11th course will be included which is an independent research project usually completed during the senior year and normally done with two faculty members from different departments.

For further information on this concentration, see any of the following faculty: Barrett Hazeltine (Engineering), Robert M. Marsh (Sociology), Peter B. Evans (Sociology), Martin Beckman (Economics), Harl Ryder (Economics), Elmer Cornwell (Political Science).

34. PUBLIC POLICY AND AMERICAN INSTITUTIONS

Public Policy and American Institutions focuses on interactions between public and private-sector institutions in the development of solutions to social problems. Because neither institutions nor the policies they pursue can be properly understood through ethnocentric modes of analysis, this concentration emphasizes comparison of the United States with other advanced industrial nations as a major tool for understanding the United States itself. The concentration is also based on the assumption that present choices are always constrained to some extent by past actions; hence historical inquiry is used as a method for understanding modern social systems. The aim is for concentrators to become sensitive to causation as well as variety in the structure of societies.

Requirements:

(A) Core courses required of all concentrators (six or seven courses): Political Science 10; Economics 111 or 113; History 169 or 170; Political Science 105 or Philosophy 158 or 165; Public Policy Colloquium (1 or 2 credits).

(B) Additional Requirements (eight courses): (1) at least three courses in American institutions, one of which must be in comparative institutions; (2) at least three courses in Public Policy Problems, one of which must be in analytic or normative methods; (3) two additional courses in area of specialization.

For further information, consult Professor Anton.

35. RENAISSANCE STUDIES

The concentration in Renaissance Studies is designed to encourage a comprehensive view of a period for which the interdisciplinary approach is especially fruitful. Students will be invited to explore several aspects of the period and several disciplinary approaches to it—e.g. history, literature, thought, art, music. The aim is to enhance the student's understanding of the period itself, and also of the uses, limitations, and interrelationships of the methods of particular disciplines. Sponsoring departments are: Art, Music, History, English, French Studies, Hispanic and Italian Studies, Comparative Literature, German, Classics, History of Mathematics.

Requirements

1. History 107 (Renaissance Italy) and History 108 (Europe in the Age of Charles V).
2. Three courses on Renaissance topics in one field in which the student has primary interest and training. (The Renaissance concentration can easily be combined with standard departmental concentrations).
3. Three courses related to the Renaissance chosen from two other fields.
4. A project seminar in the final semester, designed to enable students to gain perspective on their concentration programs through the preparation and presentation of an original paper or project. During the first part of the semester, the student will work closely with one or more members of the cooperating faculty in the definition and preparation of his or her paper. During the final weeks, students will present their papers to the seminar for discussion and criticism, thus contributing to and benefiting from the experience and perspectives of other students and faculty. Credit for the work will be granted through the medium of registration by the concentrator for one course credit of Independent Study (Reading and Research) in the Department in which the topic of research lies.
5. Reading knowledge of a relevant modern or ancient language other than English.

The program is directed by the following committee: Professors Allen (English), Benedict (History), Davis (English; chair), L. Durand (French Studies), Foley (English), Lewis (Music), Molho (History), Muller (Art History), Newman (Comparative Literature), Oldcorn (Italian Studies), Pingree (History of Mathematics), Putnam (Classics), Sabol (English), Schulz (Art History), and Woods (English). Interested students may discuss the program with any member of the committee.

36. RUSSIAN STUDIES

Russian Studies Prerequisites: A reading knowledge of Russian to be demonstrated by satisfactory completion of Russian 4 or 4I, or by equivalent examination. Requirements: Russian 19, 29, 30, two 100-level courses in the social sciences (normally in Russian history) and an appropriate course in Political Sciences, plus two 100-level courses in Russian or Slavic literatures or languages.

With the approval of the Department, and in consultation with the concentration advisor, one course from the other offerings of the Department, or where appropriate, from other departments, may be substituted for one of the two 100-level courses in Russian or Slavic literatures or languages.

Honors requirements are the same as those for a standard concentration in Russian Studies, plus Russian 198 or Slavic 198 for the preparation of an honors thesis.

37. URBAN STUDIES

The Urban Studies Program attempts to focus on urban phenomena through the approaches of different disciplines, thus providing an interdisciplinary context in which to understand various dimensions of the urbanization process. While the program attempts to provide sufficient flexibility to allow students to pursue specific interests without being overly bound by requirements, it is nonetheless designed so that there will be a core content to the program of study. The primary aim of the program is to provide a broad liberal arts education. Its purpose is to satisfy the needs of those students who are interested in urban problems, but who do not feel well served by the existing departmental programs in a single discipline.

The program requires ten courses for a concentration. Urban studies 21 or 22 (Political Science 22) is required.

The remaining courses are selected from three other course groups:

1. *Research Skills* (one course): either Sociology 102 or an approved statistics course, e.g., Applied Mathematics 165, Mathematics 162, Political Science 60, or Sociology 110.
2. *Core Curriculum*:
 - A) The disciplines (one course from each of the three disciplines) selected from among Art 56 and Art 59; Economics 141; History 175 and History 176; Political Science 22 and Political Science 118; Sociology 130, 133, 154 and 164.
 - B) Urban Studies Core Courses (two courses) selected from among Urban Studies 23, 101, 102, 116, 132, 135, and 142.
 - C) An Urban Studies Seminar, Urban Studies 18X.
3. *Complementary Curriculum* (two courses): selected from among American Civilization 152, Art 47, Classics 54, Economics 148, Engineering 90, Engineering 194D, Political Science 147, University 111, and University 163. In addition, any course listed in the above two groups, including any research seminar in an urban studies-related discipline (art, economics, history, political science, sociology, e.g., History 197C or Art 159) not used to satisfy any of the above group requirements may be used to fulfill this requirement.

Honors. Candidates for honors concentration should apply by midterm of the second semester, junior year. Twelve courses are required of an honors concentrator, including one thesis preparation course in the senior year and the second *research skills* course. To receive an honors degree, the candidate's thesis and course record must be of outstanding quality.

Concentration Advisors: Professors Zimmer, Feldman, Henderson, Meyer and Silver.

38. WOMEN'S STUDIES

This interdisciplinary concentration examines cultural definitions of women in their social, political, economic, and cultural contexts. Emphasis is on the historical, literary, and cross-cultural dimensions of the study of women and gender. Concentrators develop their individual programs in consultation with faculty advisors. Each program should be organized around questions, problems, or theses the student wishes to examine. Additional focus can be provided by choosing a particular historical period to study, by contrasting specific cultures, or by any other means appropriate to the program.

The concentration consists of 10 courses: a) 2 courses chosen from the following: American Civilization 163, 164; and the Undergraduate Seminars in History (197/198) and American Civilization (190), where the topic is appropriate; b) 3 approved women's studies courses in the social and biological sciences or in the humanities. Students who choose the social science track will examine how cultural institutions and social structures define women and how women participate in and experience those definitions. Those who choose the humanities track will study how the female is constructed in cultural productions such as literature and film, and the sexual politics which inform and shape those productions. The two tracks intersect, of course, in meaningful ways, and students in one track may well want to choose a related course or two from the other track (see "c" below). What the track provides is some methodological and disciplinary focus for the concentration, and students are expected to do upper-level work within their track; c) 4 courses related to the focus of the concentration. These courses need not be "women's studies" courses *per se*, but should help the student examine the questions, problems, or theses around which the program is organized; d) A one-semester senior seminar (Women's Studies 199) to be taken in the student's last year. In general, no more than two introductory or lower level course will be counted toward the concentration and those two courses must be in different fields.

Candidates for Honors will fulfill the above requirements. In addition they will propose a thesis project, normally by the end of their sixth semester, and will take a two-semester research and reading sequence (Women's Studies 197-198).

The Graduate School

Admission

Brown University admits students of any race, color, handicap, sex, national or ethnic origin to all rights, privileges, programs and activities generally accorded or made available to students at the University. It does not discriminate on the basis of sex, race, color, handicap, status as a veteran, national or ethnic origin in administration of its educational policies, admission policies, scholarship and loan programs, or other school administered programs. The University affirms that admission to and employment at the University are based on individual merit and performance and not on personal convictions, preferences, or happenstance of birth unrelated to academic or job performance.

Applicants for admission must either already hold or else be in the process of completing the requirements for an appropriate baccalaureate degree. It is impossible to accept all applicants; and only those whose previous records, test scores, and recommendations give clear evidence of their ability to do advanced work of the highest quality, are admissible. The suitability of the applicant's training and interests to our programs is also influential in determining which applicants can be admitted and which can not.

Students who wish to complete essentially undergraduate preparation cannot be admitted to the Graduate School.

A student who wishes to enter the Graduate School should, in the fall preceding the academic year in which he or she intends to enroll, obtain an official application from the Office of the Graduate School. All applications must be supported by official transcripts from each college or university attended, and a letter from the student stating plans for graduate study. Also required are three letters of recommendation sent directly to the Dean of the Graduate School from persons well acquainted with the applicant and qualified to comment on his or her potential for graduate study. At least two of these letters must be from professors at the institution of current study or, if not in any school at the time of applying, at which the applicant most recently studied. For submission of test scores, etc. see under Graduate Record Examinations, below. Completed applications are due in the Office of the Dean by January 2. Applications received after this date will be considered insofar as possible, but no applications for admission beginning in the Fall Semester can be considered after May 1.

Applications for admission beginning in the Spring Semester must be filed by November 1. However, it is not always possible to admit additional students at mid-year in all departments. No student is allowed to register unless he or she has been notified of admission by the Office of the Dean. Admission to the Graduate School does not imply acceptance as a candidate for a degree.

A non-refundable fee of \$35 should accompany each submitted application (\$40 for applicants not in the United States at the time of applying). An application will not be processed until the fee is paid. All correspondence concerning admission should be addressed to the Dean of the Graduate School.

Graduate Record Examinations

Both General (Aptitude) and Subject (Advanced) tests are required of applicants in Biochemistry, Biology and Medicine, Chemistry, Comparative Literature, Computer Science (the Subject test may be taken in Computer Science, Engineering or Mathematics), English, French Studies, Hispanic and Italian Studies, Mathematics, Political Science, Psychology. The General (Aptitude) test only is required of applicants in Applied Mathematics, Art, Classics, Economics, Egyptology, German, Linguistics, Philosophy, Religious Studies, Sociology, Theatre Arts, and strongly recommended for applicants in American Civilization, Anthropology, Biomedical Engineering, Education, Engineering, Geological Sciences, History, Judaic Studies, Physics, Slavic Languages.

Information about the Graduate Record Examination may be obtained from the Educational Testing Service, Box 955, Princeton, NJ 08541.

Foreign Students

Graduates of foreign colleges and universities who believe that they have completed the equivalent of at least an American bachelor's degree are invited to apply for admission. Foreign applicants should enclose with the official application original documents, or official certified copies, indicating the nature and scope of their educational program.

The importance of ability in the English language cannot be overemphasized. A student should not come to the United States to study unless he or she is competent in reading, writing, and speaking the English language; listening comprehension (for lectures) is most important.

The Graduate School Catalogue contains more information in detail for foreign applicants and students.

Classification of Students

Regular Students: All students who are admitted to an advanced degree program with full graduate standing.

Special Students: Students whose academic record shows promise of development or potential for graduate study but whose undergraduate training is insufficient in some respect. Students in this category are admitted provisionally.

Whether regular or special, students may be classified as either full-time or part-time, so long as there is no legal or contractual barrier to the classification.

Enrollment

Every student, whether continuing in courses of study or engaged in research or in writing a thesis, is required to enroll at the beginning of each academic year. To complete enrollment, all requirements of the pertinent administrative offices of the University must be met, including registration for courses, payment of accounts, and arrangements for housing as appropriate. Fees will be charged for failure to meet established deadlines. No student may take examinations, use any of the facilities of the University, submit a thesis or dissertation, or be a candidate for a degree unless properly enrolled.

Summer Study. Brown University does not have a regular summer session, but graduate students who wish to secure credit for summer work may make arrangements with their departments for reading or research courses. They must enroll formally with the Registrar before the end of the academic year. **Traveling Scholar (in absentia).** Advanced graduate students may request permission from the Graduate School to register for a semester or an academic year as Traveling Scholars in order to conduct full-time research or fieldwork in a location removed from Brown. Traveling Scholar registration is renewable for not more than one additional year. The student's department must certify to the Graduate School that the research or fieldwork to be done away from Brown is necessary for the completion of the the degree program. Students on Traveling Scholar registration are considered full-time students, are eligible for loan funds and/or loan deferment during those semesters spent away from Brown, and have the option to buy University health insurance for coverage during this same period. Applications for Traveling Scholar registration are due in the Graduate School by August 1 for Semester I or the academic year, and by December 15 for Semester II. The fee for Traveling Scholar registration is currently set at \$100.00 per semester.

Changes in Schedule. Changes in schedule, including the dropping of courses, may be made only with the approval of the department of major study and the Registrar.

Separation: A general term, covering any absence or severance of a student from the Graduate School. Separated students must be in one of the following categories:

Leave of Absence: Granted by the Dean of the Graduate School upon the written request of the individual student and with the written approval of the department or program concerned. Requests for leaves may be based upon plans to interrupt resident graduate study for field work, study abroad, professionally related employment, or for personal reasons. Leaves are granted for a specific period of time, normally not more than one calendar year. Upon termination of this time period, the student must resume active graduate study or apply for and be granted an extension of the leave; otherwise the student's leave will be changed to "withdrawn" status.

No readmission decision is required for a student returning from Leave of Absence to active graduate study. However, students must write to the Graduate School to request registration material no later than one month prior to the expiration of a leave, and pay a reenrollment fee of \$35.00. If a student whose Leave of Absence status has been changed to "withdrawn" wishes to resume graduate education at Brown, the student must make a formal request for readmission and receive the recommendation of the department and the approval of the Dean of the Graduate School. In addition, there is a readmission fee of \$35.00.

Withdrawal:

Voluntary: Separation from the Graduate School effected by the Dean upon the written request of the graduate student. The student's reasons for wishing to withdraw need not be specified in the statement of request, but those reasons may include personal, academic, medical, financial, or other factors. Departmental approval is not required, but the Graduate School routinely informs the concerned department before effecting a student's withdrawal. To resume graduate education at Brown, the student must make a formal request for readmission, and receive the recommendation of the department and the approval of the Dean of the Graduate School. In addition, there is a readmission fee of \$35.00.

Involuntary: The Dean of the Graduate School may effect involuntary withdrawal for good and sufficient reasons, including: academic reasons, failure to meet University charges, disciplinary reasons, medical reasons (see below). The Dean may consult with the student's department, the University Health Services, or other concerned parties. In the case of academic withdrawal, the action will be effected upon the recommendation of the department. Readmission is possible for some students who are involuntarily withdrawn from the Graduate School. Where this possibility exists, the conditions and procedures for readmission are described in the letter of withdrawal from the Graduate School to the student.

Involuntary Withdrawal for Medical Reasons: Implies that the length of the period of withdrawal is contingent upon the student's attaining full recovery. If such a withdrawal is occasioned by psychological factors, the minimum withdrawal period set by the Dean will normally be either (1) no less than the remainder of the semester in which the withdrawal takes place, or (2) a period no less than three months, whichever is, in the judgment of the Dean in consultation with the Brown University Health Services, appropriate to the individual student both personally and academically. The minimum length of withdrawal will be specified to the student by the Graduate School in its letter of notification. Students seeking readmission after withdrawal for medical reasons must be examined at the Brown University Health Services to determine if their recovery is sufficient to permit recommendation for readmission. The actual decision to readmit is made by the Office of the Dean of the Graduate School.

Record of Withdrawal: Reasons for withdrawal are not entered on a student's transcript, nor does the transcript show whether withdrawal was voluntary or involuntary.

General Information Regarding Degrees

Graduate study at Brown University began in 1850, at which time provision was made for the award of the Master's upon successful completion of one year's academic work past the Bachelor's degree. This system was discontinued in 1857. The more modern tradition of graduate study at Brown began in 1887, when the Faculty and Fellows agreed to publish in the *Catalogue* of the next year rules for the award of both the Master's and the Ph.D. in regular programs of advanced work. The first Master's degrees under the new plan were granted in 1888 and the first Ph.D.'s in 1889. Women were admitted to graduate study at Brown almost immediately thereafter, in 1892.

By 1900, Brown University had awarded twenty-three Ph.D.'s and eighty-nine Master's under the administration of the Standing Committee of the Faculty which was charged with this duty. In 1903 a Graduate Department was established with its own dean, Carl Barus, Hazard Professor of Physics. Dean Barus continued in his deanship until 1926. In May 1927 the Graduate Department became the Graduate School.

The first dean of the new Graduate School was R.G.D. Richardson, Professor of Mathematics and dean from 1926 to 1948. His successors were Barnaby Keeney (1949-1952), Professor of History; R. Bruce Lindsay (1954-1966), Hazard Professor of Physics; Michael J. Brennan

(1966-1974), Professor of Economics; Maurice Glicksman (1974-1976), University Professor and Professor of Engineering; Ernest S. Frerichs (1976-1982), Professor of Religious Studies. The current Dean is Mark B. Schupack, Professor of Economics.

The University Faculty delegates certain of its powers with respect to Graduate Education to the Graduate Council. The duties of the Graduate Council are to set policy for the Graduate School subject to the approval of the Faculty and the Board of Fellows, such policy to include the conditions for admission to the Graduate School and the procedures for the award of graduate fellowships and scholarships; to supervise degree requirements; to approve new courses and other modifications of existing degree programs and to approve and recommend to the Faculty new degree programs; to review graduate programs periodically, but at least once every five years, in consultation with the departments; and to make annual report to the Faculty of its activities during the preceding year. The University awards, through its Graduate School, the advanced degrees of Master of Arts, Master of Science, Master of Arts in Teaching, Master of Medical Science and Doctor of Philosophy. There is a joint M.D.-Ph.D. program which is offered in conjunction with the Brown Program in Medicine.

Most divisions, departments and programs accept applicants for both the Master's and Ph.D. degree; however, many emphasize primarily Ph.D. programs.

The degree of Doctor of Philosophy is offered in American Civilization, Anthropology, Applied Mathematics, Art, Biology, Chemistry, Classics, Comparative Literature, Computer Science, Economics, Egyptology, Engineering, English, French Studies, Geological Sciences, German, Hispanic and Italian Studies, History, History of Mathematics, Judaic Studies, Linguistics, Mathematics, Music, Philosophy, Physics, Psychology, Religious Studies, Slavic Languages, Sociology and Special Graduate Study.

The Master of either Arts or Science may be taken in all of the above areas with the exception of Special Graduate Study, and is the highest degree now offered in Biomedical Engineering, Brazilian Studies, Creative Writing, Political Science, Portuguese Studies and Bilingual Education and Theatre Arts.

The Master of Arts in Teaching is available in the fields of English and Social Studies only. The Master of Medical Science is restricted to students enrolled in the Program in Medicine, though it is awarded through the Graduate School.

An officer of instruction of professorial rank at Brown University may not be a candidate for an advanced degree. Full-Time Students. A full-time student is one who devotes his or her entire time to a program of graduate work. Such a program may include teaching and research assistance, preparation for foreign language examinations, preparation for the Preliminary Examination, and supervised work on theses, as well as regular course work.

Part-Time Study. Students who can give only a portion of their time to their studies may be admitted in almost all departments.

Credit. Academic credit is stated in terms of semester courses. A regular semester course, or the equivalent research, carries one semester course credit and for purposes of evaluation may be considered the approximate equivalent of four semester hours. The normal course load for a student who is studying full time is four courses per semester.

Conferring of Degrees. Degrees are conferred at the University Commencement at the end of the academic year. However, at any time during the year, if a student has completed all the requirements for the degree, he or she will be issued, upon request to the Registrar, a certification that the degree will be conferred at the next Commencement.

Graduate Councils

The Provost and Dean of the Faculty, the Dean of the Graduate School (Chairman), the Associate Deans of the Graduate School, the Dean of the College and the Vice President (Biology and Medicine) as ex-officio members.

Members 1984-85: P. Baum, T. Engen, D. Forsyth, W. Freiburger, S. Rabson, P. Rubertone, H. Ryder, D. Underdown.

Members 1985-86: M. Bertness, F. Bisshopp, S. Fallieros, D. Forsyth, S. Rabson, B. Rosenberg, P. Rubertone, D. Underdown.

Note: Full membership includes four graduate students.

Degree Requirements

In the Spring of 1971 the Faculty and the Board of Fellows approved proposals reflecting changes in the philosophy of graduate study at Brown University. Many of the traditional requirements for degrees were removed from the general regulations of the Graduate School, thereby bestowing on the departments, and the non-departmental programs, an unusual freedom in defining their own degree structures. Since then, provisions also have been made for individually designed programs leading to the Ph.D.

The Ph.D. is primarily a research degree, and in some departments there is a formal supervised research requirement for the degree. Teaching is also an important part of most graduate programs and certain departments require candidates for the Ph.D. to have teaching experience. The exact research or teaching requirements are noted with each department's program description.

The statements in this section describe the minimal quantitative requirements for advanced degrees. Each of the graduate programs has its own standards of quality and achievement, and these too must be met. The mere mechanical fulfillment of the stated basic requirements will not by itself earn any advanced degree. The Faculty of the program concerned must also be satisfied as to the intellectual merit and scholarly potential of the student.

Master's Degrees

There is no provision for working for any Master's degree outside the established programs. The minimum requirement for a Master's degree is eight semester course credits (eight tuition units) in graduate work, successfully completed.

Graduate work done in graduate residence at other institutions and not used in fulfillment of the requirements for a degree may be offered in partial fulfillment of the requirements for a master's degree provided it is approved by the department or program and by the Registrar. However, the equivalent of at least seven semester courses must be done in residence at Brown University. Students who wish to transfer credit for work done elsewhere should file an application with the Registrar of the University well in advance of Commencement; forms are available in the Office of the Registrar.

Normally, all work to be used in fulfillment of the requirements for the Master's degree must be completed within a period of five years.

Individual departments and programs often have additional requirements as to the number of courses to be taken, proficiency in foreign languages, special examinations and theses. Departments have more detailed information about specific Master's degree programs.

The Doctor of Philosophy

There are three general requirements for the Ph.D.: residence, advancement to candidacy and the dissertation. The normal residence requirement is the equivalent of three years of full-time study past the Bachelor's degree (i.e., twenty-four tuition units). At least two semesters beyond the Master's degree must be spent exclusively in full-time study at Brown University.

Graduate work done in graduate residence at other institutions and not used in fulfillment of the requirements for the degree of Doctor of Philosophy elsewhere may, on the recommendation of the department of study and with the approval of the Registrar, be counted in fulfillment of the residence requirement. However, no more than the equivalent of one full year of study may be so counted. A student who desires credit for work done elsewhere should file an application after completing at least one semester in the Brown University Graduate School; forms are available in the Office of the Registrar.

A student is advanced to candidacy for the Ph.D. when he or she has satisfactorily completed all the requirements, departmental and general, requisite to beginning work on the dissertation. Candidacy is determined by the department or program of the degree and certified by it to the Registrar and Graduate Council. At present, most departments require a Preliminary Examination before advanc-

ing any student to Candidacy. The Preliminary Examination is designed to test the student's mastery of his or her field of study; it is not necessarily confined to courses taken by the student at Brown University or elsewhere. Most departments also require a Final Examination. The Examination is conducted by officers of professorial rank in the department or departments concerned and by such other members of the Faculty as may be appointed. All requirements for the Ph.D. must be completed within five years after advancement to candidacy.

Individual departments and programs often have additional requirements as to course work, foreign languages, computer training and preliminary and final examinations. Each department has detailed information about its specific doctoral program.

The candidate must present a dissertation on a topic related to his or her area of specialization which embodies the results of original research and gives evidence of high scholarship. The dissertation must be approved by the professor under whose direction it is written and by the Graduate Council.

The Candidate must sign a contract authorizing the Graduate School to have the dissertation published in microfilm. Since publishing of an abstract of a dissertation in *Dissertation Abstracts* and the offering for sale of film copies of the dissertation constitute publication, the author is governed by existing laws concerning quotation of copyrighted material. Each Candidate will be required to certify that extensive use of copyrighted material in the manuscript is with the written permission of the copyright owner. There is a dissertation fee to cover the costs of collation, binding, and microfilm publication. The fee is not returned to the student in case of subsequent publication of the dissertation, or portions thereof, in other forms.

After its final acceptance by the Graduate Council, the dissertation is microfilmed by University Microfilms International, Ann Arbor, Michigan, from which positive microfilm copies may be ordered. The abstract is published in *Dissertation Abstracts* by University Microfilms International. The student may copyright the dissertation by paying an additional charge.

Special Graduate Study. If, after at least one year of full-time graduate study at Brown, a student wishes to pursue scholarly work which cannot be accommodated within an existing Ph.D. program, the student may apply for permission to enroll as a doctoral student in special study. This entails drafting a self-designed plan of study, submitting a petition to the Graduate Council for approval and fulfilling the general requirements of the Graduate School for the Ph.D. at Brown.

The Graduate School Catalogue has detailed information about admission and financial aid.

The Program in Medicine

Admission

Beginning in the fall of 1985, students interested in the study of medicine at Brown should apply to the Program in Liberal Medical Education (PLME) when they apply for undergraduate study.

Most students will spend eight years to complete undergraduate and graduate studies, and the clinical component of the program. A student who enters the PLME with advanced placement credits or advanced standing may be able to complete the program in seven years. The program in Liberal Medical Education, however, was not designed as an accelerated medical education program; its goal is enrichment rather than acceleration.

Each applicant is first considered as an applicant to The College and secondly, as an applicant to the PLME. There is no separate application form for the PLME. Interested students should request the application booklet to Brown The College and check the box marked PLME. Candidates whom The College Admission Office considers admissible are reviewed by a PLME Advisory Selection Board. Decisions are reached and communicated in the same way as for other Brown applicants.

On the basis of our experience, we expect the number of PLME applicants to greatly exceed the sixty spots available each year. University policy dictates that candidates should not be denied admission solely on the basis of the degree program to which they seek admission. A number of PLME applicants, therefore, will be admitted to Brown but not to the PLME.

Transfer to the Program

Students are not generally considered for transfer from other Brown degree programs or from another college into the PLME unless they have been selected to participate in the Early Identification Program involving Providence College, Tougaloo College and the University of Rhode Island.

Foreign Students

Foreign students may apply to the PLME by completing the standard application to Brown The College.

Degree Requirements

The Medical Education Program Leading To The Doctor Of Medicine Degree

Freshmen who have been accepted into the Medical Education Program (MEP) follow a continuum of courses which leads to an A.B. or Sc.B. degree in any field at the end of four years, and an M.D. degree 3 or 4 years later. In the seven-year continuum, the senior undergraduate year is also the first year of the Program in Medicine (PIM), but MEP students may elect to complete their baccalaureate degree first and enter the PIM in their fifth year at Brown (the eight-year continuum). Following completion of the first five (or seven) semesters, the MEP student may either drop out of the program and continue as a regular senior in The College, or ask to be promoted into the Program in Medicine, which is Brown's accredited medical school. In the latter case, a check by the undergraduate MEP Undergraduate Affairs Committee of his or her ability, personal characteristics and motivation will be made on the basis of academic performance and MCAT scores and interviews.

SCIENCE OR LIBERAL ARTS OPTION IN THE MEP

During the first 3 or 4 years, a student may choose to follow either a science/medicine option or a liberal arts/medicine option, depending on which orientation s/he prefers to emphasize as an undergraduate. Typically, a medical student with research interests will want to take more science courses, and thus choose the science/medicine option. Those who intend to complete a concentration in the Humanities, Social Sciences or Behavioral Sciences, may choose the liberal arts/medicine

option. Along with electives to make up the normal load of 24 credits in the first three years, the minimum requirements for the two options are:

Years 1 through 3 (or 4)

A. THE MEDICINE/SCIENCE OPTION

Mathematics: 2 courses (at least 1 course including elements of probability and statistics is recommended)

Physics 3, 4 or equivalent

Chemistry 3, 11, 12 or equivalent

Biomed: 4 courses, including biomed 126 or equivalent

Social/Behavioral Sciences: 2 courses (in departments of Anthropology, Psychology, Sociology, Economics or Political Science)

Concentration in any area of Science, including Mathematics

B. THE MEDICINE/HUMANITIES-OR-SOCIAL SCIENCE OPTION

Mathematics: 2 courses (at least one course including elements of probability and statistics is recommended)

Physics 3, 4 or equivalent

Chemistry 3, 11, 12 or equivalent

Biomed: 3 courses, including Biomed 126 or equivalent

Social/Behavioral Sciences: 1 course

Concentration in Humanities, Social or Behavioral Sciences

Year 1 of the Program in Medicine

Those students in a 7-year MEP continuum take the following courses in their 4th (senior) year:

Human Morphology (Biomed 181)

Human Histology (Biomed 189)

Mammalian Physiology (Biomed 117)

Biochemical Pharmacology (Biomed 128)

Medical Microbiology (Biomed 158)

General Pathology (Biomed 184)

Medical Biochemistry (Biomed 130 [126 prereq.])

Social and Behavioral Science (Biomed 390)

NOTE: ALL COURSES NUMBERED BELOW 300 MAY BE COUNTED TOWARDS UNDERGRADUATE DEGREES; 300-LEVEL COURSES MAY NOT BE SO COUNTED.

PROGRAM IN LIBERAL MEDICAL EDUCATION

(Beginning in the 1985-86 academic year, this program will replace the Medical Education Program.) Freshman who have been accepted into the Program in Liberal Medical Education (PLME) will engage in a continuum of study leading to an A.B. or Sc.B. degree in any field and an M.D. degree. The expected duration of the program for most students is eight years, but some students may complete the program in seven calendar years. Students, together with their advisors, will develop an academic plan that outlines their proposed course of study and periodic benchmarks at which point they will have their progress evaluated.

The general requirements for the M.D. degree for students in The Program in Liberal Medical Education are as follows:

1. An Undergraduate Bachelor's degree in any concentration from Brown University. The goal of the PLME is to encourage students to extend the concentration into the traditional medical school years at a level of advanced scholarship.
2. Demonstration of competence in the preclinical disciplines (including those conventionally known as pre-medical and the basic medical sciences) as judged by the faculty which may include, as part of that total assessment, performance on Medical College Admissions Test and National Board of Medical Examiners-I examinations.
3. Clinical competence based upon a period of clinical work no less than 12 months duration.
4. An overall passing score on National Board of Medical Examiners-II.
5. Satisfactory completion of a minimum of 60 credits. Advanced placement credits do not count

toward this 60 credit minimum.

Students in the Medical Education Program who have not yet entered the Program in Medicine as of August 1984, may choose to fulfill the requirements that currently exist for MEP and PIM students or fulfill the requirements of The Program in Liberal Medical Education.

Master of Medical Science

This program is oriented toward medical students who wish to obtain experience in medical research problems through the preparation of a research thesis. Required courses: seven basic science courses above the 100-level including at least one 200 level course relevant to the area of thesis research, plus one thesis-research course. Many students will apply six of the present 100-level Biomed courses of PIM Year I (Biomed 117, 128, 130, 158, 181, 184 and 189) toward the course requirements. MEP, PLME, and PIM students should obtain further information at an early stage of their studies from the office of the Division's Associate Dean for Graduate Studies.

M.D. — PH.D. Program

The combined M.D.-Ph.D. program is intended to prepare professionals interested in combining a background in Medicine with graduate training in an area of investigation related to Medicine. Entry is limited to students formally admitted to the Program in Medicine and to a Ph.D. program of the University.

Students are generally expected to apply simultaneously to the Program in Medicine and to the graduate program of their choice and admission to the M.D.-Ph.D. program is contingent upon admission to both. Students already enrolled in the Program in Medicine may also apply for admission to the M.D.-Ph.D. program during either the first or the second year of their medical studies.

The Ph.D. component of the M.D.-Ph.D. program generally takes place after either the first or second year of the Program in Medicine, and must be completed prior to beginning the clinical clerkships. Special attention is given in the clinical training component of the M.D. program to the needs of, and opportunities for, students enrolled in the joint M.D.-Ph.D. program.

Students in the M.D.-Ph.D. program are given graduate credit for the equivalent of eight courses (one year of full-time study) for satisfactory completion of the first two years (basic medical sciences) of the Program in Medicine at Brown University.

Students in the M.D.-Ph.D. program are expected to complete all the requirements of the Ph.D. program in which they enroll.

While engaged in graduate study, students in the M.D.-Ph.D. program are eligible for financial aid as teaching or research assistants.

The MCAT (Medical College Admission Test) scores may be substituted for GRE (Graduate Record Examination) scores in the review of admission credentials of candidates for the M.D.-Ph.D. program.

Financial Information

The College — Tuition Regulations

Prior to the awarding of a baccalaureate degree, each candidate must have accumulated credit for the payment of eight semesters of tuition or the equivalent. The eight-semester tuition requirement is separate from and in addition to any other degree requirements.

1. Tuition rates are set by the Corporation of the University for each semester. Normally, the tuition rates for the two semesters of a given academic year will be the same.
2. Tuition payments for the baccalaureate degree are based on the norm of thirty-two courses, four courses in each of eight semesters. The minimum tuition requirement is eight semesters, or the equivalent. This eight-semester tuition requirement is separate from and in addition to any other degree requirements. The minimum tuition requirement for the program leading to the combined degrees of A.B.-Sc.B. is ten semesters of tuition credit.
3. Payment of full-time tuition for a semester entitles the student to enroll in three, four, or five courses for that semester. For full-time degree candidates, tuition charges are set for the semester, *not* per course.
4. (a) Students who are granted Brown course credits for Advanced Placement and/or transfer credit for work completed at another college or university prior to enrollment at Brown may apply for and may be granted advanced standing and tuition credit according to the following schedule.

<i>Brown Semester Course Credits</i>	<i>Advanced Standing and Tuition Credit</i>
3-6	1 semester
7-10	2 semesters
11-14	3 semesters
15 or more	4 semesters

(b) Students who are granted Brown course credits by the Committee on Academic Standing for equivalent work completed at and transferred from another college or university after enrollment at Brown may apply for and may be granted advanced standing and tuition credit according to the same schedule as in 4(a) above. All transfer credits earned after enrollment at Brown, except as provided for in Section 4(d), are cumulative. Advanced standing and tuition credit for this cumulative total of transfer credits must be applied for by the student and will be awarded *only* in semester-equivalent blocks.

In exceptional cases the Committee on Academic Standing may allow a student to transfer the equivalent of one or two Brown semester course credits for work completed during the regular academic year (for summer school courses, see (d) below). Tuition credit will be granted for each such course at the rate of one quarter of a full-semester credit subject to the following conditions:

- (1) Such courses completed while the student is not currently enrolled at Brown will become part of the cumulative total of all transfer credits earned by the student and the Table in (a) above will apply.
- (2) If the courses are completed as part of a dual registration arrangement (e.g., a student who is permitted to carry a less-than-normal load of courses at Brown and to pay an appropriate reduced amount of tuition in order to pursue concurrently certain specialized courses at another institution), tuition credit for such courses will be independent of any other cumulative total of transfer credits earned by the student.
- (c) Once advanced standing has been granted, a student wishing to extend his or her total period of enrollment beyond eight full-time semesters, or the equivalent, must apply to do so and must declare the number of courses for which he or she will register by December 1 for the

spring semester and by June 1 for the fall semester. In such cases tuition for each course (for the extended period) will be charged at the rate of one quarter of the full-time semester rate.

(d) Summer school courses are normally not acceptable for transfer and tuition credit. On an exceptional basis, after enrollment at Brown, a student may be permitted by the Committee on Academic Standing on one or more occasions to transfer one or two semester course credits for summer study completed at another college or university. With the exception of courses being taken to complete remaining degree requirements away from Brown, for tuition purposes the summer session will be considered as part of the succeeding academic year at Brown, for which the normal full-time tuition will be charged. However, the student will be reimbursed the tuition cost of the work accepted for summer transfer credit upon presentation of proof of cost; and the maximum number of courses that he or she would normally be entitled to take that year will be reduced by the number of transfer credits awarded. Transfer credits awarded under the terms of this Section may not be combined in any cumulative total of transfer credits for the purpose of determining advanced standing and semester tuition credits.

5. An eighth-semester student who owes less than a full-semester tuition credit at the beginning of the eighth semester will be charged the fraction of the full-time tuition charge for that semester which will complete the eight-semester obligation and may take an equivalent number of courses. Additional courses will be charged at the rate of one quarter of the semester's full tuition charge.
6. Regular degree candidate students who must or choose to take courses in semesters beyond the eighth semester in order to complete requirements for the baccalaureate degree will be charged tuition at the rate of one quarter of the semester's full tuition charge for each course enrollment.
7. Degree candidate students who are given permission by the Dean to register for "short work" (one or two courses) will be charged one quarter of the semester's full-tuition charge for each course enrollment.
8. Students in the seven-year continuum leading to a baccalaureate degree and the M.D. degree (Medical Education Program) shall make three annual tuition payments at the rate fixed for The College (for years one through three) and four annual tuition payments at the rate fixed for the Program in Medicine (for years four through seven). Students who request and receive permission to delay entrance to the Program in Medicine until the fifth year and/or candidates for the five-year combined A.B.-Sc.B. degrees, each requiring an extension of the continuum to a total of eight years, shall make four annual tuition payments at the rate fixed for The College (for years one through four) and four annual tuition payments at the rate fixed for the Program in Medicine (for years five through eight).

Except as noted in the next paragraph, the tuition regulations for The College apply until such time as actual enrollment has begun for the Program in Medicine, at which time the tuition regulations for the Program in Medicine take effect.

For students in the seven-year continuum, if at the beginning of the sixth semester a student lacks less than a full-semester tuition payment to accumulate credit for six semesters of tuition, only the balance of tuition required to bring the total credit to six semesters will be charged. In such cases, i.e., when less than a full-semester tuition is charged, the student shall be eligible to register for one course for each one quarter of the full-time rate being charged.

9. The above regulations cover students who are candidates for a baccalaureate degree. For special students who are not candidates for a degree, a tuition charge of one quarter of the semester tuition rate will be made for each course taken.

Estimated Date of Completion (EDOC)

One goal of the present tuition regulations is to enable the University to manage enrollment in The College more effectively. It is essential that this be done to the maximum extent possible. Accord-

ingly, all currently enrolled students are assigned an expected date of completion (EDOC). This information is sent annually to all students with instructions to confirm the assignments or to work out any necessary adjustment with the Registrar. Any extension of enrollment beyond the student's official EDOC will have to be applied for by December 1 for the spring semester and June 1, for the fall semester. In such cases, tuition for the extended period will be charged at the rate of one tuition unit per course.

The College — Student Charges

The University reserves the right to change the charges whenever it is deemed advisable, the new rates to apply to all students. Published notice of any change will normally be given in advance.

Tuition — The annual tuition charge for the year 1985-86 is \$10,825.00 or eight tuition units. The tuition charge for part-time and special students is \$1,353.13, or one tuition unit, per course. Fourth year students in the seven year Program in Medicine pay \$14,000 for the 1985-86 year.

Room — The dormitory charge for the academic year 1985-86 in the undergraduate residence halls is \$2,080 for regular accommodations, \$2,140 for the Graduate Center, \$2,250 for Dormitory Apartments, and \$2,480 for Appleby Hall or Young Orchard Apartments.

A \$100 room reservation deposit is required of students who file applications for a room in on-campus housing.

Board — Resident freshmen elect either a twenty, fourteen, thirteen (no dinners), ten or seven meal contract at an annual charge of \$1,615; \$1,475; \$1,385; \$1,310; or \$1,200 respectively. Resident sophomores, juniors, and seniors as well as all nonresident, commuting and graduate students, although not required to participate, may elect any of the aforementioned contracts. Any board plan may be reduced or cancelled once during the first four weeks of each semester with a refund credited to the students' university account on a pro-rated basis. A student may increase his or her contract participation at any time during the academic year. As services offered are often modified to reflect changes in student life, a current brochure is available from the Food Services Office.

Nonresident Fee/Commuter Fee — A \$190 fee is charged to all nonresident students in co-ops; off campus; or commuting from home. This fee covers services provided by the University to students such as Faunce House; security services; off campus information and listing services.

Health Services Fee — A \$245 fee is charged all degree candidates in residence, both full and part time. This fee is designed to cover the costs of the health services facilities (Andrews House), including most prescription drugs, x-rays and laboratory fees. This fee does not include Health Insurance coverage.

Student Health Insurance — Charge for the academic year 1985-86 is \$118. Mandatory participation is required in the University group health and accident insurance program for students unless a waiver of participation is granted upon submission of proof of comparable coverage. Waiver deadline is October 15.

Student Activity Fee — A \$79 fee is charged to all students for the support of registered student organizations and the activities of the Undergraduate Council of Students. The fee also finances the activities of the Student Union.

Readmission Fee — A \$40 fee is charged to all students who re-enroll at the University after having been officially separated for any reason, including leave of absence.

Late Registration Fee — A \$15 fee is charged for late course registration.

Transfer Credit Fee — A \$200.00 fee is charged all undergraduate students who receive approval from the Committee on Academic Standing (CAS) for study abroad in Non-Brown sponsored programs. This fee does not apply to students receiving tuition reimbursement for summer study abroad.

Student Deposit — Each student, prior to registration for the first semester after admission or readmission, is required to pay a deposit of \$50. This deposit serves for the duration of the student's enrollment in the University as a guarantee of payment of his or her account. It is not an account against which the student may make charges. It will be refundable in full several months following

the student's graduation or withdrawal from the University, unless the University is forced to draw from it to clear the account, in which case any unused balance will be refunded.

Transcripts — Students, former students and graduates who request transcripts are subject to the advance payment of a \$2 fee per transcript. As noted below, transcripts will be issued only if all financial obligations to the University have been met.

Property Insurance — See page 389.

The College — Payment of Charges

University bills for students' annual charges are mailed to parents in early July.

Annual charges are payable in full, on or before August 1 or in two payments: one-half on or before August 1, and one-half on or before January 1.

Late Payment Charges — If Semester I payment due on or before August 1, is received after August 1, a late payment charge of \$30 is assessed; if received after September 1, an additional late payment charge of \$60 is assessed. If Semester II payment due on or before January 1, is received after January 1, a late payment charge of \$30 is assessed; if received after February 1, an additional late payment charge of \$60 is assessed. Upon application, payment of annual charges may also be made in twelve monthly installments beginning June 1 and ending May 1. Simple interest is charged at the annual percentage rate of 11% on the actual amount borrowed. A late charge of 2% of the monthly payment, or \$5, whichever is less, will be charged on any monthly payment in default for a period of 10 days or more.

Checks in payment of student accounts should be made payable to Brown University and sent to the Bursar's Office, Box 1839, Providence, Rhode Island, 02912. Care should be taken to include the name, ID number, and home address of the student for whom the credit is intended.

Students who fail to meet their financial obligations to the University in accordance with established University regulations will have the status of their accounts reported to the University Student Account Committee for appropriate action which may include cancellation of eligibility for enrollment.

No student may withdraw in good standing from The College unless all current financial obligations to the University have been met.

Students expecting to graduate in May are required to settle their accounts before they receive their diplomas. All accounts with balances of \$250 or more *paid after May 1* must be paid by *certified check or money order*.

No diploma, certificate, transcript, letter of honorable dismissal, or recommendation will be issued to any student or former student, unless all financial obligations have been met.

The College — Refund of Annual Charges

1. TUITION

A. A student who leaves the University during or at the end of the first semester shall not be charged tuition for the second semester.

B. A student who leaves the University (except under conditions noted in (c) below) or changes his/her enrollment status during a semester shall be eligible for tuition payment refund during the first five weeks according to the following schedule:

<i>Week of Withdrawal</i>	<i>Percentage Amount of Refund</i>
1 and 2	80 percent
3	60 percent
4	40 percent
5	20 percent

If a partial refund is made, no portion of the tuition paid and unrefunded will be credited to the total tuition required for the degree. When *no* refund is made, the four tuition units paid will

be credited toward the total tuition requirement for the degree, and the number of semesters to which a student is entitled for full-time enrollment will be reduced by one.

- C. A student who is suspended, dismissed, or withdraws when under investigation for misconduct shall not have tuition refunded for the semester in which the action is taken.

2. ROOM

While residence hall rooms are rented on an academic year basis, students who leave the University or change their status to commuting or married students during or at the end of the first semester are not charged room rental for the second semester.

Students who leave the residence halls during the semester are charged room rental for the balance of that semester unless the Residential Life Office can provide a satisfactory replacement for the vacant space. A satisfactory replacement is deemed to be a student who is not currently living on campus or a student who is living in a "roomsharing" room if the total occupancy of the residence halls is in excess of normal capacity.

Prorated room refunds when applicable will be made from a schedule prepared by the Director of Residential Life and will be on file in the Office of Residential Life. A student suspended or dismissed from the University or withdrawing when under investigation for misconduct is not entitled to any refund of room rental charges for the balance of the current semester. Students seeking any further information regarding room charges and/or refunds should contact the Office of Residential Life.

3. BOARD

Resident freshmen, as a requirement of their first year in residence, must elect one of the following meal contracts: the twenty; any fourteen; any thirteen (no dinner); any ten; or any seven meals. Resident upperclassmen, as well as nonresident, commuting, and graduate students may take advantage of the aforementioned contracts or may make other dining arrangements.

All board contracts are for the Academic Year. Contracts are in force on all days the University is in official session as stated in the University Academic Calendar including holidays that do not fall in the recess periods.

All students, except freshmen, may exercise the option of changing or cancelling their board contract once during the first four weeks of each semester. Freshmen are limited to a change of meal plan only (see restriction above).

A credit or debit will be applied to the student's University account based on a weekly proration of annual contract values modified by the following conditions:

A \$10 charge will be applied for changing from one contract to another after the start of the term of any contract.

In the event of cancellation after the start of the term of any contract \$50 of the cost is nonrefundable and retained by the University to cover nonreducible overhead obligations (students who leave the University between semesters, having completed their degree requirements or on an approved leave of absence for Semester II, may apply for a waiver of this provision).

A pro rate refund schedule is available in the Food Service Office. Transactions completed by Wednesday noon become effective the following Friday.

Any modification to an annual board contract must be made in the Food Service Office and signed by the contract holder.

4. HEALTH FEE

A student who leaves the University at any time after the start of the semester is not eligible for a Health Fee refund.

A student who leaves the University during or at the end of the first semester shall not be charged a health fee for the second semester.

Student account records are maintained in the Office of the Bursar. Questions concerning the exact amount of debit or credit balance on a student account should be directed to the Bursar.

The College — Financial Aid

Through a comprehensive program of scholarships, loans, and student employment the University helps many students with limited funds meet their college expenses. Financial aid is based on the principle that as many well qualified students as possible should be helped to gain a university education through awards based on a careful assessment of financial need. Information concerning the program may be obtained from the following University publications: *Brown: Application to the College* and *Guidebook for Undergraduate Financial Aid*. This program is administered through the Office of Financial Aid, and all inquiries concerning scholarships, loans, and student employment should be addressed to the Financial Aid Awards Committee, Box 1827, Brown University, Providence, Rhode Island 02912.

The College — Financing Alternatives

The Loan Office is the centralized department for all University based loan programs. This office administers student loans for undergraduates, graduate and medical students. In addition, they operate the Parent Loan Program and the Tuition Prepayment Program, along with various employee loan programs.

If you have any questions regarding these programs or require more information you may write to Box 1950, Providence, R. I. 02912 or call (401) 863-3296.

The Graduate School — Tuition Regulations

(effective June 15, 1980)

DEFINITIONS:

Annual tuition — such amount as is fixed by the Corporation of the University for a given academic year.

Tuition Unit — one-eighth of the annual tuition

Full-time enrollment — registration for 3, 4, or 5 courses per semester, or as defined by the Dean of the Graduate School.

Part-time enrollment — registration for fewer than three courses per semester, or as defined by the Dean of the Graduate School.

1. Annual tuition payment entitles a student to full-time enrollment for the normal academic-year and is payable in advance. Teaching Fellows, Teaching and Research Assistants, Assistants, and any others holding equivalent appointments, shall pay at a maximum rate of three-quarters of the annual tuition. They will be considered to be full-time students and will be credited with a maximum of $\frac{1}{4}$ of an annual tuition payment (or $\frac{3}{4}$ of an annual tuition payment in the case of one-semester appointees) toward the requirement for the degree. Graduate students holding such appointments may register for no more than six courses in the academic year (three courses per semester of appointment in the case of one-semester appointees).
2. When fewer than eight tuition units (six in the case of Teaching Fellows, Teaching and Research Assistants, Assistants, etc.) are in a given year needed to satisfy the minimum remaining tuition requirements for a degree, charges and credits will be prorated accordingly.
If, at the beginning of any academic-year, only one tuition unit is required to meet the minimum total tuition requirement, the one tuition unit will be charged in Semester I and Enrollment Fee (see below) will be charged in succeeding semesters.
3. Except as noted in the next paragraph, the minimum total tuition which must be paid for a Master's degree is an amount equal to one annual tuition payment (eight tuition units), for which a student is entitled to two semesters of full-time enrollment or the equivalent. The minimum total tuition which must be paid for a doctorate is an amount equal to three annual tuition payments (twenty-four units), for which a student is entitled to six semesters of full-time enrollment or the equivalent.

If the Graduate Council approves a standard program leading to a Master's degree which requires less than three courses per semester but more than one year of the equivalent of full-

time enrollment, or wherein the normal enrollment pattern is not consistent with the normal academic year (e.g., the MAT program), students officially enrolled in such a program will be charged tuition at the rate of one tuition unit per course for the length of the program.

The tuition requirement must be satisfied prior to the awarding of a degree and no portion thereof will be waived. However, Ph.D. candidates who have completed all academic requirements for the degree but have spent without interruption less than the equivalent of three full years in residence, may appeal to the Graduate Council for a reduction in tuition requirements.

4. The total tuition required for a degree may, upon petition, be reduced by one tuition unit for each semester course of transfer credit (to a maximum of one tuition unit for a Master's degree, two in Integrated Programs, and eight tuition units for a doctorate).
5. If a Ph.D. candidate applies to be awarded a degree prior to the normal accumulation of credit for the required minimum number of annual tuition payments, the unpaid balance of the minimum tuition requirement for the degree will be charged at the rate in effect during the year in which the requirements for the degree are completed.
6. In addition to those Master's candidates in approved programs provided for in 3, above, the following students will be charged tuition at the rate of one tuition unit per course:
 - (a) Part-time degree candidates enrolled for courses.
 - (b) Master's degree candidates who choose or are required to enroll for courses beyond the period covered by the minimum tuition requirement for the degree.
 - (c) Special students.
7. Until the tuition requirement for a degree has been satisfied, candidates for the doctorate who are not in residence but who are writing dissertations or preparing for examinations in fulfillment of degree requirements must pay a minimum of one tuition unit per semester.
8. For students enrolled in combined-degree programs which include the M.D. degree, the tuition requirement for the M.D. degree covers the minimum total tuition requirement for the other advanced degree as follows:

for the Master of Medical Science—all
for the Master of Science—all
for the Doctor of Philosophy— $\frac{1}{3}$
9. No student may take examinations, use any of the facilities of the University, including the services of a dissertation or thesis advisor, submit a thesis or dissertation, or be a candidate for an advanced degree unless properly enrolled.

Students, both in residence and not in residence, who have fulfilled the total tuition requirement as stated in these Regulations, are required to pay a fee equal to 12% of full tuition for each semester in which they are enrolled to complete degree requirements.

A graduate student who is registered and has paid the enrollment fee is a full-time student. In general, full-time enrollment will be understood to mean that at least thirty hours per week are being actively devoted to completion of degree requirements.
10. Enrollment privileges, other than registration for courses, will be extended beyond the end of one academic year to the beginning of the next academic year (that is, over the summer months) without additional tuition charge.
11. Students who reenroll after an approved Leave of Absence or a withdrawal will be charged a Readmission Fee to be set by the Corporation.

The Graduate School — Student Charges

Tuition — Tuition fees for 1985-86 are charged at the rate of \$10,825 per year. Teaching Fellows, Teaching and Research Assistants may pay at the rate of three quarters of this amount. Students registered in the Masters of Arts in Teaching Program and those special students who are not

following a regular program of study leading to an advanced degree will pay \$1,353.13 per semester course. Candidates for the doctorate who are not in residence but who are writing a thesis or preparing for examination in fulfillment of degree requirements must pay a minimum of \$1,353.13 per semester, unless they have already fulfilled total tuition requirements, in which case they must pay an enrollment fee.

Every candidate for a master's degree must pay tuition fees for the equivalent of one year of full-time study. Every candidate for the doctorate must pay tuition fees for the equivalent of three years of full-time study. See (4) under Tuition Regulations concerning reduction of tuition requirements for the degree.

Enrollment Fee — Students, both in residence and not in residence, who have fulfilled the total tuition requirements, as stated above, are required to pay a fee equal to 12% of full tuition for that semester and each additional semester as long as they are registered to complete degree requirements. No students may use the University facilities (including the services of a thesis advisor) unless properly registered.

Thesis Fee — If the thesis for the doctorate is presented in typewritten form, a fee of \$50 is required at the time of final acceptance.

Late Registration Fee — A fee of \$15 is charged for late course registration.

Student Deposit — Each student, prior to registration for the first semester after admission or readmission, is required to deposit \$50. This deposit serves for the duration of the student's enrollment in the University as a guarantee of payment of his or her account; it is not an account against which the student may make charges. It will be refunded in full several months following the student's graduation or withdrawal from the University, unless the University is forced to draw from it to clear his or her account, in which case any unused balance will be refunded.

Room — The 1985-86 academic year charge for a room in the Graduate Center is \$2,140. A room reservation deposit of \$100 is required with each room application. Students who cancel their contract after the effective date of occupancy, are charged room rental for the balance of the contract period unless the University can provide a satisfactory replacement.

Health Services Fee — A mandatory fee of \$245 is charged all degree candidates, both full and part-time. This fee is designed to cover the costs of health services facilities (Andrews House) and it does not include health insurance coverage, pharmacy, x-rays or laboratory fees.

Student Health Insurance — Charge for the academic year 1985-86 is \$118. Participation in the University group health and accident insurance program is mandatory for all students. A waiver of participation may be granted upon submission of proof of comparable coverage.

Student Activity Fee — A \$10 fee is charged to all graduate students for the support of registered student organizations and the activities of the Graduate Student Council.

Readmission Fee — A \$35 fee is charged to all graduate Students who re-enroll at the University after having been officially separated for any reason, including leave of absence.

Transcripts — students, former students and graduates who request transcripts of their academic records are charged \$2 for each transcript. Transcripts will be issued only if all financial obligations to the University have been met.

The Graduate School — Refund of Annual Charges

Provisions for the refund of annual charges in the Graduate School are the same as for refunds for The College — see page 103.

The Graduate School — Financial Support

Brown University recognizes merit and financial need as appropriate criteria for the awarding of financial aid to graduate students. Accordingly, all applicants, except foreign nationals, for Fellowships, Teaching Fellowships, Teaching Assistantships, Assistantships, Scholarships, Proctorships, and loan assistance from the University are required to submit the GAPS FAS (Graduate and Professional School Financial Aid Service) application.

The Graduate School Catalogue contains detailed information about various Fellowships, Scholarships and Assistantships.

Traveling Scholars (in absentia) Registration

Advanced graduate students may request permission from the Graduate School to register for a semester or an academic year as Traveling Scholars in order to conduct full-time research or fieldwork in a location removed from Brown. Traveling Scholar registration is renewable for not more than one additional year. The student's department must certify to the Graduate School that the research or fieldwork to be done away from Brown is necessary for the completion of the degree program. Students on Traveling Scholar registration are considered full-time students. Applications for Traveling Scholars registration are due in the Graduate School by August 1 for (for Sem. I) or the academic year, and by December 15 for Sem. II. The fee for Traveling Scholars registration is currently set at \$100.00 per semester.

The Graduate School — Payment of Charges

University bills for annual charges are mailed to students in early July.

Annual charges are payable in full, on or before August 1, or in two payments: one-half on or before August 1, and one-half on or before January 1.

Late Payment Charges — If Semester I payment due on or before August 1, is received after August 1, a late payment charge of \$30 is assessed; if received after September 1, an additional late payment charge of \$60 is assessed. If Semester II payment due on or before January 1, is received after January 1, a late payment charge of \$30 is assessed; if received after February 1, an additional late payment charge of \$60 is assessed.

Upon application, payment of annual charges may also be made in eight monthly installments beginning October 1 and ending May 1. This plan carries a \$60 service charge. The maximum amount which may be remitted under this plan shall be total University charges minus bank loans, scholarships, fellowships and student loans. If any monthly installment is not received on the due date, the full balance of the installments will be due and payable immediately.

Late Payment Charges — A late charge of \$5 shall be incurred if a monthly installment is not paid on time, except in the months of October and January when the late charge is \$30.

Checks in payment of student accounts should be made payable to Brown University and sent to the Bursar's Office, Box 1839, Providence, RI 02912. Care should be taken to include the name, ID number and home address of the student for whom the credit is intended.

Students who fail to meet their financial obligations to the University in accordance with established University regulations will have the status of their accounts reported to the University Student Account Committee for appropriate action which may include cancellation of eligibility for enrollment.

Students expecting to receive a degree in May are required to settle their accounts before they receive their diplomas. All accounts with balance of \$250 or more paid after May 1, must be paid by certified check or money order.

No student may withdraw in good standing unless all current financial obligations to the University have been met.

No diploma, certificate, transcript, letter of honorable dismissal, or recommendation will be issued to any student or former student, unless all accounts are satisfactorily settled.

Program in Medicine — Tuition Regulations

Tuition rates are set by the Corporation of the University for each academic year. Annual tuition, which is payable in advance, entitles a student a full-time status and covers all courses taken at Brown University during the twelve month period including the summer preceding the academic year.

Normally the course requirements for the Program in Medicine are fulfilled over four academic years. With permission of the Dean of Medicine, students may enroll on a part-time basis and fulfill the course requirements over a longer period of time in which case their tuition might be prorated.

Students may apply for placement out of courses for work completed at another educational institution. Placement decisions are made by the course leader of the corresponding course at Brown. Students receive tuition credit only when admitted to the Program in Medicine with advanced standing. In such case tuition credit will be given only for those semesters in which the student has been placed out of all course requirements for that semester. Students who have placed out of some, but not all, course requirements for a given semester are expected to pay full tuition for that semester.

Students enrolled in the continuum program leading to a baccalaureate degree and the M.D. degree at Brown University (Program in Liberal Medical Education) are required to make four annual tuition payments at the rate fixed for the Program in Medicine, usually during the last four years of the continuum (for years five through eight).

Program in Medicine — Student Charges

Tuition — The 1985-86 annual tuition fee for the Program in Medicine is \$14,000. This charge covers all courses taken during the twelve month period including the summer preceding the academic year. Students in the first year of the Program in Medicine who have not yet received a Bachelor's degree from Brown shall be subject to the above charge.

Late Registration Fee — A fee of \$15 is charged for late course registration.

Student Deposit — Each student, prior to registration for the first semester after admission or readmission is required to deposit \$50. This deposit serves for the duration of the student's enrollment in the University as a guarantee of payment of his or her account; it is not an account against which the student himself or herself may make charges. It will be refunded in full several months following the student's graduation or withdrawal from the University, unless the University is forced to draw from it to clear his or her account, in which case any unused balance will be refunded.

Health Services Fee — A mandatory fee of \$245 is charged all degree candidates. This fee is designed to cover the costs of health services facilities (Andrews House) including most prescription drugs, x-rays and laboratory fees. This fee does not include health insurance coverage.

Student Health Insurance — charge for the academic year 1985-86 is \$118. Mandatory participation is required in the University group health and accident insurance program for all medical students (including students in the fourth year of the seven year continuum of Medical Education Program) unless a waiver of participation is granted upon submission of proof of comparable coverage. Waiver deadline is October 15.

Student Activity Fee — A \$35 fee is charged all medical students for the support of registered student organizations and the activities of the Medical Student Senate.

Commitment Deposit — A \$100 commitment deposit is required of all students admitted in regular or special standing at any level of the Program in Medicine, with the exception of students promoted from the Continuum of Medical Education at Brown University.

Readmission Fee — A \$60 fee is charged to all Medical students who re-enroll at the University after having been officially separated for any reason, including leave of absence.

Transcripts — Students, former students, and graduates who request transcripts are subject to the advance payment of a fee of \$2 for each order. As noted below, transcripts will be issued only if all financial obligations to the University have been met.

Medical Student Research Fee — Medical students with the approval of the Dean of Medicine may be excused from attending classes to participate in research activities under faculty supervision for a designated period of no less than one semester and no more than two years. Such students shall be authorized to use Brown University educational resources (e.g. the libraries), but shall not be permitted to register for any courses. The fee for the status shall be \$100.00 per semester. (Such students may retain their Brown ID cards and have it validated upon payment of the appropriate fee.) If they are not gainfully employed, they will be certified to be full-time students on an approved leave of absence.

Payment of Charges — Payment regulations are the same as those of the Graduate School. See The Graduate School — Student Charges.

Program in Medicine — Refund of Annual Charges

Adjustment of annual tuition charges will be made for any student in the Program in Medicine who withdraws officially or who is dismissed for academic reasons, subject to the following provisions:

A. Year I

1. A student who leaves the Program in Medicine prior to the beginning of the second semester shall not be charged tuition for the second semester.
2. A student who leaves the Program in Medicine during either Semester I or II shall be eligible for a refund of the normal charge for that semester (50% of the annual charge for the Program in Medicine) during the first five weeks only as follows:

First two weeks	80% refund
Third week	60% refund
Fourth week.....	40% refund
Fifth week	20% refund

B. Year II

1. A student who leaves the Program in Medicine during or at the end of the enrollment period preceding the beginning of the normal academic year for the University shall be refunded 90% of the total annual charge for the Program in Medicine.
2. A student who leaves the Program in Medicine prior to the beginning of the second semester of the normal academic year for the University shall not be charged tuition for the second semester.
3. A student who leaves the Program in Medicine during Semester I or II shall be eligible for a refund of the normal charge for that semester (50% of the annual charge for the Program in Medicine) during the first five weeks of the regular semester as follows:

First two weeks	80% refund
Third week	60% refund
Fourth week.....	40% refund
Fifth week	20% refund

C. Year III

1. The academic program for the third year of the Program in Medicine is divided into four clerkship periods of approximately thirteen weeks each.
2. A student who leaves the Program in Medicine during or at the end of the first clerkship period shall be refunded 75% of the total annual charge.
3. A student who leaves the Program in Medicine during or at the end of the second clerkship shall be refunded 50% of the total annual charge.
4. A student who leaves the Program in Medicine during or at the end of the third clerkship shall be refunded 25% of the annual charge.
5. No refund shall be made to a student who leaves the Program in Medicine during or at the end of the fourth clerkship period.

D. Year IV

1. The academic program for the fourth year of the Program in Medicine is divided into three clerkship periods of approximately thirteen weeks each.
2. A student who leaves the Program in Medicine during or at the end of the first clerkship period shall be refunded 66% of the total annual charge.
3. A student who leaves the Program in Medicine during or at the end of the second clerkship shall be refunded 33% of the total annual charge.
4. No refund shall be made to a student who leaves the Program in Medicine during or at the end of the third clerkship period.

Student Account records are maintained in the Office of the Bursar. Questions concerning the exact amount of debit or credit balance on a student account should be directed to the Bursar.

The Program in Medicine — Financial Information

During the college years of the program, financial aid is available to PLME students on the same terms and through the same channels as for all undergraduate students at Brown. Applicants with specific questions about financial aid during the first four years of the program should contact the University Financial Aid Office. Students in the four years accredited as a medical school (known as the Program in Medicine) receive assistance through the Office of Financial Aid, Division of Biology and Medicine, 97 Waterman Street, Providence, R.I.

Both loans and scholarships are available, although loans are the most common form of financing, particularly in the two years which precede the awarding of the M.D. degree.

Departments, Divisions, Centers, Programs

General Information

TYPES OF COURSES OFFERED

There are several types of courses available at the University as follows:

Departmental Courses (including those offered by Divisions, Centers, and Programs), page 113.

Extra-departmental Courses, page 364.

Special Themes and Topics Courses, page 364.

University Courses, page 366.

Seminar Courses for Freshmen and Sophomores, page 369.

Modes of Thought Courses, page 369.

Special Themes and Topics/Seminar Courses, page 371.

Foundations Courses (Special Themes and Topics/Foundations), page 372.

Independent Study Plans, page 373.

Independent Study Projects, including Internships, page 373.

Group Study Projects, page 373.

Details concerning these courses will be found on the pages indicated, including course descriptions as appropriate; however, specific time schedules are not available in this catalogue. The University publishes a Course Announcement each spring for the following academic year. Reference should be made to this booklet for the courses offered each semester and for the times at which they are given. In general, courses are assigned to recitation groups, each group consisting of three fifty-minute periods a week. A schedule of these groups arranged according to days and hours appears on the inside back cover of this catalogue. The courses described in this catalogue and also those listed in the Course Announcement are subject to change. The University reserves the right to add or delete courses of instruction at any time without notice.

UNIT OF CREDIT

The semester course is the unit of credit. This is defined as one fourth of a student's normal program of academic work for one semester and for purposes of evaluation may be considered the approximate equivalent of four semester hours.

COURSE NUMBERING SYSTEM

Courses numbered 1 to 99 are open only to undergraduates. Courses numbered 100 to 199 are open to undergraduate and graduate students. Courses numbered 200 to 299 are open to graduate students and, by special arrangement, to undergraduates. Courses numbered 300-399 are open only to students enrolled in the Program in Medicine.

YEAR COURSES AND TWO-SEMESTER SEQUENCES

A dash between course numbers (for example, French 1-2) indicates a year course in which the grade at the end of the first semester is normally a temporary one; the final grade submitted at the end of the course covers the work of the entire year and is recorded as the final grade for both semesters.

A comma between course numbers (for example, History 1, 2) indicates a two-semester course, the first semester of which is normally prerequisite to the second semester; two independent grades are submitted, one at the end of each semester.

Afro-American Studies

Professor BASS, Associate Professors BELANCE (Emeritus), FRUZZETTI, JONES, MOSES (Chairman); Assistant Professors BROWN-COLLINS, DAVIS, DZIDZIENYO.

The Afro-American Studies Program at Brown is a meeting place for professors and students with numerous disciplinary and interdisciplinary interests. The research and teaching tasks of the faculty are concerned in the broadest sense with the Afro-American experience in the United States of America. Courses are also offered in the culture and society of Brazil, the Caribbean, and the various regions of Africa. The faculty have expertise in such diverse areas as Anthropology, Drama, Folklore, History, Literature, Psychology, and Sociology. All faculty members have research and teaching specialties related to the impact of slavery, colonialism, and racialism on the modern world, and they also have interests in other areas of research and study. These include classical literature, Arabic and Islamic Studies, world mythologies, the culture of India, Native American Studies.

Central to the work of the program is the role of Rites and Reason, the research theatre and performing arts component of Afro-American Studies at Brown. Artists collaborate closely with scholars in various disciplines to discover the underlying harmonies between academic and artistic perceptions of the world around us. Rites and Reason provides the Program with important means of interaction with the various academic and non-academic communities of Greater Providence.

The Program has a history of commitment to participation in the life of the Afro-American communities of Greater Providence, and provides opportunities for students to become involved in the activities of these communities. Interested students should consult with the faculty.

By its very nature the Program is involved in international studies. A total of eight African languages are spoken by various faculty members. Four faculty members have African experience. Two have lived for considerable periods in India. Three have spent lengthy periods in Europe and two have participated in the Fulbright Program. Faculty members are fluent in such non-African languages as French, German, Spanish, Italian, Arabic, Portuguese, and Bengali, among others. One faculty member has participated in the Brown University exchange program with East Germany. The Program emphasizes strongly the importance of foreign language study and foreign travel.

The Brown University libraries provide numerous opportunities for original research in the subjects for which the Program provides training. The John Hay Library has the Harris Collection on American Poetry, Popular Entertainment and Plays, the McClellan Lincoln Collection, and the Metcalf Collection of pamphlets. The John Carter Brown Library has probably the best collection in this hemisphere of works published in and about the New World before the nineteenth century. The libraries are particularly outstanding for their extensive holdings in the areas of slavery, colonialism, and race relations. Microfilm collections include the FBI files on Martin Luther King and Malcolm X, as well as the papers of W.E.B. Du Bois, Alexander Crummell, and Carter G. Woodson.

UNDERGRADUATE PROGRAMS

At least eight courses in Afro-American Studies are required of concentrators; these must include Afro-American Studies 9, 10 and at least one seminar at the 100 level, emphasizing research or bibliographic skills. Students should attempt to gain familiarity with the various disciplinary perspectives and the geographical areas surveyed in the Program's offerings. Concentrators are also required to elect at least six courses in one department of the arts, sciences or humanities, in order to develop disciplinary as well as interdisciplinary competency. All concentrators are strongly urged to develop foreign language skills.

The Program encourages foreign study and study at Tougaloo College during the junior year. At least six courses offered for the concentration must, however, be completed in the Program at Brown.

Honors: Students with outstanding records may be admitted to the honors program. Competency in a foreign language, equivalent to two semesters of study at Brown is required. Working in consultation with a faculty advisor, the student must prepare a plan of work before the end of the junior year. This is not to exceed three typewritten pages, which must be signed by the faculty member

who is to direct the thesis. By the beginning of the senior year, the candidate for honors is expected to have become familiar with the major secondary works in the field. These should be plentiful, and alluded to in the plan of work. The candidate is expected to complete a research paper of distinguished quality while enrolled in a 100 level seminar. Completion of these requirements does not automatically guarantee that the candidate will receive a degree with honors.

GRADUATE PROGRAM

Numerous dissertations have been written on various aspects of Afro-American Studies by students at Brown. Faculty of the Program direct research through several cooperating departments, and it is also possible to earn the Ph.D. in Afro-American Studies through the Special Studies program. Interested persons should contact the Chairperson of the Program for details.

I. PRIMARILY FOR UNDERGRADUATES

9, 10. *An Introduction to Afro-American Studies*

Ms. BROWN-COLLINS, Messrs. MOSES and JONES.

Introduction to modern history and culture of black populations in Africa, the United States and the Caribbean with current events an ever present concern. The role of political and economic forces in shaping literary ideological and artistic expression. Historical topics covered include the abolition of slavery in the Americas, the challenge to colonialism in Africa, and the development of a Pan-African tradition in journalism. The various approaches of art, psychology, folklore, seminar, history, semantics, literature, sociology, anthropology, musicology, and economics will be explored. An introduction to the bibliographies of each of these fields will be presented and discussed in its relation to the interdisciplinary field of Black Studies.

15. *African History and Society I* (Pre-Colonial and Colonial Africa 1450-1957)

Mr. DZIDZIENYO, Mr. DAVIS, and Ms. FRUZZETTI.

A multi-disciplinary course provides students with an understanding of the African past so that they may intelligently confront contemporary Africa and the present black experience in America. The thrust is thematic rather than chronological and emphasis will be placed on discussion and the exchange of ideas. Readings drawn from history, anthropology, and literature.

16. *African History and Society II* (Independent Africa 1957-1980)

Mr. DZIDZIENYO, Mr. DAVIS, and Ms. FRUZZETTI.

Focus is on post-colonial African development and its problems. Approach is multi-disciplinary and themes include: internal and external conflict, continental and regional integration, the African writer and his society, and politics of the armed forces and civil society. Not a chronological course — emphasis is on themes and their relationship.

17. *Afro-American History and Society*

Mr. JONES.

The course precedes Afro-American History and Society (AA 18) and ought ordinarily be taken before it. It is concerned with the history, culture and development of Afro-American Society in what is now the United States. Unlike most American history courses it is not Anglo-centric, but rather examines the evolving Afro-American culture in settlements undertaken by the French, Dutch, Spaniards, and Germans as well as the English. No prerequisites. Offered every other academic year.

18. *Afro-American History and Society*

Mr. MOSES.

Sequel to Afro-American History and Society (AA 17). Begins in 1789 and traces the development of social forces and the ways in which they have been shaped by ideas originating among the black population of the United States. Will examine, from several disciplinary perspectives, the development of mechanisms for self determination by black Americans. Will focus on the development of the black press, the black church and other institutions by means of which black Americans began to shape their own destinies.

19, 20. *Caribbean History and Society*

Mr. JONES.

This year long course aims at familiarizing undergraduates with the history, peoples, cultures, and societies of the Caribbean through a multi-disciplinary perspective. The first semester examines the

Carib and Arawak background, the first Spanish colonies, the challenge to Spanish hegemony by other European powers, Maroon societies, and the transit of European and African civilizations to the New World. The second semester begins with the Revolutionary Era and covers the impact of imperialism and racism on the Caribbean, the migration of Asians and East Indians to the region, the end of slavery, the Caribbean family, the consequences of the Spanish American War, the Marine occupations, the movement for independence in the British West Indies, the Cuban revolution, and recent events in such areas as Puerto Rico, Cuba, Jamaica, Haiti, Martinique, Trinidad, and Grenada. No Prerequisites. Offered every other academic year.

21, 22. *Blacks in Latin American History and Society*

Mr. DZIDZIENYO.

The role of blacks in the national histories of Latin American countries and their role in contemporary society. Focus on Hispanic America. Issues include comparative slavery and race relations and their bearing on national and international politics of these countries, black socio-cultural and political movements and the issue of race and class in Afro-Latin America. In the second semester, particular attention to the role of black Latin Americans in the recent politics of the African Diaspora, the implications of the assertion of Africanity within Latin American politics and the theory and practice of race relations and politics in Latin America and the United States of America. Readings are multi-disciplinary. While a reading knowledge of Spanish is not a prerequisite, students with such knowledge should inform the instructor by the end of the first week.

II. FOR UNDERGRADUATES AND GRADUATES

101A. *Special Topics in Afro-American Studies: Voices from Beneath the Veil*

Mr. BASS.

Thirty plays written by Afro-American playwrights and presented on the American stage between 1858 and 1970 will be examined as cultural and historical documents of Afro-American realities. Supplementary readings from the humanities and social sciences will provide critical frameworks for in-class discussions and student papers.

101B. *Special Topics in Afro-American Studies: Black Psychology (Psychology 105)*

Ms. BROWN-COLLINS.

Introduction to the issues and perspectives in the study of the psychological development of black people in America, past and present. Special consideration to such issues as: The Afro-American and Euro-American ethos, the nature of Black personality as impacted upon by slavery and racism, psychological assessment of blacks, treatment and counseling techniques, and the relationships between psychological research and social policy in American research. Prerequisite: Psychology 1 or written permission.

101C. *Special Topics in Afro-American Studies: Introduction to the Afro-American Literary Tradition*

The STAFF.

Explores the published works of black writers and seeks to introduce students who have little knowledge of Afro-American literature to the genre. Students are encouraged to read widely, but not superficially in the many varieties of black thought. Emphasis on understanding the complex web of relationships among black literature, black life, and black political thought.

101D. *Special Topics in Afro-American Studies: The Making of a Contemporary Myth*

Mr. BASS.

Faculty in Afro-American Studies at Brown and members of Rites and Reason (the arts component of the Program) are building a myth set in Providence that interprets the making of America and New World societies from an Afro-American perspective. This course will examine the collaborative effort to build a contemporary myth located in the shared perceptions and realities of the people of Providence as well as document and evaluate the making of Apocalypso: The Judgement of a Dreamer. Selected readings of myths and literature on myth-making from humanities and social science disciplines will be used to provide a critical focus for the semester-long inquiry.

102A. *Special Topics in Afro-American Studies: The Afro-Luso-Brazilian Triangle: Socioracial and Political Perspectives,*

Mr. DZIDZIENYO.

Focuses on recent political developments in the historical triangular relations among continental Africa, Brazil, and Portugal. Topics to be included: Luso-Brazilian relations and independence movements in Luso-phone Africa, Afro-Brazilians and Brazil's African relations, and post-colonial

bilateral or multi-lateral relations within the Portugese-speaking world. Conducted in English. Written permission required.

102B. *Special Topics in Afro-American Studies: Afro-American Folk Traditions and the Aesthetics of Change* Mr. BASS.

This seminar systematically explores the link between black folkthought and the interpretation of Afro-American realities in folk and academic art from a multi-disciplinary perspective. Readings not only from the arts but from the humanities and social sciences as well. Particular attention to the relationship between the evolving Afro-American aesthetic and the role of folk art in the struggle for black liberation.

102C. *Special Topics in Afro-American Studies: The Black Family* Ms. BROWN-COLLINS.

An overview of the African-American family in sociological, psychological, economic, anthropological, and historical perspective. Seeks to unravel the complex interplay of self-definition and definition of the other among black women, men, and children within the context of the African-American family. Changing sex roles among black women and men are also explored.

102D. *Special Topics in Afro-American Studies: This is the Time: Protest and War in Central and Southern Africa* The STAFF.

Students will read a great deal of southern and central African Poetry not ordinarily available in the United States, but more importantly will have the chance to put this poetry in the context of the continuing struggle by African peoples for liberation. Examines the direct link between the political and economic struggle for freedom and poets who seek to be a voice in the struggle.

102E. *Special Topics in Afro-American Studies: Black Women in the Americas* Ms. BROWN COLLINS.

This seminar explores, from a multi-disciplinary perspective, the characteristics, lifestyles, and reflective thought of black women in the western hemisphere. It not only draws upon essays, novels, sociological studies, historical works, poetry, and fiction, but makes students in the course aware of an on-going project concerned with black women in greater Providence.

103. *Politics and Religion: Contemporary North African Societies* Ms. FRUZZETTI.

Politics and the changing political structure in North Africa. Post colonial history will serve as a tool for an understanding of present social and political conditions. The study of Islam as part of a cultural and political system provides an understanding of the intricate relationship which exists between politics and religion in North Africa. Will cover Morocco, Africa, Tunisia, Algeria, Libya, Egypt, and the Sudan.

105. *Seminar in Afro-American Studies: Black Leadership in the Twentieth Century: Focus on W. E. B. DuBois* Mr. MOSES.

A survey of the life and writings of W. E. Burghardt DuBois (1868-1963) founder of the NAACP and first editor of its official journal, the *Crisis*. DuBois was the author of over thirty books, including five novels, and some of the classics of 20th century sociology and social history. DuBois was one of the first scholars to insist on the importance of central Africa to the development of the world's civilization. He was first to advocate that slavery must be understood as an economic force and not as a badge of shame.

106. *Seminar in Afro-American Studies: The Slave Community* Mr. JONES.

Knowledge of life within the slave quarters has expanded tremendously over the past decade and a half. The course will draw on recent works in the exploration of such issues as slave diet, religion, family life, social structure, relations between the sexes, economic activities, and political aspirations.

121. *Afro-Brazilians and the Brazilian Polity* (Portuguese and Brazilian Studies 121) Mr. DZIDZIENYO.

The participation of Afro-Brazilians in Brazilian Society and politics in the 20th century is explored in a thematic examination of political movements and organizations with specific reference to Brazilian blacks. Topics include: the uses and exploitation of the "African Heritage," a comparison of race and politics in Brazil and the USA, and the Afro-Brazilian role in Brazil's contemporary relations with Africa. While reading knowledge of Portuguese is not required, students with such background should immediately apprise the instructor of the fact.

140. *Origins of Black American Literature*

Mr. MOSES.

Survey of writings in the English language of Africans and Afro-Americans from 1770-1920, with primary focus on the United States. Fiction, drama, and poetry will not be excluded, but greater attention will be given to letters, autobiographies, formal sermons, political tracts, diaries, journalism, and oratory. The following writers, among others, will be considered: Phillis Wheatley, David Walker, Frederick Douglass, Alexander Crummell, Edward Wilmot Blyden, Booker T. Washington, W. E. B. DuBois, Sutton Griggs, Marcus Garvey, and Mary Church Terrell.

141. *Africans and the West: Studies in the History of Ideas*

Mr. MOSES.

This course offers an introduction to primary and secondary sources in the history of political philosophy and social change among the African peoples from the age of the slave trade to the present. The political and ideological interaction between continental Africans and Africans of the diaspora (people dispersed by the slave trade) will be a major concern of this course. Considerable attention will be focused on African adaptation of Marxism, Freudianism, and existentialism.

154. *Multi-racial Societies in the Americas before 1800* (History 154)

Mr. JONES.

155. *Slave Societies in the English Speaking Caribbean* (History 155)

Mr. JONES.

166. *Problems in Afro-American History* (History 166)

Mr. JONES.

191, 192. *Independent Reading and Research*

The STAFF.

Work with individual students in connection with directed readings, problems of research, preparation of theses, or field work.

The Center for Alcohol Studies

The Center for Alcohol Studies was formally established in 1982 and consists of affiliated multi-disciplinary faculty members who conduct psycho-social and bio-medical research.

The purpose of the Center is to reduce the health risks associated with excessive alcohol use through application of research findings to the development of alcohol and drug related public health policy. Such policies address methods of intervention into the interaction of excessive drinking with chronic disease, personal and familial dysfunction, lowered work productivity, and accidental injury and death which increase the costs of health care, goods and services, and security for society as a whole. Of particular interest are the needs of special populations such as adolescents, the elderly, and children of alcoholics.

Some of the types of activities the Center currently engages in are as follows: collaborative research projects with faculty and other university centers, state policy makers, and community service providers; guidance and support for undergraduate and graduate student research projects; post-doctoral fellowship program; resource development, technical assistance, and sponsorship of journal clubs and colloquia on alcohol issues; education of medical students, residents, and physicians on alcohol diagnosis and intervention; and alcohol education with campus and community groups.

The Center Director is David C. Lewis, M.D., Professor of Medicine and Community Health.

American Civilization

The Program in American Civilization is directed by an Executive Committee composed of Professor BRUCE A. ROSENBERG (Chairman; American Civilization and English), Professor DAVID H. HIRSCH (English), Professor CHARLES H. NICHOLS (English), Professor JOHN L. THOMAS (History), Professor WILSON J. MOSES (Afro-American Studies and American Civilization), Associate Professor MARI JO BUHLE (American Civilization and History), Assistant Professor RICHARD A. MECKEL (American Civilization), Mr. ROBERT G. LEE (Assistant Dean of the College), Mr. PATRICK M. MALONE (Lecturer in American Civilization and Director, Slater Mill Museum Site), and Ms. KATE E. WITTENSTEIN (Lecturer and Executive Secretary American Civilization).

Brown University offers unusual facilities for research in American Civilization. The Americana of the John Carter Brown Library, the Harris Collection of American Poetry and Plays, the McClellan Collection of Lincoliana, and other special resources in the Libraries of Brown University afford a wealth of material for American studies. These resources are appreciably supplemented by the extensive holdings of the Library of the Rhode Island Historical Society, the Providence Athenaeum, and the Providence Public Library.

UNDERGRADUATE PROGRAMS

Concentration in American Civilization is designed to offer undergraduate students at Brown University the opportunity to study intensively the history, literature, and general culture of the United States. With the collections of Americana in the John Carter Brown Library and in the John Hay Library, Brown has unusual facilities for this type of study.

The requisite for concentration in American Civilization is American Civilization 75. Candidates for honors are required to enroll in American Civilization 190 in the first semester of their junior year. They must also complete American Civilization 180 (the honors seminar) and American Civilization 192 (an honors project).

GRADUATE PROGRAMS

Graduate study in American Civilization is intended to encourage the interdisciplinary study of American history, literature, society and culture. While the program does not attempt a formal synthesis of traditional scholarly fields, it does attempt to foster such insights as may be available only to a person who is at home in more than one body of knowledge and who is thus prepared to examine a civilization from an interdisciplinary point of view. According to their aptitudes and interests, students may pursue graduate work in history, literature, anthropology, folklore, political science, philosophy, religion, art and architecture, and any other discipline that may contribute to an understanding of the United States.

MASTER OF ARTS: The program of a candidate for the degree of Master of Arts will be planned individually to fit the background, interests, and intentions of the candidate. Eight units of coursework are required, including at least four graduate seminars, one of which must be American Civilization 201. Under the direction of the Chairman of the American Civilization Program, the Executive Secretary is the advisor of all graduate students and must approve their programs.

DOCTOR OF PHILOSOPHY: Through a flexible program of graduate seminars, coursework, and independent reading, planned in consultation with the graduate advisor, students working towards the degree of Doctor of Philosophy prepare themselves for a preliminary oral examination in four fields of study. These four fields may be conceived either traditionally (e.g., American Colonial History, Historical Archaeology, Religion in America, The Novel in 20th Century America) or topically (The Family in American History, The Image of Women in the Domestic Novel, The Sociology of Modern Corporations, Religion and the Counter-Culture). These fields are defined by the student in consultation with the faculty members who will conduct the oral examination. It is expected, however, that the four fields will be related to one another in a manner that will reflect, not only depth, but also breadth and coherence. No more than two of the four fields may be in the same discipline, and the candidate's fields must be approved by the Executive Committee. At least two full years of course work (sixteen courses) are necessary for preparation for the preliminary examination.

All graduate students are required to enroll in American Civilization 201 during their first semester at Brown. This seminar is designed to examine an American period or topic from several points of view and to introduce students to scholarly research and writing.

Doctoral dissertations must be significant contributions to scholarly knowledge of an interdisciplinary nature. The dissertation topic must be approved by the Executive Committee.

I. PRIMARILY FOR UNDERGRADUATES

51, 52. *Introduction to Folklore*

Mr. ROSENBERG.

Introduction to the theory, methodology, and genres of American folklore. Collection of data, methods, and systems of classification and analysis, and familiarization with genres will be emphasized. The goal will be to develop techniques for the study of civilization from the perspective of small, homogeneous "folk" groups.

75. *Introduction to American Civilization: Ideas and Methods*

The STAFF.

An extensive survey of American Civilization as it is viewed by a number of different disciplines in the humanities and social sciences. Required of all concentrators.

II. FOR UNDERGRADUATES AND GRADUATES

152, 153. *Technology and Material Culture in America*

Mr. MALONE.

Selected topics from the 17th Century to the present will be covered in readings, slide lectures, and field trips. Crafts, architecture, transportation, city plans, and other subjects within the field of material culture.

161A. *Theories and Methods of Folklore*

Mr. ROSENBERG.

Examines the theoretical bases of folktale scholarship and methods by which those theories are implemented.

161B. *The Immigrant Experience*

Mr. MECKEL.

Focuses on the self-described experiences of those immigrants to America whose descendants constitute much of that large and heterogeneous group known today as white ethnics.

161D. *Death and Dying in America*

Mr. MECKEL.

Focus on American death-related behavior from social economic, psychological and cultural perspectives.

161E. *East Asian Relations*

Mr. LEE.

Deals with the relationships between America and the societies which lie in an arc from Korea to Vietnam along the western shore of the Pacific.

161F. *Asian Immigration to the United States*

Mr. LEE.

This course will examine the impact of Asian immigration on various fundamental aspects of American society.

163, 164. *History of American Women* (History 163, 164)

Ms. BUHLE.

Survey of women's history in the United States from colonial era to the present. Examination of the prevailing cultural prescriptions of Womanhood as related to the social context of daily life. Semester I: pre-industrial society, industrialism and woman's culture, the Woman's Rights movement, and social diversity of the Gilded Age. Methods of interpretation will be the primary concern. Semester II: New Woman and progressivism, the transformation of feminism in 1920s, individualism and mass society, and the emergence of the Women's Liberation movement in the 1960's. Interdisciplinary methods and research will be emphasized.

180. *Honors Seminar*

The STAFF.

Interdisciplinary interpretations of American experience. Selected topics. Required for Honor candidates.

190. *Undergraduate Seminars in American Civilization*

(Note: More than one American Civilization 190 may be taken for credit.) Small interdisciplinary seminars for undergraduate concentrators on varying topics. Topics for 1983-84 included: The New England Town: From Plymouth to Peyton Place; American Women Playwrights of the 20th Century; American Society and Culture in the 1920s; Faulkner and the Literature of Unofficial History; the Harlem Renaissance; the Image of the Indian in American Art and Literature and The Halcyon Fifties.

192. *Independent Reading and Research*

Required of Honors candidates in the senior year. May be repeated for credit.

III. PRIMARILY FOR GRADUATES

201. *Introduction to Interdisciplinary Methods*

The STAFF.

Required for first year graduate students in American Civilization.

250. *Problems in American Civilization*

Mr. MALONE.

Topic: Industrialism in America: A Problem in Museum Interpretation. Open to all graduate students and to advanced undergraduates with written permission. The historical theories of industrial development and discussion of museum interpretation of this important subject. Involvement in the operation of a nearby industrial museum. The Slater Mill Historic Site.

263. *Seminar in American Labor History* (History 263)

Ms. BUHLE.

290. *American Civilization Practicum*

Designed to provide graduate students with significant and rigorous fieldwork experience in agencies involved in the study and recording of American culture. Students are assigned to an agency and required to acquire general background in that field and undertake a project working closely with agency supervisors and a faculty coordinator. Possible fields include museums, historical preservation, and archives and libraries.

291, 292. *Independent Reading and Research*

Ancient Studies

The Program in Ancient Studies is administered by a director (Professor BOEGEHOLD, (Classics)) and an executive committee composed of Professors RAAFLAUB and WYATT (Classics) and Professor LESKO (Egyptology). Participants in the program include many faculty members from the Departments of Art, Classics, Egyptology, History of Mathematics, Philosophy and Religious Studies. The aim of the program is to promote understanding and study of the ancient world as a whole.

UNDERGRADUATE PROGRAM

The concentration in Ancient Studies is designed to encourage broad interests in the ancient world, including Mesopotamia, Egypt, ancient Israel and India as well as Greek and Roman civilization. There are presently three standard concentration patterns, but concentrators may also, with the approval of the executive committee, propose individual programs within the general framework of ancient civilization.

Requirements:

1. Ancient Studies 1 and 2. The Ancient World. For a detailed description see Foundations Courses F13 and F14.
2. (Ancient History pattern). 4 courses from: Classics 121, 122, 131, 132, Egyptology 143, 144. (Ancient Religion pattern). 4 courses from: Religious Studies 15, 16, 51, 63, 71, 72, 81, 82, 161, 164.
3. 4 other related courses. Recommended electives are: Art 42, 43, 143; Classics 54, 55, 57, 58, 113, 114, 116, 118, 121, 122, 129, 131, 132, 136, 151, 157; History of Mathematics 143, 144, 152, 153; Religious Studies 15, 16, 51, 63, 71, 72, 81, 82, 117, 161, 164, 171, 188, 190, 194, 195, 196; Judaic Studies 111, 112; Egyptology 131, 132, 143, 144, 143A, 143B; Philosophy 125, 180; Engineering 94F.

Honors:

1. Ancient Studies 191, 192. Honors Thesis.
2. (a) Ancient History and Ancient Religion patterns; requirements as above, except that only 3 related courses are required. In addition, the candidate for honors must have passed one intermediate-level course in an ancient language (Egyptian, Hebrew, Aramaic, Sanskrit, Greek or Latin).
(b) Languages and Literatures of Greece and the Ancient East (available only as an honors concentration). Requirements: Ancient Studies 1, 2; 2 100-level courses requiring one of the

languages Egyptian, Hebrew, Aramaic or Sanskrit, plus 2 courses in the literature or culture associated with that language; 2 100-level courses requiring knowledge of Greek, plus 2 courses in classical literature or culture. Interested students should discuss the program with Professor Boegehold.

Anthropology

Professors ANDERSON,¹ (Chairman), GOULD (Acting Chairman 1985-86), HEATH, JAY, LEIS; Associate Professors BEEMAN, FRUZZETTI,² HICKS, LAMPHERE,¹ HOLLOS;¹ Associate Professors (Research) NEWMAN, SCHMIDT;¹ Assistant Professors RUBERTONE; Visiting Associate Professor BEAN.

The program of graduate instruction in the Department of Anthropology prepares students for a professional career in social and cultural anthropology, archaeology and linguistics. Faculty research experience covers many areas of the world: North and South America; the Circumpolar Region; Europe; Middle East; Asia; Africa; and Australia.

As part of its regular curriculum, the department has an orientation toward the study of cultural change in general and the following problem areas in particular:

Interethnic relations. Emphasis is given to the comparative study of institutions and cultural change in societies of various types, ranging from non-literate communities to complex societies. The program prepares students for research and teaching on problems of cultural dynamics in pluralistic settings. There are opportunities for preliminary summer field research in Rhode Island, with its multiethnic population, before undertaking dissertation projects in other parts of the world.

Archaeology. The curriculum integrates the archaeological discipline with methods and theory of social/cultural anthropology. There is special emphasis on the application of ecological, ethnohistoric and ethnographic data to archaeological problems, and the establishment of cultural sequences in selected world areas. Students are encouraged to utilize interdisciplinary approaches to generate archaeological research problems. The Laboratory for Circumpolar Studies, Foundation for African Studies, the John Carter Brown Library, and excellent collections of the Haffenreffer Museum of Anthropology offer a wide range of research possibilities.

Cognition and Communication. Emphasis is on the study of the role of cognition and communication, and the structure and use of symbolic systems. A joint program with the linguistics department offers the opportunity for additional training in formal linguistics.

Museum Studies. A two year graduate program in museum studies, a joint program with American Civilization, began in 1978. The program emphasizes either of the two disciplines and has more required courses than other graduate programs, as well as mandatory summer internship at various museums.

Population Studies. In cooperation with the University's Population Studies and Training Center, the department is able to offer a degree in anthropology with a major focus on population. The Center is a multidisciplinary unit involving sociology, history, the Bio-Medical Programs, and other departments, as well as anthropology. In addition to courses on demography and population, research facilities associated with the Center include Data Banks, a Demography Library, Population Research laboratory, and Social Science Data Center, which contains personal computers and terminals for the University's central computing system.

EuroAmerican Ethnology. Several faculty and graduate students have conducted fieldwork in various European countries and EuroAmerican groups in the United States and Canada. The department welcomes students with research interests in modern European and EuroAmerican problems. The department's resources are enlarged by its links to the excellent facilities and faculty of the departments of English, History, and Sociology and the graduate program in American Civilization.

¹ On leave of absence, 1985-86.

² On leave of absence, fall semester 1985.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE.

A minimum of eight courses is required for the standard concentration. Candidates for honors must take no less than ten courses, including a thesis as part of an independent study project (Anthropology 193 and/or 194). The Senior Conference (Anthropology 198) is also included in the honors requirement; it is highly recommended for all concentrators. When relevant, a course from another department or program can be substituted for one of the eight (or ten) required number of courses.

A concentrator develops an individually focused program or "track" of study composed of a series of courses, through consultation with his or her faculty advisor and approval of the Undergraduate Coordinator. A track should meet two objectives: 1) it should provide a sustained and integrated study of a topic or theme; and 2) it should have sufficient breadth to touch on the various contributions anthropology brings to the study of the human condition. When relevant, a course from another department or program can be substituted for one of the eight (or ten) required courses.

The department offers courses in each of three major fields of anthropology: social-cultural anthropology, archaeology, and linguistic anthropology. To grasp the diversity of anthropology a concentrator should take course in at least 2 of these 3 fields. These divisions are broadly reflected in the numbering of courses, as follows:

Social-cultural anthropology: 10 to 40's, 100 to 140's, 200 to 240's. Archaeology: 50 to 70's, 150 to 170's, 250 to 270's. Linguistic anthropology: 80's, 180's, 280's.

The course numbers reflect the levels of experience expected of students. Courses numbered below 100 are for students without an anthropological background: 100-level courses presuppose at least one previous course in the department (or permission of the instructor). 200-level courses are primarily for graduate students, but advanced undergraduates are encouraged to enter with permission of the instructor.

A project of independent study (Anthropology 193 or 194) may be accepted for concentration. Projects should be planned in consultation with a faculty member and might include assisting in archaeological or social anthropological research, designing and setting up exhibits at Haffenreffer Museum, or research on a topic of the student's interest.

Concentrators are encouraged to supplement their programs with the study of a foreign language and with courses in closely-related fields such as Biology, Egyptology, Geology, History, Linguistics, Psychology, Semiotics, and Sociology.

GRADUATE PROGRAMS

MASTER OF ARTS. The successful completion of eight approved semester courses, demonstration of research skills as evidenced by a research paper are required for the degree, and successful completion of a comprehensive examination.

Students are encouraged to study foreign languages and to acquire other skills, such as computer applications, related to their fields of research interest.

DOCTOR OF PHILOSOPHY. Students can generally expect to complete all requirements for the doctorate, except field work and the dissertation, within three years. Besides fulfilling the general requirements set by the Graduate School, to be admitted to Ph.D. candidacy a student is required to:

1. Fulfill the requirements for the M.A. degree.
2. Pass the Preliminary Examination. The examination is given orally, or in written form, or both, at the option of the faculty committee in consultation with the student. It should be taken by a student's fourth semester in residence (but not later than May 15 of that semester). Extension to the fifth semester may be requested. The objectives of the Preliminary Examination are to provide the faculty with an opportunity to evaluate a student's mastery of anthropological literature and to provide the advanced graduate student with an opportunity to explain in detail the ways in which his or her interests relate to the discipline as a whole. A student should demonstrate a thorough knowledge of method and theory either in social and cultural anthropology or in archaeology, and more specifically:
 - a) method and theory related to selected problems of anthropological concern (such as

- "religion," "political organization," "peasantry," "urbanization," "neolithic," "cultural ecology," etc.) using data drawn from various parts of the world, and
- b) the ethnography or archaeology of at least one major world area, and the theoretical problems pertinent to that area.

Each student should request written approval from his or her Prelim Committee for the choice of theoretical aspects and world areas no later than two months before the examination.

3. Students, including foreign students, must demonstrate a knowledge of at least one major non-English language of anthropological discourse; that is, one in which there is an established body of anthropological discourse. Language facility will be demonstrated either by a score of 500 or better on a Foreign language Examination, or by a manner determined by the students' Preliminary Examination Committee. Foreign students must also demonstrate a knowledge of English.
4. Propose a research topic for a Ph.D. dissertation. A research proposal must be accepted by his or her faculty committee, composed of the dissertation advisor and two other faculty members, before a student applies to research foundations for support. Deadlines for applications to foundations usually occur at least nine months before the research project is to begin. Upon having the proposal accepted by his or her committee the student should distribute copies of the proposal to all faculty members and other graduate students.

Upon being admitted to candidacy a student completes the requirements for the Ph.D. degree by engaging in field work, writing a Ph.D. dissertation, and defending it.

1. Field Work: research for the dissertation may be carried out in any part of the world. The amount of time to be spent in the field depends on the problem, but a least a year and usually no more than two should be sufficient. A dissertation utilizing library materials alone may be substituted only in exceptional cases.
2. Ph.D. Dissertation and Examination: The specific procedures for preparing the Ph.D. dissertation are found in "Instructions for the Preparation and Presentation of Theses for Advanced Degrees," issued by the Graduate School. In order to receive the Ph.D. degree at Commencement in June, a candidate must submit the completed manuscript to his or her committee at least one month prior to the deadline set by the Graduate School for receipt of dissertations.

I. PRIMARILY FOR UNDERGRADUATES

10. *Cultural Meaning and Social Order: An Introduction to Cultural Anthropology*

Mr. HICKS.

A general inquiry into the question "What is Man?", emphasizing both the unity and the diversity in human culture. Emphasis on learning about ourselves by studying the varieties of social, economic and political systems, communicative processes, arts, and religions found among the world's people.

11. *Peace and War*

Mr. LEIS.

After reviewing the nature-nurture question of whether peaceful cooperative behavior is basic to human nature, the course will explore the connections between assumptions about humanness and social-cultural theories of social stability, power, rationality, conflict, and revolution.

12. *Magic, Science, and Religion*

Mr. JAY.

What is 'religion'? is the central topic, and the question is put to the students' experience, to the experiences of articulate and reflective "natives", and to the thought and work of major anthropological figures. The aim is not to gain a definitive answer, or answers, but to use the question to push out the limits of students' understanding on that mysterious topic.

13. *Cultural Ecology and Change*

Mr. HEATH.

Analysis of change (and continuity) in patterns of human belief and behavior, with special emphasis on relations to the environment. Theoretical and practical implications for the individual, society, and culture are considered. Illustrative case-studies include aspects of contemporary urban-industrial life as well as tribal and peasant cultures around the world.

14. *Women, Work, and Family* (Anthropology 38)

Ms. LAMPHERE.

An introduction to broad issues concerning the relationship between work and family life with an emphasis on women's roles. Using data from anthropology, history and sociology, the first part will focus on 19th and 20th century U.S. experiences of women in selected ethnic groups (European immigrant women, Blacks, Hispanics, and Native Americans) as well as with the relationship between women, work, and family in Latin American countries.

15. *Evolution of Human Behavior*

Mr. GOULD.

This course will introduce freshman to the operation of biological and cultural processes in human evolution in relation to the paleo-ontological and archaeological record from the Plio-Pleistocene period to the complex hunter-gatherers of recent times. Identification will be made and measured of the relative importance of learned as contrasted with genetically inherited behavior and to explore to what extent concepts of adaptation and evolution derived from neo-Darwinian biology can be usefully applied to explanations of human behavior in complex situations.

18. *Utopia: Visions and Constructions*

Mr. HICKS.

Focusing on some well-documented attempts to create new societies and cultures, with examples from Japan, Israel, Europe; some developing nations, and the U.S. Of particular interest are the ideas about human nature espoused by leaders of such groups and communities, and how these ideas are related to everyday behavior.

20. *Culture and Human Behavior*

Ms. HOLLOS.

Principal objective is to examine stages of the human life cycle in a cross-cultural context. Problems and results in the field of psychological anthropology will be presented within this framework, including the relation between culture and personality, cross-cultural differences in perception, cognition, intellectual and personality development and the contemporary study of mental disorders.

22. *Transitions in Human Life*

Ms. HOLLOS.

This course will examine the human life cycle in a cross-cultural perspective, focusing on the life crises or transition points between different periods. Life crises may be taken to mean those periods in the life span in which there is some interruption in continuity — a transition from one culturally defined stage of life to another, and at which there is regularly expected individual stress. The course will concentrate on six critical transitions — birth, infancy to childhood, puberty, marriage, menopause and death. While the focus of interest is in the transition, it will be dealt with in the context of the periods of human life to which they mark entrances and exits.

50. *Interpreting Our Past: Introduction to Archaeology and Prehistory*

Mr. GOULD.

The physical origins of man and the development of human culture as revealed by archaeology. Focus on the significance and history of discovery of man's fossil ancestors, on the description and comparison of prehistoric lifeways, and on patterns of cultural development in response to changing habitat and technology. Basic principles and methods of archaeological research.

80. *Sound and Symbols: Introduction to Linguistic Anthropology*

Mr. BEEMAN.

An introduction to the study of human communication emphasizing particularly the relationship between language and culture. Topics will include: "animal language"; the question of chimpanzee communicative competence; the effects of vocabulary and grammatical structure on human "world view"; language differences within society; and creative use of communication in literature, advertising, interpersonal interaction, and mass media.

II. FOR UNDERGRADUATES AND GRADUATES

100. *Communities*

Ms. NEWMAN.

The course will survey a variety of types of communities ranging from small scale societies to ethnic groups within complex societies and will attempt to draw generalizations towards the definition of the concept of "community."

101. *Pluralism and Ethnicity*

The STAFF.

Relations among groups in the urban context of modern, complex societies are examined, using selected ethnographic materials. Some specific topics are: cultural and structural pluralism; assimilation, stratification, and boundary-maintenance of ethnic groups.

102. *Phenomenological Approaches to Anthropology*

Mr. JAY.

To reveal and subject to critical examination the situatedness of anthropological description, as exhibited in that of the writer (the fieldworker) and that of its readers (course members). A small number of outstanding descriptive works that reveal specific phenomenological approaches are supplemented with carefully selected material.

105. *Development and Change in Small Scale Societies*

Mr. ANDERSON.

A study of the problems of adaptation of hunting, fishing and gathering, and small-scale horticultural peoples throughout the world to changing natural, socioeconomic, and political environments. Particular attention will be given to the problems of indigenous ethnic minorities as perceived by themselves and by their national governments.

110. *Circumpolar Ethnography*

Mr. ANDERSON.

A study of the traditional and modern Eskimo and other Arctic and sub-Arctic cultures focusing on the response of small-scale societies in the north to a changing ecology.

111. *Black Africa in Anthropological Perspective*

Mr. LEIS.

An interpretive description of "traditional" cultures found in Sub-Saharan Africa; a review of theories offered to explain similarities and differences among them; and analyses of selected problems related to the development of colonial and post-independence societies.

112. *Peoples of Latin America*

Mr. HEATH.

Exploration of both the unity and diversity found among contemporary societies and cultures throughout mainland Latin America. Emphasis is on the interrelations of values and behavior patterns with economic and political institutions; selected case studies include urban-industrial populations as well as tribal and peasant communities.

113. *European Ethnography*

Ms. HOLLOS.

Principal objective is to familiarize students with the societies and cultures of Europe from an anthropological perspective. Historical material will be provided for the understanding of current cultural, linguistic, religious, and ethnic variation. Major emphasis on the analysis of a range of contemporary communities, from peasant to urban, from East to West, and from North to South.

114. *Native American Cultures*

Ms. LAMPHERE.

An introduction to the cultures and contemporary status of Native Americans. Lectures, readings, and discussion will draw on selected case studies of Native American cultures. The history of American Indian contact with Europeans and issues relevant to present day reservation life will also be examined.

115. *The Middle East in Anthropological Perspective*

Mr. BEEMAN.

Emphasis on the need to develop an understanding of the cultural bases of life in the Middle East, including Iran and Afghanistan. The role of Islam, ecological adaptation, problems of development, and sources of social conflict as a basis for comprehending contemporary issues in the region.

116. *Anthropological Perspective on Contemporary America*

Mr. HICKS.

Selected aspects of American life are critically examined from the comparative perspective of anthropology. Emphasis is on analysis of American institutions, values, and the logic of public policy.

118. *Japanese Culture and Society* (Special Themes and Topics 106)

Mr. BEEMAN.

An interdisciplinary overview of Japanese society drawing on insights from anthropology, sociology, literature, history, political science and economics; but focusing on continuity and change in Japanese cultural tradition.

130. *Themes in Anthropology*

The STAFF.

Writings of past and contemporary anthropologists focusing on selected problems will be discussed on a seminar basis.

132. *Social Organization and Thought*

Ms. FRUZZETTI.

The nature and organization of social relationships within a society. How elements of social structure can be understood in themselves and as a part of the whole.

133. *Politics, Community and the State*

The STAFF.

A comparative study of the phenomenon of power and authority in human societies.

134. *Comparative Sex Roles*

Ms. FRUZZETTI.

The analysis of female cultural roles and structural positions in society. The study of women and ideology will entail a cross-cultural comparative approach as well as a consideration of male sex roles.

135. *The Anthropology of Economic Life*

The STAFF.

A review of anthropological perspectives on economic activities in diverse cultural settings with an emphasis on critically analyzing the problems of economic development.

136. *Anthropological Perspectives on Education*

Ms. HOLLOS.

The course will focus on the cultural transmission of human knowledge in formal and informal contexts. It is an exploration of an area which is rapidly coming into its own: the interface between the disciplines of anthropology and education.

137. *Impact of Colonialism*

Ms. FRUZZETTI.

The relationship between the historical past and problems of the present. Questions of cultural change vis-a-vis political and economic development.

138. *Women in Socialist and Developing Countries*

Ms. FRUZZETTI & Ms. RUESCHMEYER.

This seminar, jointly sponsored by a sociologist and an anthropologist explores the changing role of women in the socialist countries of Eastern Europe and developing countries in Africa and Asia. It will cover women's position, ideologies and choices within these societies. Such exploration of the role of women in other societies will indirectly contribute to a better understanding of their role in ours.

151. *Hunter-Gatherer Adaptations*

Mr. GOULD.

Addresses the question: to what extent can the concept of the ecosystem, as developed in evolutionary biology, explain variability in human behavior? It will examine the literature on contemporary hunting and gathering societies, both human and non-human, as well as relevant findings in archaeology and human biology. Background in general biology, ecology, and anthropology will be needed.

153. *American Material Culture*

Ms. RUBERTONE.

Surveys the many items of Native and European material culture. Processes of manufacture, distribution, and especially function, are addressed. The primary goal is to understand the relationships between human behavior and the world of objects.

154. *Archaeology of the Northeast*

The STAFF.

The glaciated northeast (New England, New York, and Pennsylvania) is an area that has had a fundamentally different natural and cultural history than the rest of the U.S. This course will provide an intensive introduction to what is known of the region's human ecology over the past 12,000 years in terms of previous and future archaeological research.

155. *Arctic Archaeology*

Mr. ANDERSON.

The cultural development of American Arctic peoples from their earliest known North Asian beginnings to historic times (the traditional Eskimo and northern Indian cultural period). The development of the study of Arctic archaeology by American, Canadian, Danish, and Soviet scholars. Archaeological interpretations will focus on the evolution of adaptive strategies and the development of techniques to cope with life in the north.

156. *Archaeology of Urban Societies.*

Ms. RUBERTONE.

The course examines the important contributions that archaeologists have made to the study of urban societies by making us aware of the range and diversity of ancient cities. This evidence and theories to account for urban origins are explored. Equal attention is given to issues of how cities operate and how they organize social and natural resources across city and hinterland. Case studies are drawn from ancient Mesopotamia, Mesoamerica, Islamic North Africa and North America.

157. *American Indian Archaeology*

Mr. ANDERSON.

The course traces the development of North American Indian Cultures through the comparative study of prehistoric archaeological remains. The course will emphasize analyses of subsistence

modes and settlement patterns within an ecological framework.

160. *Archaeological Field Methods* (Classics 6)

Ms. RUBERTONE.

The premise is that to learn archaeology one has to "do" archaeology and that "doing" archaeology is more than just "digging". Students will be familiarized with basic aims of archaeological field research and will learn field techniques and laboratory procedures. The class will be involved in the design of an archaeological field project and actually carry out the various field and laboratory operations.

180. *Sociolinguistics*

Ms. BEAN.

Focus on the anthropological study of meaning conceived of as the study of linguistic behavior in its social and cultural context. Topics will include: social class and language behavior, language and ethnic processes, the ethnography of communication, the study of inter-action as a phenomenological process, and speech act theory and its relation to linguistic anthropology.

193, 194. *Individual Research Project*

The STAFF.

Intensive supervised reading, ordinarily involving a research paper. A specific program will be arranged in terms of the student's individual needs and interests. One or two semesters of research, depending on the project, is required of all students who are candidates for Honors in Anthropology.

194A. *Cross-Cultural Approaches to Study of Gender*

Ms. LAMPHERE.

Focus on theoretical issues that have emerged in the anthropological study of gender since the publication of Professor Lamphere's book, *Women, Culture and Society*. The course will examine new approaches to sexual asymmetry, women's productive and reproductive roles, and the cultural construction of gender. Examples will be drawn from the new scholarship of women in the U.S., Europe, Latin America, Africa and the Middle East.

198. *Senior Conference*

Mr. HICKS.

Field methods and their applications in social-cultural anthropology.

III PRIMARILY FOR GRADUATES

200. *Applied Anthropology*

The STAFF.

A critical evaluation of real and potential applications of anthropological theory, data, and methods to the solution of immediate problems. Special emphasis on practical and ethical considerations related to the impact of Western "development" on peasant and tribal cultures around the world, and on various roles of anthropologists, non-academic as well as academic.

201. *Anthropology of Urban Societies*

Ms. LAMPHERE.

An introduction to topics related to the structure of social relationships in modern cities. The seminar will examine the concepts of role, network, social class and ethnicity as utilized in research on American and British urban contexts. These urban settings will then be compared with those in developing countries including Africa and Latin America.

202. *Political Organization*

Ms. LAMPHERE.

A focus on politics and the use of power in local communities and in complex, state societies. An exploration of important theoretical approaches to the study of politics and an examination of the interface between local and national level politics for a variety of foraging, tribal and "peasant" peoples.

203. *Medical Anthropology*

Ms. NEWMAN.

A seminar stressing theoretical perspectives in medical anthropology and including field observation and research methods. Course content includes ethnopsychiatry, ethnomedicine, population anthropology, varieties of the therapeutic encounter, and alternative health resources in the United States.

210. *Cultural Issues in Latin America*

Mr. HEATH.

The purpose is to examine in detail selected aspects of contemporary cultures and societies in Middle and South America. A research-oriented workshop, in which each member actively pursues a topic of his/her choice in depth, with periodic discussions serving to address methods, problems, and findings and simultaneously to set each topic in a broader historical and ethnographic perspective. Languages and prior grounding in Latin American ethnology will be helpful but are not prerequisite.

211. *Circumpolar Ethnography* Mr. ANDERSON.
An appraisal of the languages, physical traits, and cultures of the ancient and more recent peoples of the Arctic and Sub-Arctic regions.
220. *Principles of Cultural Anthropology* Mr. LEIS.
A seminar on the science and art of understanding and explaining in social-cultural anthropology.
221. *History of Ethnological Theory* Mr. JAY.
The historical developments of social and cultural theory during the 19th and early 20th century. These will be approached in relation to the major social and intellectual currents of the period. Writings of European thinkers (Marx, Weber, Durkheim, Engels and Maine) will be dealt with as well as American anthropologists (Morgan, Boas, and others).
222. *Methods of Anthropological Research* Ms. HOLLOS.
A seminar on the methodological problems associated with field research in social and cultural anthropology. Designed to help students prepare for both summer and dissertation field work.
223. *Analysis of Social Structure* Ms. FRUZZETTI.
The seminar will involve a review of the major theoretical and methodological issues in the classic British analysis of social structures. Next, detailed studies of empirical cases will be attempted. Afterwards, further attention to variables outside the classic analysis — e.g., class and networks — will lead to the study of complex societies.
224. *Current Theoretical Issues in Cultural Anthropology* Mr. LEIS.
Intensive study of evolutionary theory and its history, current state and prospects.
225. *Problems of Psychological Anthropology* Ms. HOLLOS.
An advanced treatment of psychological anthropology. The subject matter will vary from one semester to another. The seminar members will review carefully and critically the various anthropological approaches to the problem.
226. *Ethnicity and Minority Relations* Mr. HICKS.
An effort to unravel some skeins, and perhaps tie some new ones, in the anthropological study of ethnicity. Some concepts to be examined are: group, category, pluralism, social and cultural; assimilation, acculturation, adaptation, and accommodation; rituals and symbols of ethnicity.
227. *Law and Conflict* The STAFF.
Introduction to the range of variation and the methods, problems, and theories relevant to the anthropological study of law in various contexts.
251. *Environmental Archaeology* Mr. ANDERSON.
This course examines the relationship of habitat and culture from an archaeological (spatial and temporal) perspective. It critiques paleobotanic faunal, geoarcheological and human ecosystemic studies as sources of information for understanding human interactions with the environment.
252. *Ethnoarchaeology* Mr. GOULD.
This seminar explores the relationship between observations of present day human behavior and evidence of the prehistoric past. On what basis can archaeologists make reliable inferences about past behavior by looking at the present? Will involve a local field exercise as well as more conventional reading and discussion format.
253. *Ethnohistory* The STAFF.
A research seminar on anthropological interpretation of historical sources. Methods for collecting, evaluation, and analyzing historical evidence as it relates to problems in ethnography and archaeology. Original research is emphasized.
256. *Quaternary and Human Paleoecology* Messrs. ANDERSON, GOULD and WEBB.
An advanced seminar on the method and theory of studying human interactions with the physical environment. Offered jointly with Geological Sciences.
261. *Circumpolar Archaeology* Mr. ANDERSON.
A specialized course dealing with advanced problems in Arctic archaeology. Although primarily oriented toward the northern specialist, the seminar is designed to present by example methodological and analytic problems that are applicable to most archaeological areas and hunting, fishing, and gathering societies.

270. *Principles of Archaeology*

Mr. GOULD.

Discussion of current theory and method in physical anthropology and archaeology and the relationship between archaeology and anthropological sub-disciplines. An emphasis on archaeology as a technique for the study of cultural process and the development of integrative procedures, such as the use of ethnographic data.

271. *Historic Archaeology*

Ms. RUBERTONE.

Integration of theoretical and methodological approaches to the archaeology of historical sites. The first part of the course will focus on development of research designs—the second with substantive examples of current research in historical archaeology.

280. *Linguistic Theory and Practice* (Semiotics 163L)

Mr. BEEMAN.

Designed to provide graduate students in social science who have limited previous experience in technical or theoretical linguistics with an introduction to theory and practice in the field.

281. *Problems in Linguistic Anthropology*

Ms. BEAN.

This seminar is designed to deal with theoretical problems of interest to both linguists and anthropologists. The topic for the seminar will change yearly.

293, 294. *Reading and Research*

The STAFF.

Work with individual students in connection with special reading, problems of research, or preparation of theses.

295, 296. *Teaching Practicum*

The STAFF.

Applied Mathematics

Professors BANKS, BRACKBILL, C. DAFERMOS, S. DAFERMOS, DALENIUS (Visiting), DAVIS, FALB, FLEMING, FREIBERGER, GEMAN, GIDAS (Visiting), GOTTLIEB, GREANDER (L. HERBERT BALLOU University Professor), HALE, HIKATA (Research), HSIEH, KOLSKY, KUSHNER, MALLET-PARET, MCCLURE (Chairman), PIPKIN, SIROVICH, STRAUSS, and SU; Associate Professor BISSHOPP; Assistant Professors MAJDA, MAXEY, SOUGANIDIS;

The Division of Applied Mathematics offers standard concentration programs leading to the degree of Bachelor of Science, the degree of Bachelor of Arts, the Master of Science degree, and the Doctor of Philosophy in applied mathematics. The differences between the undergraduate degree programs lie primarily in the distribution of required courses in mathematics and its applications. Both concentrations have considerable flexibility and allow students to pursue courses of study to suit individual needs and interests. Programs are designed by the student and a faculty advisor to provide both strong terminal degrees and preparation for more advanced study in applied mathematics, mathematics, engineering, or any of the sciences. The broad interdisciplinary character of the Division and the strong science departments in the University make possible a diversity of programs which may emphasize applications to the physical sciences, computer sciences, engineering, economics, biomedical sciences, etc. The current standard programs of this nature are Applied Math.-Biology, Applied Math.-Economics, Applied Math.-Psychology, and Applied Math.-Computer Science.

Since the summer of 1941, Brown University has continuously supported instruction and research in applied mathematics to meet the needs of universities, industry, and government for engineers, physicists, and mathematicians whose training extends beyond the accepted boundaries of their respective fields. The instructional program includes courses in mathematical fundamentals, as well as introductory and advanced courses in particular fields of applied mathematics. Emphasis in the program is placed on the development of the ability to formulate and analyze mathematical problems which arise in science and technology. Training in research is stressed, and instruction is integrated with a research program covering both theoretical and some experimental aspects of various fields.

The Division emphasizes the importance of modern computing methods in the study of applied mathematics. Computing facilities are extensive and growing. In addition to the mainframe IBM

3081 maintained by the Computer Center, the Division maintains or shares in the maintenance of numerous workstations and personal computers, a VAX 11/780 and other minicomputers, and a high speed array processor hosted by the IBM 3081. There are sufficient numbers of terminals, hard-copy devices (such as a laser printer), graphics devices, etc. to accommodate the variety of student and faculty needs that arise in the Division. For computation-intensive experiments, increasing use is being made of a variety of remote supercomputer facilities.

Scientific computing as a method of research is inherently multidisciplinary. It is entering a period of phenomenal growth in response to the demonstrated successes of computational methods in advancing the understanding of fundamental scientific problems, the existence and increased availability of supercomputers to university researchers, and the current initiatives of federal agencies to stimulate research and education in large-scale scientific computing. In response to this growth, the Division has participated in establishing the Center for Scientific Computation. The purpose of the center is to coordinate the variety of computing activities spread across the Divisions of Engineering and Applied Mathematics, and the Departments of Physics, Geological Sciences, Chemistry, Psychology, and Computer Science. Activities of the center include; sponsoring research seminars, hosting medium- and long-term visits of researchers in large-scale scientific computing, coordinating departmental course offerings, providing resources for instructional programming, software and hardware support, and coordinating proposals for the outside funding of joint research projects.

In September, 1964 the Center for Dynamical Systems was formed within the Division. It is a Center for research on differential equations and the theory of dynamical systems in general with strong programs in the modern theories of stability and control. This Center has a world-wide reputation and is one of the largest in the western world working on these problems. A few postdoctoral appointments are available for advanced study in this Center.

There is a growing interest within the Division in the application of mathematics to the nonphysical sciences, particularly to problems arising in biology, medicine, linguistics, psychology, and economics. The Division is represented in the Center for Biophysical and Biomedical Engineering, the Center for Neural Sciences, and the Cognitive Sciences Center, which promote cooperation among faculty from several departments.

Since applied mathematics involves many disciplines, students of varied backgrounds find their way into the graduate program. A strong background in and predilection for mathematics is essential, but an undergraduate may have majored in engineering, physics, biology, economics, psychology or other sciences.

The Division is not formally structured into isolated research groups and in fact stresses applied mathematics as a discipline in its own right. One can, however, distinguish the following research interests and activities of present staff members: (1) applied probability and mathematical statistics, (2) computer science and numerical analysis, (3) control and stability of dynamical systems, (4) stochastic control theory, (5) ordinary, functional, and partial differential equations, (6) fluid mechanics, (7) solid mechanics, (8) mathematical problems in biology, and (9) operations research and optimization.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

Prerequisite: Mathematics 9, 10 or their equivalent.

Program: Ten additional semester courses approved by the Division of Applied Mathematics, including Mathematics 18, 52, Applied Mathematics 35, 36 and 4 or Computer Science 4 or 11. AM 33, 34 will sometimes be accepted as substitutes for AM 35, 36. Of the unspecified courses four should be chosen from the 100-level courses taught by the Division of Applied Mathematics. Substitution of alternate courses for the specific requirements is subject to approval of the Division. Concentrators are urged to consider Mathematics 54 as an alternative to Mathematics 52 and to complete their introductory programming course before the end of their sophomore year.

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF SCIENCE DEGREE

A. Eighteen approved semester courses in Mathematics, Applied Mathematics, Engineering, the Natural or Social Sciences, including Mathematics 9, 10, 18, 52; Applied Mathematics 35, 36, and 193 or 194, and 4 or Computer Science 4 or 11. AM 33, 34 will sometimes be accepted as substi-

tutes for AM 35, 36. Of the unspecified courses six should be chosen from the 100-level or higher level courses. Students are urged to take Applied Mathematics 133, 134. Substitution of alternate courses for the specific requirements is subject to approval by the Division. Concentrators are urged to consider Mathematics 54 as an alternative to Mathematics 52 and to complete their introductory programming course before the end of their sophomore year.

B. Students who have not established proficiency in a foreign language will be encouraged to take French, German, or Russian.

RELATED COURSES OR PROGRAMS. In addition to the standard concentrations in Applied Mathematics there are also interdepartmental standard concentrations in Applied Mathematics-Biology, Applied Mathematics-Computer Sciences, Applied Mathematics-Economics, and Applied Mathematics-Psychology.

GRADUATE PROGRAMS

MASTER OF SCIENCE. The general requirements for this degree are the satisfactory completion of the equivalent of one year of study at a graduate level with the program of courses subject to the approval of the Division. The student may also be required to complete satisfactorily a project or thesis.

DOCTOR OF PHILOSOPHY. The general requirements for the degree of Doctor of Philosophy in Applied Mathematics include the satisfactory completion of two years of study at a graduate level of a program approved by the Division, the passing of a preliminary examination, the ability to read in mathematics and science an approved foreign language, the completion of a project of research and the writing of a dissertation, a final examination on the dissertation, and a public presentation of the dissertation.

I. PRIMARILY FOR UNDERGRADUATES

1. *Interactive Computing, with APL*

Introduction to computing using APL, including numerical applications, semi-numerical applications, and some non-numeric applications.

4. *Introduction to Computer Programming for Scientific Problems.*

Introduction to the basic numerical and programming techniques useful in solving scientific problems. Problems will be drawn from the physical, biological or social sciences. There will be 5-6 projects in a semester. Theoretical background for projects are presented in class; students are then required to write a computer program, run the program and interpret the results. Scientific subroutines packages may be employed. Corequisites: Mathematics 10 or 18.

33, 34. *Methods of Applied Mathematics I, II.*

Mathematical techniques involving differential equations used in the analysis of physical, biological and economic phenomena. Emphasis is placed on the use of established methods, rather than rigorous foundations. I: First and second order differential equations. II: Application of linear algebra to higher order differential equations. Numerical methods for the solution of differential equations, with computer applications. Non-linear problems and stability. Introduction to partial differential equations. Three hours lecture and one hour recitation. Prerequisite: Mathematics 10.

35, 36. *Methods of Applied Mathematics*

A more intensive treatment of the material in Applied Mathematics 33, 34. Intended for students who desire a rigorous development of the mathematical foundations of the methods used, for students considering one of the Applied Mathematics concentrations and for all students in the sciences who will be taking advanced courses in Applied Mathematics, Mathematics, Physics, Engineering, etc. Three hours lecture and one hour recitation. Mathematics 18 is desirable as a corequisite. Prerequisite: Mathematics 10.

II. FOR UNDERGRADUATES AND GRADUATES

107. *Quantitative Models of Biological Systems* (Biomed 107)

An intermediate course between Biomed 110 and 212/Applied Mathematics 222. Quantitative modeling techniques useful in solving real problems in molecular biology, physiology and ecology. Topics range from the sub-cellular level through the cellular level and the organ system level to the level of the whole organism and ultimately to population dynamics and ecosystem analyses. Prerequisites: 1 year chemistry, Biomed 110, 1 year physics plus Applied Mathematics 33, 34 or 35, 36; or written permission.

116. *Introduction to Computational Probability and Statistics*

Examination of probability theory and mathematical statistics from the perspective of computing. Topics selected from random number generation. Monte Carlo methods, limit theorems, stochastic dependence, estimation and hypothesis testing. Prerequisites: calculus, linear algebra, and Applied Mathematics 165 or equivalent. Some experience in programming is desirable. Offered in alternate years.

117. *Introduction to Numerical Analysis*

Basic numerical analysis. Topics include linear systems, eigenvalues and eigenvectors, nonlinear equations, interpolation and approximation, numerical integration and the solution of ordinary differential equations, optimization. A short course in Fortran is also given.

118. *Introduction to the Numerical Solution of Partial Differential Equations*

An introduction to numerical solution of elliptic, parabolic and hyperbolic partial differential equations. Students will implement algorithms with FORTRAN programs. Previous experience with FORTRAN is helpful, but not necessary. Prerequisites: 33, 34 or 35, 36, or 117.

120. *Operations Analysis: Probabilistic Models*

Basic probabilistic problems in operations research; methods of problem formulation and solution. Markov chains, birth-death processes, stochastic service and queuing systems, sequential decision theory, dynamic programming. Prerequisite: 165, or Mathematics 161, or equivalent.

121. *Introduction to Mathematical Programming*

An introduction to the basic mathematical ideas and computational methods of optimizing allocation of effort or resource utilization, with or without constraints. Linear programming, network models, integer programming.

125. *Analytical Mechanics* (Engineering 137)

An analytical approach to the study of dynamics of particles and rigid bodies. Variational principles and Lagrangian formulation of mechanics, rigid body motion, introduction to Hamiltonian formulation of mechanics.

126. *Introduction to Field Theory*

Vector and tensor calculus. Mechanics of continuous media. Electric and magnetic fields. Special relativity. Waves in fluids and solids, and electromagnetic waves. Prerequisite: AM 34 or 36, and EN4 or PH6 or equivalent.

133, 134. *Methods of Applied Mathematics III, IV*

Formulation of discrete and continuous problems drawn from physical and biological applications, leading to mathematical models including difference, differential, and partial differential equations. Solution techniques will include: Laplace and Fourier transforms; complex analysis; discrete and continuous Fourier series; general eigenfunction expansions.

151. *Applied Modern Algebra*

Development of basic concepts of algebra with emphasis on applications to computer science, engineering, operations research, and other areas which make significant use of discrete mathematics. Introduction to logic, set theory, algebraic structures, graph theory and combinatorics.

165, 166. *Statistical Inference I, II*

Systematic introduction to mathematical statistics, including point and interval estimation, hypothesis testing, linear statistical models and nonparametric methods. Statistical software packages are introduced and used in 166. Prerequisite: Mathematics 10. Basic linear algebra is presumed in 166.

167. *Statistical Inference III*

Different topics in different years: time series analysis, stochastic processes, nonparametric statistics, etc. May be repeated for credit. Prerequisite: 166.

169. *Mathematical Population Models* (Mathematics 169)170. *Introduction to Automatic Language Analysis* (Linguistics 170)183, 184. *Linear Operator Theory and Applications*

An introductory course on the basic facts of functional analysis in a form suitable for applications. Introduction to integration and measure theory. Metric spaces and linear spaces. Banach and Hilbert spaces. Analysis of linear compact operators and unbounded operators.

186. *The Mathematics of Insurance*

Mathematical theory of risk analysis, as applied to insurance. Actuarial concepts. The collective theory of risk. Reinsurance. Management games. Prerequisites: calculus, linear algebra, and Applied Mathematics 165 or equivalent. Computing experience is useful but not required. Offered in alternate years.

188. *Advanced Matrix Theory*

Canonical forms of orthogonal, Hermitian, and normal matrices, Rayleigh quotients. Norms. Eigenvalues. Matrix equations. Generalized inverses. Banded, sparse, non-negative, and circulant matrices. Prerequisites: Applied Mathematics 34 or 36, or Mathematics 52, or permission of the instructor. Offered in alternate years.

193, 194. *Senior Seminar*

Independent study and special topics seminars in various branches of Applied Mathematics offered by the Staff.

III. PRIMARILY FOR GRADUATES

205, 206. *Mathematical Methods of Applied Science*

Introduces science and engineering graduate students to a variety of fundamental mathematical methods. Topics include linear algebra, complex variables, Fourier series, Laplace transforms and applications, ordinary differential equations, integral equations, tensor analysis, differential geometry and partial differential equations.

211. *Real Analysis*

Topics in real analysis which are fundamental to the study of Applied Mathematics with emphasis on metric spaces and integration theory.

212. *Hilbert Spaces and their Applications*

Metric and normed spaces; theory of bounded operators; spaces l^2 and L^2 , unbounded operators; integral equations and partial differential equations.

213. *Methods of Applied Mathematics: Partial Differential Equations*

Theory and solution of first and second order partial differential equations, Riemann's method, separation of variables, integral transforms and distributions, Green's function, quasilinear systems.

214. *Methods of Applied Mathematics: Integral Equations*

Integral equations. Fredholm and Volterra theory, expansions in orthogonal functions, theory of Hilbert-Schmidt. Singular integral equations, method of Wiener-Hopf. Calculus of variations and direct methods.

216. *Methods of Applied Mathematics: Asymptotics*

Calculus of asymptotic expansions, evaluation of integrals. Solution of linear ordinary differential equations in the complex plane, WKB method, special functions. May be taken concurrently with Applied Mathematics 214.

217. *Functional Analysis and Applications*

Linear spaces, metric spaces, operators, contraction principle, fixed point theorems, linear functionals, adjoint spaces, spectral theory. Non-linear operators. Special spaces and selected applications to differential equations, control theory, integral equations, quantum mechanics, and numerical analysis.

218. *Topics in Functional Analysis*

Topics of current interest in applications of functional analysis.

219, 220. *Ordinary Differential Equations and Their Applications*

Existence and general properties of solutions, linear systems, Floquet theory. Stability, Liapunov's method, some general properties of nonlinear systems. Two-dimensional systems, Poincaré-Bendixson theory. Boundary value problems. Non-linear oscillations and asymptotic methods.

221. *Topics in Differential Equations*

Topics of interest in ordinary, partial and functional differential equations.

222. *Mathematical Models in Physiology* (Biomed 242)

The development and use of mathematical models for describing physiological systems. Techniques for the formulation and solution of systems of linear and nonlinear algebraic and differential equations will be emphasized. Applications of optimization techniques and parameter identification methods will also be discussed. Prerequisites include (1) Applied Mathematics 33, 34; (2) at least one 100-level course in biology; (3) some programming background; (4) permission of one of the instructors.

223, 224. *Partial Differential Equations* (Mathematics 237, 238)

Distributions, Fourier transforms and Sobolev spaces. The Cauchy problem. Hilbert space methods. Elliptic boundary problems and regularity. Hyperbolic and parabolic systems. Semester I covers the basic linear theory. Semester II focuses on some special topic, usually nonlinear.

226. *Introduction to Stochastic Control Theory*

Sources of stochastic control problems in Economics, automatic control theory and communications, finite Markov chains, dynamic programming, finite and free time problems, discounted and average cost per period problems, stability, linear systems with quadratic cost and with or without filtering, numerical methods, heuristic introduction to continuous time models and to diffusion processes.

227, 228. *Topics in the Control of Systems*

Topics will vary from year to year, but will include optimal control theory, computational methods for control, and algebraic methods in systems science.

229, 230. *Mathematical Methods in Operations Research*

Basic topics in operations research, with examples drawn from engineering, economics, business control theory, and other areas of application: Linear programming and duality theory, applications to scheduling, allocation of resources, PERT, etc.; optimization methods for static systems (hill climbing); nonlinear programming, theory and computational methods. Semester II will concentrate on Markov chains and process, modelling of systems by Markov chains and processes, queueing theory, and applications, dynamic programming and applications; and utility theory.

233. *Foundations of Continuum Mechanics* (Engineering 221)

Mathematical foundations of continuum mechanics. Vectors and tensors, properties and basic operations. Kinematics of deformation. Conservation laws. Thermodynamics. Stress. Constitutive equations. Elastic, viscous, and viscoelastic response. Linearization. Simple problems in finite and linear elasticity, and in Navier-Stokes flows. Creep and relaxation in linear viscoelasticity.

234. *Linear Elasticity* (Engineering 224)

General theorems in linear elasticity. Basic singular solutions. Boussinesq-Papkovich and Galerkin representations. Curvilinear coordinates. Cavity, inclusion, crack, and contact problems in three dimensions. States of plane strain, plane stress and axial symmetry. Complex variable techniques. Torsion. Thermoelasticity.

235. *Advanced Elasticity* (Engineering 227)

Large elastic deformations. Controllable deformations of incompressible materials. Initial stress problems. Elastic stability. Additional topics may include membrane theory, fiber-reinforced materials, second-order elasticity.

236. *Topics in Continuum Mechanics* (Engineering 228)

Advanced topics in continuum mechanics. Examples are: non-linear viscoelastic constitutive equations, strain gradient and micropolar theories of elasticity, coupled mechanical and thermal or electromagnetic phenomena, continuum thermodynamics.

237. *Plasticity* (Engineering 229)

Theory of the inelastic behavior of materials with negligible time effects. Experimental background for metals and fundamental postulates for plastic stress-strain relations. Variational principles for incremental elastic-plastic problems, uniqueness. Upper and lower bound theorems of limit analysis and shakedown. Slip line theory.

238. *Stress Waves in Solids* (Engineering 226)

Elastic wave propagation theory with an introduction to waves in viscoelastic and plastic media. Waves in unbounded media, half spaces, layered media, plates, rods and beams. Solutions to transient problems. Relation of theory to experiment. Stress waves and fracture.

239. *Viscoelasticity* (Engineering 225)

Creep. Stress relaxation. Sinusoidal oscillations. Boltzmann's principle of linear superposition. Memory functions. Relaxation and retardation spectra. Time and temperature dependence. Second order transitions. Experimental determination of linear viscoelastic properties. Relation between molecular structure and macroscopic properties. Volume viscosity. Non-linear behavior.

241. *Fluid Dynamics I*

Tensor notation and curvilinear coordinate systems. Thermodynamics. Eulerian and Lagrangian description of fluid motion. Conservation laws. Constitutive relations and irreversible processes. Initial and boundary conditions. Vorticity and Bernoulli theorems. Potential flow in two and three dimensions. Surface waves in liquid.

242. *Fluid Dynamics II*

Dimensional analysis and similarity. Classification of flows according to dimensionless ratios. Exact, incompressible, viscous flow. Stokes and Oseen approximations and Stokes' formula. Boundary layer theory of the Blasius problem. Hydrodynamic stability: Inviscid theories; The Orr-Sommerfeld equation; Qualitative theory of viscous instabilities. Turbulence. Compressible flow. Simple waves and shock waves. Sound propagation.

243. *Viscous Flow I*

Dimensional analysis and groups. Self-similar and other exact solutions of the Navier-Stokes equation. Incompressible, laminar boundary layer in two and three dimensions: Forced and free heat convection; Methods of solution; Integral methods; Leading and trailing edges and separation points. Compressible boundary layers. Low Reynolds number flow.

244. *Viscous Flow II*

Shock structure. Hydrodynamic stability: Thermal instability; Curved flows; Parallel flows and boundary layers. Turbulence: Statistical approach; Mixing length theories and turbulent boundary layers.

245. *Compressible Flow*

Hyperbolic systems of equations and characteristics. The hodograph transformation. Simple waves. Limit and critical lines. Discontinuous solutions. One dimensional unsteady flow. Two dimensional steady flow. Subsonic and transonic flow. Axisymmetric flow.

246. *Asymptotic Methods in Fluid Dynamics*

Regular and singular perturbation theories. Differential equations containing a large parameter. General boundary layer methods. Inner and outer expansions. Multiple scaling techniques. Application to problems in fluid mechanics.

247, 248. *Topics in Fluid Dynamics*

Topics chosen from: Advanced rarefied gas dynamics; Hydromagnetics; Non-Newtonian fluids; Stability Theory; Turbulence.

250. *Rarefied Gas Dynamics*

Qualitative theory. The Boltzmann equation. H-theorem. Initial and boundary conditions. Free molecule flows. Equilibrium and near-equilibrium flows. Hilbert-Chapman-Enskog theory. Transport phenomena. Linearized Boltzmann equation. Eigentheory. Theory of kinetic models. Methods of solution: Integral iteration; Moments methods; Half-range techniques. Initial value problem. Boundary value problems; Couette flow; Heat flow; Sound propagation.

251. *Analytical Mechanics*

Mathematical study of the dynamics of particles, Lagrangian and Hamiltonian formulations, transformation theory, perturbation theory.

252. *Topics in Analytical Mechanics*

Mathematical study of modern developments in mechanics. Topics will vary.

254. *Topics in Analysis of Algorithms* (Computer Science 254)

Interested students should register for Computer Science 254

255. *Numerical Analysis I*

Matrix computation and solution of elliptic partial differential equations.

256. *Numerical Analysis II*

Numerical solution of parabolic and hyperbolic partial differential equations.

257. *Numerical Analysis III*

Finite difference methods. Polynomial interpolation. Numerical solution of ordinary differential equations.

258. *Numerical Analysis IV*

Approximation theory and application of functional analysis to numerical analysis.

263, 264. *Theory of Probability* (Mathematics 263, 264)

This course presents a rigorous development of the theory of probability. Measure theory will not be required before the second semester.

266. *Stochastic Processes*

Topics in the theory of continuous parameter stochastic processes. The precise content varies from year to year, but generally includes many of the following topics: Second order stationary processes, ergodic processes and their applications, Markov processes including jump processes and diffusions, applications to noise and communication theory.

267, 268. *Topics in Probability and Statistics*

Advanced topics varying from year to year, including pattern theory, computational nonparametric statistics, statistical mechanics, and applications to image processing.

281, 282. *Seminars in Applied Mathematics*

The graduate program in numerical analysis and scientific computation is being revised and expanded. An extensive revision in 200-level Applied Mathematics course offerings in this area will be made during 1985-86.

RELATED COURSES

Attention is also drawn to the following courses which are of particular interest to graduate students of applied mathematics: Mathematics 201; 221, 222; 225, 226; Physics 205, 206, 207; 209; 210; 214; 230, 232; 234; 236; Chemistry 201; 202; 203; 277, 278; Engineering 203; 204; 235; 238; 240; 241; 242; 252; 254; 255; 257; 263; 264; 266; 276, 281; 282, 289.

Art

Professors CHAMPA, FELDMAN, FISHMAN, SCHULZ (Director of Art History), TOWNLEY, WINKES, ZERNER; Associate Professor MAYER; Adjunct Associate Professors KOREN, SCHER; Assistant Professors BONDE, DRISKEL, (Graduate Representative), EDWARDS, MULLER, Visiting Assistant Professors KENT, MALIK.

UNDERGRADUATE PROGRAM

STANDARD CONCENTRATION PROGRAMS FOR THE BACHELOR OF ARTS DEGREE

History of Art

INTRODUCTORY COURSES (TWO COURSES): Art H1, H2, or H3, plus Art P10 (or other Practice course).

CONCENTRATION PROGRAM

1. *Period (four courses)*: beyond the introductory level, at least one from each of three periods: Ancient and Medieval; Baroque through Eighteenth Century; Nineteenth Century and Modern.
2. *Electives (three courses)*: three courses in History of Art (only one of which may be chosen from among the introductory courses), or related courses (with prior approval of the Concentration Advisor).
3. *Concentration Seminar (one course)*: normally limited to seniors.
4. *Languages*: It is suggested that, at minimum, a reading knowledge of French and German should be acquired, plus any other language appropriate for the field of possible specialization.

Practice of Art

INTRODUCTORY COURSES (2 COURSES): Art H1, H2, or H3, plus Art P10, Foundation Studio (prerequisite to all other studio courses).

CONCENTRATION PROGRAM

1. *Period (two courses)*: in History of Art distributed over two periods (see above for period descriptions).
2. *Practice (five courses)*: at least one shall be Drawing (Art P111 or Art P90 — RISD).
3. *Elective (one course)*: which will be in either History of Art or Practice of Art, or selected from the following:
Computer Science 224 (prerequisite not included); Semiotics 12, 66, 71, 72, 73, 113, 163, 166; Theatre Arts 25, 26, 125A, 125B, 126; Mathematics 8; Acceptable RISD courses: (A current listing of acceptable Brown/RISD courses is developed yearly and is available at the Art Department or Registrar's Office).
4. *Senior Thesis Exhibition*, which does not carry academic credit, is required for graduation (usually presented during the eighth semester).

Art-Semiotics

An interdepartmental concentration combining courses which study the cultural role of artistic production. The concentration aims to engage students in an analysis of theories of production elaborated within various philosophical and artistic traditions, while encouraging them to produce works of art which stand in some critical relation to these traditions. Students will be able to integrate their studies with courses from other departments in the humanities and social sciences through consultation with their advisors.

A concentration in Art-Semiotics consists of ten courses distributed as follows: at least two core courses, three semiotic theory courses, four practice or studio courses, and one senior seminar. For Honors in Art-Semiotics, the program should usually entail one additional course, generally an independent study, which is described and approved at the end of the student's sixth or the beginning of the seventh semester.

Prerequisites: Art H1 and P10

1. *Core courses (2 courses)*:
Two of the following three:
Semiotics 12, Foundation of the Theory of Signs
Semiotics 66, Introduction to Cinematic Coding and Narrativity
Semiotics 113, History and Theories of Semiotics
2. *Semiotic Theory Courses (3 courses)*:
Three theory courses covering the following subjects: philosophy of language, communication theory, rhetorical theory, film theory, theory of culture, theory of discourse. A list of recom-

mended courses is available every spring in the Semiotics and Art Offices. Courses should be selected with approval of the advisors.

3. *Practice of Art Courses (4 courses):*

A sequence of four courses involving: painting, video production, filmmaking, printmaking, sculpture, photography, computer graphics, or approved courses at RISD (a list of acceptable RISD courses is available in the Semiotics and Art Offices.)

4. *Senior Seminar (1 course):*

Art P180, Advanced Studio Seminar

CENTER FOR OLD WORLD ARCHAEOLOGY AND ART: See listing under Other University Activities.

GRADUATE PROGRAMS

MASTER OF ARTS. Applicants to the degree program must possess the Bachelor of Arts degree or its equivalent and submit Graduate Record Examination (Aptitude) results. Typically, each student takes a balanced program of 12 courses through four semesters, or a total of 14 tuition units, culminating in a written Master's Thesis. The basic program of study provides experience in both art history and museum training. (See below for a chart of this typical program arranged by semesters.)

A central feature of the program is the requirement that all students prepare, over a span of two semesters, a loan exhibition of art historical interest, accompanied by a scholarly catalog. Many of these exhibitions have been supported by the National Endowment for the Arts and have gained nationwide public recognition.

Candidates for the degree are expected to have completed between their junior year as an undergraduate and the granting of the Master's degree a year's course work in each of at least three periods of the history of art. These periods are: Classical, Medieval, Renaissance, Baroque, or Modern (18th through 20th-century). Students who upon entry into the program are deficient in this requirement, or whose undergraduate work lies many years in the past, should expect to do more than the minimum program of 12 courses for the Master's degree.

Students are required to take one seminar in the Department in each of the first four semesters (courses above 100 level). A term paper is required in these courses. An individual reading course may be substituted for a seminar with the consent of the instructor and the Graduate Representative. A term paper is normally required in reading courses. With approval of their advisor students may, and are in fact encouraged to, take courses related to their area of interest in other departments of the University. The required Art H293 and H294 (exhibition) carry double credit.

First Year: Typical Program

<i>Fall</i>	Art H292	<i>Spring</i>	Art H293 (2 credit units)
	Department Seminar		Department Seminar
	Elective		Elective
	Elective		

Second Year:

<i>Fall</i>	Art H294 (2 credit units)	<i>Spring</i>	Art H295 or H296
	Department Seminar		Department Seminar
	Elective (optional)		Elective (optional)

H296 is pending Graduate Council Approval.

Art H293 (Exhibition) is graded Satisfactory/No Credit. Students are encouraged to take other courses ABC/No Credit. At the end of the first year overall performance is reviewed by the Graduate Representative with the student.

Candidates are required to pass language examinations in German and French (or Italian instead of French). One language must be passed in the first year. The second language must be passed by the Fall semester of the second year. A score of 540 or above on the GSFLT may be submitted to fulfill language requirements. The Master's thesis will not be accepted until *both* language requirements have been completed.

Master's Thesis: The thesis is a research paper (of article length) which may be either a brief, original treatment of an existing scholarly problem or a critical review of the state of the question on such a problem. In practice, the Master's thesis is most often a revised seminar paper. It is expected that it demonstrate a thorough command of research techniques and a sound interpretation of its art

historical theme. Students work closely with their advisor in the Department. In cases when research is supervised by a scholar outside the Department, there is also an advisor within the Department who is responsible for the project. Students must submit their revised seminar paper or independent study which is to serve as the Master's thesis by the end of the second year.

DOCTOR OF PHILOSOPHY. Admission to this program requires completion with distinction of a Master of Arts degree.

Students holding an M.A. from other institutions are not admitted directly to the Ph.D. program. Their first year is probationary. In order to be accepted into the Ph.D. program the student must present the M.A. thesis for approval by the Department. This should be done as soon as possible after arrival. The students must fulfill language requirements during the probationary year. At the end of the first year the student can be admitted to the Ph.D. program, and a year of credit units toward the required three years of residence for the Ph.D. may be transferred from the former institution. All students, including probationary students, must complete the methodology sequence: Art H292, H293, H294. The exhibition course is waived only in the exceptional cases when a student enters the program with extensive museum experience, including the preparation of scholarly catalogues. All students take the required program of Art Department Seminars. Students in residence who are completing their Masters degrees are not automatically admitted to the Ph.D. program but must be confirmed upon petition to the Department and presentation of the M.A. thesis.

The residence requirement for the degree is expressed in a total of years of enrollment for graduate study. A minimum of three years of full-time study is required, up to two years of which may be completed in studying for the M.A. degree. However, students transferring to Brown University from other graduate programs will receive no more than one year's credit toward the residency requirement for the Ph.D., no matter how long they were enrolled at their previous institution or institutions.

The doctoral program prepares the student for specialized research in one of the fields regularly taught in this department. A dissertation is required, together with expertise in the art of one particular period and knowledge of the art or thought of a chronologically or otherwise related period. The latter means often that the candidate must take courses in other departments. One or more additional languages are sometimes necessary to pursue the research for the dissertation. Decisions concerning course work and languages necessary for this research are made by the dissertation advisor in consultation with the student.

A colloquium defines the exact subject matter of the dissertation, a major and two minor fields to be studied in order to pass the subsequent oral examination. The colloquium should be held during the student's third year of graduate study. The student is required to submit a prospectus of the dissertation including an outline of the subject, description of the proposed research, and a critical evaluation of previous scholarship, prepared in consultation with the dissertation advisor. The oral examination may be taken before preparation of the dissertation.

The dissertation should be a substantial contribution to the history of art, embodying original research and suitable for publication as submitted or in revised form.

Financial Aid. The following forms of financial aid are available on a competitive basis to first-year students: (Application must be completed by January 10th).

1. Dean's Fellowships
2. University Fellowships
3. Tuition Scholarships

Dean's and University Fellowships are available to first year students. Second year students may receive a Teaching Assistantship or a Proctorship. Assistants are not normally asked to teach independently but are expected to assist in an undergraduate course; Proctorships may also involve specific duties in the Library, Bell Gallery, etc. The Artemis and Martha Joukowsky Dissertation Fellowship is available for award to a doctoral candidate in Ancient Art.

The Department also assists holders of Masters degrees who are enrolled in our Ph.D. program to find part-time visiting teaching positions at neighboring institutions. Our students have regularly taught at a number of colleges in the area.

Application. Inquiries about the program should be addressed to the Graduate Representative of the Art Department. Formal application and inquiries about application procedures must be addressed to the Graduate School of Brown University, Providence, R.I. 02912. Completed appli-

cations are due January 2nd and must be accompanied by an application fee of \$30, U.S. resident. Applications outside U.S., \$35.

COURSES IN THE HISTORY OF ART

I. PRIMARILY FOR UNDERGRADUATES

Courses numbered below 100 are open to all undergraduates and graduate students (extra work is required for graduate credit); prior completion of Art H1 is recommended. They deal broadly with the development of styles and motifs and the major artistic personalities of a particular period in art history. Lectures are illustrated with slides; outside readings and written papers are assigned.

H1. *Introduction to the History of Art* (Foundations 12) Ms. BONDE, Mr. WINKES and STAFF.
A general introduction to the history of art. A survey of Western art treating several selected periods.

H2. *The History of Western Architecture and Urbanism* Mr. SCHULZ and Ms. ZERNER.
The evolution of architectural styles, building types and urban settlements in Western Europe, from antiquity to the modern day. The periods emphasized will vary from year to year. Open to both under- and upper- classmen.

H25. *Classical Art and Architecture* (Classics 44) The STAFF.
This course will cover Greek monumental statuary from its beginnings in the 7th century B.C. through the idealism of Periclean Athens to the baroque complexity of the Hellenistic period. Single freestanding statues, group compositions, and architectural sculpture will be considered.

H34. *Late Republican and Early Imperial Art and Architecture* (Classics 43) Mr. WINKES.
This course will cover the art and architecture of the Roman world from the second century B.C. through the first century A.D. It will show the influence of neighboring cultures on the emerging art of the Roman empire. Discussed are all media: wall painting, sculpture, minor arts, architecture. No prior background in Roman Art is needed.

H40. *Early Christian and Byzantine Art* Ms. BONDE.
The transformation of late antique art into modes of Christian and Jewish expression, and the subsequent use of art forms by the Byzantine church and empire.

H41. *Medieval Islamic Art* Ms. BONDE.
The formation of an Islamic artistic expression in art and architecture, and the regional manifestations of that art from Central Asia and the Middle East to Sicily and Spain.

H42. *Early Medieval Art in the West* Ms. BONDE.
The course begins with the migration of barbarian tribes into formerly Roman territory, and follows the survival and revival of classical and barbarian art forms and the use of art by the institutions of feudalism, monarchy and monasticism. Concludes with an examination of Romanesque art of the twelfth century.

H44. *Gothic Art*. (Pending EPC approval) Ms. BONDE.
The formation of Gothic art in the twelfth century France, and the varying developments of and reactions to that style throughout western Europe.

H48. *The Trecento: Italian Art and Architecture, 1260-1400* Mr. SCHULZ and Ms. ZERNER.
Major artists and monuments of the heroic age in Italian medieval art (Cimabue, Giotto, the Pisano; the Basilica of St. Francis at Assisi; the cathedrals of Florence and Siena, etc.)

H50. *Northern European Art Before 1600* Mr. MULLER.

H56. *The Quattrocento: Italian Art and Architecture, 1400-1500* Mr. SCHULZ and Ms. ZERNER.
The new style in Italy. The architecture of Brunelleschi and Alberti, sculpture of Donatello, and painting of Masaccio, Fra Angelico, Botticelli, and their peers.

H57. *The Cinquecento: Italian Art and Architecture, 1490-1590*

Mr. SCHULZ and Ms. ZERNER.

The High Renaissance in Italy and its aftermath, Mannerism Academicians. Major artists and monuments of the period (Bramante, Michelangelo, Raphael, Titian; St. Peter's, the Sistine Chapel, the Vatican Stanze).

H60. *Seventeenth Century Painting and Sculpture*

Mr. MULLER.

H70. *Nineteenth Century Architecture*

The STAFF.

H75. *Early Nineteenth Century Painting*

Mr. DRISKEL.

Neo-classicism, Romanticism, and Realism.

H76. *Later Nineteenth Century Painting*

Mr. CHAMPA.

Impressionist and Post-Impressionist painting.

H85. *Twentieth Century Architecture*

The STAFF.

H87. *Twentieth Century Architecture (Urban Studies 59)*

II. FOR UNDERGRADUATES AND GRADUATES

Courses numbered above 100 are open to upperclassmen and graduate students. They deal intensively with specific problems in a particular period and ordinarily presuppose some prior knowledge of the period. Discussion is invited; outside reading and oral or written reports are assigned.

Limited enrollment. Written permission of instructor required. For Ancient Art also consult offerings by the Classics Department.

H114. *Topics in Pre-Modern Architecture*

Ms. ZERNER.

The architects from antiquity to the eighteenth century. An examination of the history of architectural profession. Emphasis will vary but will include study of the role of the architect, design techniques, methods of building, and patronage through study of selected architects. Prerequisite: Art H2. Permission of instructor.

H140. *Topics in Early Christian and Byzantine Art*

Ms. BONDE.

H146. *Medieval Archaeology*

Ms. BONDE.

H148. *Topics in Fourteenth Century Italian Art*
(Pending EPC Approval)

Mr. SCHULZ and Ms. ZERNER.

H155. *Topics in Fifteenth Century Italian Art*

Mr. SCHULZ and Ms. ZERNER.

H156. *Topics in Sixteenth Century Italian Art*

Mr. SCHULZ and Ms. ZERNER.

H160. *Topics in Seventeenth Century Art*

Mr. MULLER and Ms. ZERNER.

H165. *Topics in Eighteenth Century Art*

Mr. DRISKEL.

Hogarth and 18th century graphic satire.

H190. *Concentration Seminar*

Mr. MULLER and STAFF.

Restricted to senior concentrators in Art History, this seminar will consider selected approaches to art historical problems.

H192. *Individual Study Project in the History of Art*

The STAFF.

Reading and reports on an approved topic, supervised by an individual member of the staff. Project proposals must be filed with the Department no later than the first week of the semester.

H198, H199. *Honors Thesis*

The STAFF.

The subject of the thesis and program of study will be determined by the needs of the individual student. Prerequisite: written permission of the instructor and concentration advisor.

III. PRIMARILY FOR GRADUATES

H235. *Research Seminar in Roman Art and Architecture (Classics 243)*
Pompeiiian fresco painting.

Mr. WINKES.

H240. *Research Seminar in Early Christian and Byzantine Art*

Ms. BONDE.

- H248. *Research Seminar in Italian Fourteenth Century Art.*
(pending EPC approval) Mr. SCHULZ and Ms. ZERNER.
- H255. *Research Seminar in Italian Fifteenth Century Art*
Mr. SCHULZ and Ms. ZERNER.
- H256. *Research Seminar in Italian Sixteenth Century Art*
Mr. SCHULZ and Ms. ZERNER.
- H260. *Research Seminar in Seventeenth Century Art*
Flemish painting. Mr. MULLER.
- H265. *Research Seminar in Eighteenth Century Art* Mr. DRISKEL.
- H276. *Research Seminar in Later Nineteenth Century Painting*
The 1889 World's Fair and the Arts. Mr. CHAMPA.
- H285. *Research Seminar in Twentieth Century Architecture* The STAFF.
- H290. *Individual Reading Course* (single course credit)
- H291. *Individual Reading Course* (double course credit)
- H292, H293, H294. *Methods of Research and Art Historical Interpretation* The STAFF.
Work of the first semester centers partly in methods of research, both historical and technological, partly in theories of art historical interpretation. These studies focus on a specific exhibition project during the second semester, a project which culminates in the third semester, in an exhibition. The organization of the exhibition and the preparation of the critical catalogue are executed by the students under faculty supervision. Required of all M.A. candidates (H292, single course credit; H293, H294, double course credit.)
- H295. *Thesis Reading, Master's Degree* (pending Graduate Council approval)
- H296. *Thesis Research, Master's Degree* (pending Graduate Council approval)
Required of all M.A. candidates.
- H297. *Individual Reading Course for the Doctoral Candidate*
- H299. *Dissertation Research, Doctoral Degree* (Double course credit)

STUDIO COURSES

I. PRIMARILY FOR UNDERGRADUATES

- P10. *Foundation Design* The STAFF.
An introduction to visual design, exploring a wide range of materials with emphasis on experimentation and analysis of visual relationships. Art P10 is prerequisite to any advanced studio work at Brown or the Rhode Island School of Design. Enrollment is limited. Students must have written permission from the Art Department prior to registering for the course. A limited number of openings are available for freshmen.

II. FOR UNDERGRADUATES AND GRADUATES

These studio courses provide introduction to the major media of the visual arts, while continuing to explore and develop visual principles which were initiated in the basic studio course. Limited enrollment. Written permission is required. Art P10 is a prerequisite. In exceptional cases a bypass of Art P10 is permitted on the basis of approval of a portfolio; however, this does not guarantee a place in an advanced course.

- P100. *Color Theory* Mr. MAYER.
A studio seminar dealing with the theoretical aspects of color. The emphasis is on the interaction of color as applied to the language of visual arts. Thresholds of color perception and cultural implications of color phenomena are considered. Studio problems incorporating pigments, light, color aid paper, and computer graphics are used to explore color. Considerable outside work is required. The course may not be repeated for credit. Written permission required.

P111, P112. *Drawing* Messrs. EDWARDS, FELDMAN, FISHMAN, TOWNLEY, and STAFF.
Drawing from nature, still life, the model and the imagination in a variety of media. A continuing series of outside assignments is required. Visits to galleries and museums and pertinent exhibitions may be undertaken. The portfolio of the individual student will be the basis for evaluation. Great emphasis is put on classroom participation. Limited enrollment. Written permission required. P111 is prerequisite for P112. P112 may be repeated for credit.

P121, P122. *Printmaking* Mr. FELDMAN and Ms. KENT
Investigations into various printmaking techniques, emphasizing the image and form. No prior experience in printmaking is required but background in drawing and design is desirable. Individual criticism will be given, and participation during group criticism periods is encouraged. Enrollment is limited. Written permission required. P121 is prerequisite for P122. P122 may be repeated for credit.

P123. *Papermaking* Mr. FELDMAN.
The course will emphasize the creative use of handmade paper as a visual medium. Paper will be made from a wide variety of fibrous materials and will be developed in two-dimensional as well as three-dimensional form. Limited enrollment. Written permission is required.

P131, P132. *Painting* Ms. EDWARDS, Messrs. FELDMAN, MAYER, and STAFF.
This course is designed to accommodate a variety of interests and attitudes. Basic instruction in media and painting procedure is given, but the emphasis is toward the development of the image as a visual statement. Individual criticism is given and participation in regularly scheduled group discussions is strongly encouraged. Limited enrollment. Written permission required. P131 is a prerequisite for P132. P132 may be repeated for credit.

P141, P142. *Sculpture* Messrs. FISHMAN and TOWNLEY.
Exploration of basic sculptural concepts using both traditional and experimental materials. Specific techniques covered will depend on the individual instructor in a given semester. Considerable outside work is required. Group and individual criticism, slides and viewing original works of art will form an integral part of the course. P141 is a prerequisite for P142. P142 may be repeated for credit. Written permission is required.

P180. *Advanced Studio Seminar* Messrs. FISHMAN, MAYER.
An approach to contemporary art which combines theory and production. Meetings alternate between discussions of assigned readings and students' visual works. Work is not limited by historical definitions bound by media and is expected to develop a critical perspective with respect to prevailing modes of image-making. Written permission is required.

P181. *Sources of Contemporary Art* The STAFF.
Enables students to become conversant with the art of their own time in terms of visual style, principal artists and underlying theory. Written permission required.

P182. *Holography* Mr. THORNTON.
Introduction to the nature of light, of laser and of photochemistry, explores the concept of complementarity, and teaches students experimental holographic techniques. Written permission required.

P191. *Individual Study in the Production of Art* The STAFF.
Work on an approved project, leading to the presentation of a portfolio or body of work, under supervision of an individual member of the staff. Project proposals must be filed with the department no later than the first week of the semester.

P198, P199. *Honors Thesis* The STAFF.
The subject of the thesis and program of study will be determined by the needs of the individual student. Prerequisite: written permission of the instructor and concentration advisor.

Note: Students concentrating in the Production of Art are required to arrange and present an individual exhibition of their work in their final semester.

COURSES AT THE RHODE ISLAND SCHOOL OF DESIGN

It is possible under certain conditions for students enrolled at Brown to take courses in studio work and art history at the Rhode Island School of Design and to have such work credited toward their degree requirements. No more than four courses may be taken at the Rhode Island School of Design for Brown credit during a student's undergraduate career. A student registers at Brown for either Art P90, H009, or P193 as appropriate.

Written permission to enroll in Art P90, H009 or P193 is required as follows:

- (a) From the RISD instructor
- (b) From the RISD Registrar

For a list of courses which qualify as Art P90, H009 or P193, please consult list of approved courses in the Office of the Registrar. Art P10, Foundation Design is a prerequisite for taking courses at RISD. At the discretion of RISD, a portfolio may be submitted to satisfy this prerequisite.

If an applicant wishes to take a course not listed in the Office of the Registrar, either on the list of art courses or those approved through other departments, he/she may consult with the Registrar to determine possibilities for petitioning the Committee on Academic Standing or the Educational Policy Committee.

Forms to be used in obtaining permission to register for Art P90, H009 or P193 are available in the Registrar's office.

P90. *Studio Work Elected from Approved Offerings at RISD*

Written permission is required (see above).

H009. *Art History Elected from Approved Offerings at RISD*

Written permission is required (see above).

P193. *Advanced Studio Work Elected from Approved Offerings at RISD*

Written permission is required (see above).

Bibliography

Professor ADAMS.

102. *Introduction to Manuscript Theory and Practice*

The STAFF.

Through readings in standard texts, supplemented by current articles and discussions, the course will require students to master basic archival and manuscript theory and practice. In addition, special seminars will illustrate methods of conducting research at the primary source level. As such, students will approach the processing of manuscripts both as archivists and historians or literary scholars.

105. *Bibliographical Organization*

The STAFF.

A study of the development of man's record of manuscripts, books, periodicals, films, etc. Students will examine national, international, and special types of bibliographies. Subject bibliography will receive secondary consideration.

193. *Seminar in Printed Sources on the early History of the Americas* (American Civilization 193). With written permission only.

Biochemistry

The program in biochemistry draws on the resources of several departments. It is designed to per-

mit flexibility in the selection of areas of research and courses of study. The study will have available the facilities of the Chemistry Department, the Division of Biology and Medicine, and the affiliated hospitals. See page 79, under Standard Interdepartmental Concentration Programs, for details of standard concentration programs leading to the A.B. and the Sc.B.

A Ph.D. is granted in Biochemistry. The requirements are the passing of a preliminary examination and the presentation of an acceptable thesis. Specific requirements and individual study will be tailored to meet the needs of the student.

Biology and Medicine

PROGRAM IN BIOLOGY

SECTION OF BIOCHEMICAL PHARMACOLOGY: Professors PARKS (Acting Chair), BARNES (E), S. CHA, S. H. CHU, FISCHER (E), SENFT; Associate Professors AGARWAL, M. Y. CHU, MIECH, STOECKLER; Assistant Professors AGINS, EL KOUNI, NAGUIB, SAVARESE.

SECTION OF BIOCHEMISTRY: Professors BIGGINS (Chair), DAHLBERG; Associate Professor BEALE, Assistant Professors BOSTIAN, W. BOWEN, BRAUTIGAN, GRUPPUSO, MATES, ZARET.

SECTION OF MOLECULAR, CELL, AND DEVELOPMENTAL BIOLOGY: Professors J. R. COLEMAN (Chair), KNOPF (CoChairperson), A. COLEMAN, ELLIS, GERBI, GOSS, LANDY, LEDERBERG, LEDUC, QUEVEDO, ROTHMAN (Dean), ROTMAN, WEISZ (E), ZIMMERING; Associate Professors FAUSTO-STERLING, HEYWOOD, HOLOWINSKY, K. R. MILLER, SHANK; Lecturer RIPLEY.

SECTION OF NEUROBIOLOGY: Professors MCILWAIN (Chair), BIANCANI, EBNER, J. MARSHALL; Associate Professors CHAPMAN, PATRICK; Assistant Professors BEREITER, BERSON; Adjunct Assistant Professor GIAMBALVO.

SECTION OF PHYSIOLOGY AND BIOPHYSICS: Professors L. GOLDSTEIN (Chair), CSERR, GALLETTI, D. C. JACKSON, RICHARDSON, P. A. STEWART (E); Adjunct Associate Professor CHIU; Assistant Professors BUSATH, DEGNAN, MAGINNISS; Lecturer B. T. STEWART (E).

SECTION OF POPULATION BIOLOGY, MORPHOLOGY AND GENETICS: Professors MORSE (Chair), ERIKSON (CoChair for Anatomy,) HAGY, J. F. KIDWELL; Associate Professor WAAGE; Assistant Professors BERTNESS, JANIS, KINGSOLVER, SCHMITT; Adjunct Assistant Professor CORTRIGHT; Adjunct Instructor KELLEY.

PROGRAM IN MEDICINE

DEPARTMENT OF COMMUNITY HEALTH: Professors ARONSON,, COBB (E), GREER (Dean), S. HOFFMAN, S. KATZ, LEWIS (Chair), MONTEIRO (Vice Chair), MORRISON, WESSEN; Associate Professors CONSTANTINE, LASATER, MCKINLAY, MOR, NEWMAN, SPENCE (Adj.); Assistant Professors ASSAF, FINDLEY, FULTON, LEFEBVRE, MURRINEN, NOVACK, REUBEN, SPECTOR, WACHTEL, WELLS; Instructors SPIVACK; Lecturers BECK (Adj.), MICHEL, R. SMITH; Clinical Professors R. JOHNSON (E), SHERWOOD; Clinical Associate Professor TIERNEY; Clinical Assistant Professors GAGNON, HOLLINSHEAD, KEENLYSIDE, LASZEWSKI, LECO, LEPREAU, R. MARSHALL, V. SUSSET; Clinical Instructors BRABECK, DEPUE, DONAHUE, EDELSTEIN, FISHBEIN, F. FRIEDMAN, GRANT, HACHADORIAN, HARTON, HICKEY, KIRKALDY, MACKENZIE, MCCLOY, NORTON, P. RAYMOND, ROMEO, ROWLAND-MORIN, R. SCHWARTZ, ST. PIERRE-ENGELS, SUCSY, WATERS, WEISBERG, WILLIAMS.

DEPARTMENT OF FAMILY MEDICINE: Associate Professors CULPEPPER, CUNNINGHAM (Acting Chair), S. SMITH (Associate Dean); Assistant Professors EMPKIE, GILBERT, MCINTYRE, RETSINAS (Adj.), WEIHS; Instructor J.B. MURPHY; Clinical Assistant Professors CARTER, DEROLF, GUTMAN, KREMBS, MILLARD, WEISMAN, WILHELM; Clinical Instructors BROCHU, COLETTA, COSTA, CROPP, FLOOD, HOLLENBECK, IP (Assistant Dean) KLEIMAN, LAMBE, LASSWELL, LYTTON, MAGLIO, MANDEL, MINER, OU, PROCACCINI, RACIOPPI, T. SIMON, SYME, VERARDO, VICINI, WARNER, WARSHAW, WILSON.

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ALBALA, ALPER, ANAGNOSTOU, BOUGH, BRAMAN, R. CAPONE, A. CARVALHO, CRABTREE, CROWLEY, CUMMINGS, DEXTER (Adj.), ERICKSON, GEWIRTZ, KAEMMERLEN, A. KHAN, MANIS, M. MILLER, M. PASSERO, ROLAND (E), SHULMAN, SOLOMON, P. THOMPSON, TUCCI, WARTMAN, ZAWADZKI; Assistant Professors J. ABUELO, BANSAL, BAUSSERMAN, BODEN, BODENHEIMER, BRUHN, J. CARVALHO, COHENFORD (Adj.), DOOLITTLE, DUDLEY (Adj.), ETTENSOHN, FAST, FEINSILVER, FRACKELTON, FRETWELL, J. FRIEDMAN, GINSBERG, HASAN, HELLER, D. KAPLAN, KOPPELMAN, KORR, LABRESH, LALLY, LAMBERTON, LANCE, LEVINSON, LEY, MALIK, K. MAYER, MAZUR, MCCOOL, MCGARVEY, MEITNER, MIKLOZEK, MILATOVIC (V), B. MILLER, MILLMAN, MOALLI, OLDMIXON, OPAL, POSNER, RAFAL, SCHIFFMAN, SHARMA, SILLIMAN, TREBBIN, VAN ZUIDEN, WEINBERG, WEITBERG, WIEMANN, WITTELS, WU, YAAR; Instructors CYR, DENUCCI, D. KERN, RING, K. SABBATH, SHURMAN, F. SULLIVAN, TIBBETTS, UCHMAN, WARTENBERG; Lecturers FULLER, HARUN, YOUNGKEN; Clinical Professors FLAXMAN, A. KERN, SCHIFF (E); Clinical Associate Professors CHAZAN, CORRAO, FINELLI, E. IANNUCILLI, IZEMAN, C. KAHN, KNISLEY, LOVERING, PESARE, H. RAKATANSKY, R.S. RILEY, SAWYER, SCOTT, SETTIPANE, TOH, TRIEDMAN, WELTMAN; Clinical Assistant Professors AHN, ALTONGY, ARIF, ARMADA, ASHBA, BASILE, BERCOVITCH, BLOOM, BOTELHO, BURROUGHS, CALEDA, CALIFANO, CHMIELEWSKI, CHRISTIAN, CLARK, CLAUNCH, R.H. COLEMAN, CRISAFULLI, R.L. CURRAN, D'AMICO, DAILY, DEFOREST, DIMASE, DREW, EASTON, ESTRUP, E. FELLER, FRAGOLA, FRARY, GAETA, GEORAS, HAHN, HERSTOFF, HO, HORWITZ, JACOBS, S. KAHN, KARAS, KAUFMAN, KAZARNJIAN, KERZNER, M. KHAN, KING, KITZES, KLIE, KRAUSS, T. KUMAR, LEDERER, B. LEVIN, W. LEVIN, LOMBARDOZZI, MACKO, MCDOWELL, MEAD, MEMON, MERLINO, B. MORENO, MORGAN, J. MYERS, T. MYERS, NANIAN, O'DOWD, OLIVIER, PAULL, PERSON, PHILLIPS, R. RAYMOND, RIFKIN, RIVERA, ROBERTS, RYTER, SALTZMAN, B. SCHWARTZ, STAPLES, STRUMINSKY, SUTTON, TARPEY, TORGAN, VANCURA, VOHR, WITMAN, ZIPIN; Clinical Instructors AHOLA, AMIN, ANGERMEIER APPENFELLER, J. BARON, BORENSTEIN, BRAUN, BREX, CAPIZZO, CARNEVALE, CASHEL, COLAVECCHIO, J. COLEMAN, CONLEY, CUTLER, DEMEDEIROS, DEMICCO, DIBENEDETTO, DONAT, DROGIN, ENDRENY, E. FAIN, FARRELL, FEDER, FELLOWS, FEMINO, FISHER, FITZPATRICK, FORTUNATO, FOSTER, GEFFROY, GILMAN, GLEASON, GLINICK, GOSPER, GROSS, HADAMARD, HEREC, HINES, HOLLMANN, HOOKWAY, HUGHES, HYZINSKI, D. JOHNSON, L. JOHNSTON, S.D. KAPLAN, KARANASIAS, KEMPNER, KOLKER, U. KUMAR, LAI, LAPPIN, LATHAM, LAUDADIO, LIDOFISKY, LONGOBARDI, D. LOWE, LYMAN, MANCINI, E. MARTIN, MARZILLI, D. MAYER, MERINGOLO, MIGNACCA, MOORE, C. MORENO, MOTOLA, NAIK, NEWHALL, OLCHOWSKI, PELLA, PERONE, R. PERRY, PIERIK, RODRIGUEZ, SALVATORE, SALZSIEDER, SARLES, SCHNEIDER, E. SCHOENFELD, L. SCHOENFELD, SEPE, J. SMITH, SMYTHE, SOMLO, D. STOLL, STONE, TENO, TESTA, TOBACK, TOWNE, R. TRIEDMAN, URBAN, VACCA, VREELAND, E. WELCH, WHITED, R. WILLIAMS, WILSON, WOLFSOHN.

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tant Professors BELLIN, BLOCK, CORWIN, FREYE, GAUVIN, HOGAN, LOBATO, LORD, P. MATHIEU,
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DOHERTY, FALTUS, FAUST, FEINSTEIN, FOGEL, FOLICK, GRAPENTINE, HERZ, IRWIN, R. JOHN-
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NIRENBERG, NORMAN, PRIZANT, RASMUSSEN, ROBBINS, SILVERMAN, STAUNTON, STOUT, SWIFT,
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JONES, J. SABBATH; Clinical Professor FEATHER; Clinical Associate Professors BAUERMEISTER,
INGALL, LANDAU, NIRK, I. ROSEN, F. SULLIVAN; Clinical Assistant Professors ABERGER, ALEX-
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JACKSON, JASINJACK, M. JOHNSON, KASS, KELLER, KRIEBEL, LAMBERT, LILLY, S. MARTIN, J.
McGUIRE, MUSIKER, NADOL, NAJERA, NUNEZ, PEARSON, PLUMMER, QUALLS, W. ROSEN,
RUBIN, SAMUELS, SAPIR, SCARAMELLA, SHIELD, M. SILVER, SIROTA, SORRENTINO, SPARADEO,
SPIRITO, TAUSSIG, WOLD, WOLSTON, ZUCKER; Clinical Instructors FEINSTEIN, FURMAN, HARROP,
INGLESE, KUCHARSKI, NOEL, PALMATEER, C. SULLIVAN.

DEPARTMENT OF RADIATION MEDICINE: Professors GLICKSMAN (Chair), LEITH, LITTMAN, TEFFT;
Associate Professors AMOLS, GANDSMAN; Assistant Professors KRITHIVAS, MALHOTRA, SHEARER,
WEINHOUS; Instructor CHOUGULE, EATON, MICHELSON; Lecturers COLAIACE, A. DEUTSCH,
HALLMANN, LAND, UDIS; Clinical Associate Professors MADDOCK, SPRARAGEN, WEBBER; Clinical
Assistant Professors ABEDI, BROTMAN, H. COHEN, J.H. COLEMAN, CONKLIN, CRONAN, DENNY,
DEWEY, DORFMAN, ENTEZARY, FRATER, HANSON, HAAS, HUDSON, JAMESON, C.H. LEE, S. LEE,
LUNDSTROM, MANDELL, MAUCERI, McLISTER, A. MILLER, MOON, O'BRIEN, RYAN, RYVICKER,
SCHATZ, SCHEPPS, F. SCOLA, WOLD, YU; Clinical Instructors CHAFFA, D'SOUZA, SHAH, SHAPIRO.

DEPARTMENT OF SURGERY: Professors GANN (Chair), HOPKINS, B. JACKSON, KARLSON, J.M.
MORAN, RANDALL (E), SIMEONE (E), STEIN, J. SUSSET; Associate Professors CALDWELL, EDST-
ROM, FRANASZEK, KAYE, LEKAS; Assistant Professors ALBINA, ALLEN-ROWLANDS, BALKO, BER-
EITER, BURCHARD, CARLSON, W. COHEN (Adj.), COHN (Adj.), ENGLAND, KENNEY, SLOTMAN,
VEZERIDIS; Instructor DUBIN; Lecturers CLOWES (E), GOLDOWSKY, HOYE, SAVRAN (E), H. STE-
PHENS (E); Clinical Professors DeLUCA, FELDER, KINDER, SELVERSTONE, J. STOLL, VERSACI;
Clinical Associate Professors ASHWORTH, J. BOWEN, CAPALBO, G. COOPER, N. DAVIS, J. DOWL-
ING, FRANCIS, HERMAN, HODOSH, McLENNAN, McNELIS, PAHIGIAN, PORTER, ROBINSON, SEX-
TON, S. SIMON, SINGH, STURIM, W. THOMPSON, L. TRIEDMAN, WESSELHOEFT; Clinical Assistant
Professors AZZOLI, BAHR, P. BARON, BELLINO, BERNARDO, BEVIVINO, BHAT, L. BOWEN, CAR-
LOTTI, CARNEY, JR., CARNEY, SR., CARUOLO, S. COHEN, G. COLEMAN, CONWAY, R.E. CURRAN,
DORMAN, ENGEL, J. FELLER, GELCH, GELTZER, HAIRABET, H. HANING, HITTNER, HORVITZ,
IANNOTTI, INDEGLIA, ISSENBERG, JACEWICZ, C. JACKSON, C. JOHNSON, KLUTZ, LANGENBRUN-

NER, LATINA, LAWLOR, LECLERCQ, LENTRICHIA, LIANG, LIFFMAN, MARCACCIO, MAYNARD, MCKENDALL, MCNAMEE, MCRAE, MEISELMAN, MIGLIACCIO, MONCHIK, MORIN, MUNRO, NIGRI, PERLMAN, T. PERRY (E), PETERS, PITTS, N. RAKATANSKY, REGAN, RICHMAN, REIMER, ROBIDOUX, ROSENBAUM, SCHINAZI, SHAHINIAN, SLAFSKY, C. SMITH, SODERBERG, S. STEINER, K. STEPHENS, STUART, SYDLOWSKI, TSARAS, VITO, WAGDI, P. WELCH, WEYMAN, WOODCOME, J.J. YASHAR, J. YASHAR; Clinical Instructors ALTENHEIN, M. BARRETT, BRESLIN, BROCCOLI, CALLAGHAN, CAMBIO, CARELLA, CATALLOZZI, CLUKIES, S. I. COHEN, COLASANTO, G. COUGHLIN, CRAYBAS, DEBLASIO, DELLA TORRE, M. FELDMAN, HILL, JOSEPHSON, KORTYNA, LATCHIS, LAURELLI, MACANDREW, MARSOCCI, MCOSKER, MILES-MATTHIAS, MOULE, PROANO, RAUFI, ROCCHIO, ROETTINGER, SABORIO, SHEA, SIDDIQI, R.B. SMITH, SZLATENYI, WEAVER, WEXLER, WOOLARD.

GRADUATE PROGRAMS

The Division of Biology and Medicine presents four programs of graduate study leading to the degrees of Master of Science and Doctor of Philosophy in Biology or Medical Science. These programs are 1) Molecular Biology, Cell Biology, and Biochemistry. 2) Pharmacology, 3) Physiology, Neurobiology and Biomedical Engineering, and 4) Ecology and Evolutionary Biology. The Division also offers a Program in Medicine leading to the degree of Doctor of Medicine. Students in the Program in Medicine may also pursue a degree of Master of Medical Science and/or Doctor of Philosophy.

The collections of the Biological Sciences Library are now housed, along with those of the Physical Sciences Library, in the Sciences Library, located at the corner of Thayer and Waterman Streets. This library provides access to more than 4,700 current periodicals and 268,000 volumes in the fields of bio-medicine, psychology, and all the physical science disciplines. Research facilities are available for work with a wide variety of prokaryotic and eukaryotic organisms. Major shared Divisional facilities are the Animal Care Facility, the Electron Microscope Facility and the Greenhouses.

Students entering graduate programs must have, in addition to college courses in Biology, a background in Physics, Chemistry, and Mathematics (see below). Courses are chosen with the advice of Program counselors, and may include, in addition to Divisional offerings, courses offered by other University Departments. The language requirements of the Division may be satisfied in any modern foreign language in which there is significant and copious literature relevant to the student's special area of study. As a part of the doctoral training each student will be required to participate in the teaching of one or more courses related to the program.

THE PROGRAM IN MOLECULAR BIOLOGY, CELL BIOLOGY, AND BIOCHEMISTRY. The Graduate Program in Molecular Biology, Cell Biology, and Biochemistry is intended for highly qualified students who plan to pursue a career which includes research in biology or medical sciences. Admission is generally limited to candidates for the Ph.D. degree, though in some cases candidates for the M.S. degree will be admitted. The program is interdisciplinary, focusing on molecular and cellular aspects of biochemistry, developmental biology, genetics, immunology, microbiology, physiology and virology. An individual program is designed to meet each student's needs and interests while providing a firm background in molecular and cell biology and in biochemistry.

THE PROGRAM IN PHARMACOLOGY. The Ph.D. Program in Pharmacology embraces the areas of Cancer Biology and Biochemical Pharmacology. The Program is undergoing reexamination. For current information please contact the Associate Dean for Graduate Affairs of the Division.

THE PROGRAM IN PHYSIOLOGY, NEUROBIOLOGY, AND BIOMEDICAL ENGINEERING. The Graduate Program in Physiology, Neurobiology and Biomedical Engineering offers advanced training to highly qualified students who wish to pursue academic and research careers in fields of biology and medical sciences which include cellular, comparative and organ systems physiology, neurophysiology, neuropharmacology, neuroanatomy, biomaterials, biomechanics, artificial organs and related areas of biophysics and bioengineering. Specific degree requirements of the program are to pass a comprehensive examination and a preliminary research examination according to established schedules, to complete and publicly defend an original research dissertation, and to meet the teaching and foreign language requirements of the Division of Biology and Medicine. There are no specific

course requirements. Programs of study and research are developed individually in consultation with the student's advisor and advisory committee according to his or her qualifications, interests, and career goals, and are expected to insure expertise in the students' fields of research as well as competence in broadly related areas of physiology and neuroscience. Students with particular interests in Bioengineering may apply either to this Program or to the graduate program of the Division of Engineering, as appropriate to background qualifications and career goals.

THE PROGRAM IN ECOLOGY AND EVOLUTIONARY BIOLOGY. The Graduate Program in Ecology and Evolutionary Biology is intended for highly qualified students who plan to pursue a career that includes research in ecology and/or evolutionary biology. Admission to graduate study is open to candidates for both the Ph.D. and M.S. degree. Individual programs are designed to meet each student's needs and interests while providing a strong background in ecology, evolutionary biology and relevant related areas. All students are expected to attain proficiency in ecological theory, field research methods, evolutionary theory, and statistics. Depending on the student's interests, he/she may be expected to demonstrate proficiency in other areas as well, such as ethology or genetics. This proficiency may be attained through course work, seminars, independent reading, and laboratory and field programs. The faculty of this program includes ecologists, evolutionary biologists, and geneticists, and provides opportunities for interactions with other programs in the Division as well as those without (e.g., Applied Mathematics, Geological Sciences).

Students will demonstrate proficiency in the language most appropriate to their area of thesis research. A preliminary examination and a thesis defense are required, and every candidate must write a dissertation and present it in proper form to the Graduate School.

MASTER OF SCIENCE IN BIOMEDICAL ENGINEERING. A program leading to the Master of Science in Biomedical Engineering is sponsored jointly with the Division of Engineering and is described on page 208 (Engineering Graduate Programs).

UNDERGRADUATE PROGRAMS

Further information regarding these programs, courses, research opportunities, and advising can be obtained from Dr. Marjorie Thompson, Biology Undergraduate Affairs Office, Arnold Laboratory, Room 122, (x3814).

CONCENTRATION FOR THE BACHELOR DEGREE IN BIOLOGY

STANDARD PROGRAM FOR THE A.B. DEGREE (For classes of '88 and beyond)

- a. Prerequisites: Mathematics 9, 10 (or equivalent); 1 year of chemistry. Students are also strongly urged to take one year of college physics, particularly if contemplating postgraduate work.
- b. A total of ten other courses. Two of these courses must be Biomed 11 and 12, at least three must be Biomed courses which include laboratory work, and at least one course must be included from each of the following groups: AREA 1: CELL AND MOLECULAR BIOLOGY: Biomed 46, 47, 105, 106, 114, 115, 122, 123, 126, 151, 153. AREA 2: STRUCTURE DEVELOPMENT AND PHYSIOLOGY: Biomed 32, 38, 44, 61, 81, 110, 117, 118, 131. AREA 3: ORGANISMAL AND POPULATION BIOLOGY: Biomed 41, 42, 43, 45, 46*, 47*, 132, 142, 181, 185. (*Bio 46 or 47 may fulfill either Area 1 or Area 3, but not both.)

Three of the ten courses may be course above the introductory level in related sciences as approved by the concentration advisor.

No more than two semesters of independent study (Biomed 195, 196) may be counted towards the 10 course requirement.

STANDARD PROGRAM FOR SC.B. DEGREE IN BIOLOGY (For classes of '88 and beyond)

The curriculum is based on the fact that much of biology is interpreted and understood in terms of mathematics, chemistry, and physics. The needed background in the physical sciences should be acquired early.

A total of twenty courses including:

- a. Seven Prerequisites: 2 in calculus, 3 in chemistry (including organic) and 2 in physics (or equivalent).

b. Three additional courses in the physical sciences. These include approved courses in the Division, and in the departments of chemistry, mathematics, physics, applied math, computer science or engineering.

c. A total of 10 other courses. Two of these courses must be Biomed 11, 12, three must include laboratory work, and at least one course must be included from each of the following groups: AREA 1: CELL AND MOLECULAR BIOLOGY: Biomed 46, 47, 105, 106, 114, 115, 122, 123, 126, 151, 153. AREA 2: STRUCTURE, DEVELOPMENT AND PHYSIOLOGY: Biomed 32, 38, 44, 61, 81, 110, 117, 118, 131. AREA 3: ORGANISMAL AND POPULATION BIOLOGY: Biomed 41, 42, 43, 45, 46*, 47*, 132, 142, 181, 185. (*Biomed 46 or 47 may fulfill either Area 1 or Area 3, but not both).

Three additional courses in the Division or courses above the introductory level in related sciences as approved by the concentration advisor.

d. At least one semester of independent laboratory research (Biomed 195, 196). Biomed 195, 196 may be taken for no more than two concentration credits. One of the following foreign languages is recommended: Russian, German or French.

INTERDEPARTMENTAL PROGRAMS. Students who are interested in the following concentration programs should see descriptions beginning on page 77: Applied Mathematics-Biology, Aquatic Biology, Biochemistry, Biophysics, Health and Society, Human Biology, Biology-Geology and Neural Sciences.

HONORS: All candidates for Honors in biology must elect Biomed 195 and/or 196. Participation in the Honors program in biology may start at any time, but candidates must file a formal application for the program, by the middle of their *seventh semester* with the Honors Advisor. Successful completion of the Honors program requires a 3.3 grade point average in the concentration a written Honors thesis, and an oral presentation of the student(s) independent research.

Note: Community Health Courses are listed at the end of this section.

I. PRIMARILY FOR UNDERGRADUATES

NOTE: BIOMED 1, 3, 4, 5, 6, 7, 8, AND 9 CANNOT BE USED FOR CONCENTRATION CREDIT.

1. *Introduction to Human Biology*

Mr. QUEVEDO.

An examination of the principles of biology with emphasis on the human species and its place in an evolutionary universe. Particular attention is given to the interlacing of biological and cultural evolution within the family of man. Major events and attributes of human life are considered from viewpoints of heredity and environmental control as well as evolutionary significance.

3. *Personal Nutrition*

Ms. LASSWELL.

The course acquaints the student with fundamentals of nutrition as related to health. Major objectives are evaluating the nutritional status of individuals during different stages in the lifecycle; study of the six major classes of nutrients needed to maintain health; evaluating nutrition claims; and study of the current dietary recommendations in disease prevention and health promotion.

4. *Ecology in Current Society* (pending EPC approval)

Mr. MORSE

The ecological principles underlying the relationship between organisms and their environment will be presented using current issues as a vehicle. Representative topics will include extinction of species, agricultural methodology, deforestation, acid precipitation, and biological control. This course will concentrate on scientific issues rather than on ones of policy.

5. *Dynamics of Living Systems* (Foundations 5)

Messrs. BIGGINS and HEYWOOD.

An overview of current knowledge in biology including the structure, function and reproduction of cells and their organelles and the correlation of structure and function in animals, plants, and microorganisms. Contemporary issues will include nutrition, exercise, stress, reproduction, disease, radiation, chemical mutagens, genetic engineering, biotic interactions, management of ecosystems, and the development of agriculture.

6. *Introduction to Human Physiology*

Mr. GOLDSTEIN.

The course intends to increase the general level of awareness of normal bodily functions, as a basis for more rational and well-informed responses to personal health care decisions, health-related aspects of consumerism, and problems of survival. Topics will include basic cardio-vascular, respiratory, kidney, gastrointestinal, endocrine and neuromuscular function, as well as aspects of reproduction, and exercise physiology.

7. *Radiation and Life*

Messrs. GLICKSMAN, AMOLS, and GANDSMAN.

A descriptive nonquantitative course designed to give the student broad-based knowledge of the biological effects of radiation, the uses of radiation in medicine, industry and national defense, and an approach to an assessment of the hazard-to-benefit ratio for the individual and for society. The involvement of the student as a responsible citizen in policy making concerning radiation will be emphasized.

8. *Genetics, You and Society* (Special Themes and Topics 68)

Mr. HAGY.

Genetics is an exciting, relevant area of modern biology. New technology is leading to rapid expansion of knowledge in human genetics which has implications both for individuals and for society. Topics include gene-chromosome relationships, modern concepts of gene structure and function, experiments with recombinant DNA, cloning and genetic engineering, genetic counseling, prenatal diagnosis, and genetic screening programs. Written permission.

9. *Biosociology*

Mr. GREER.

A course designed to demonstrate the impact of biology on society. Topics covered will include the "Green Revolution" and the problem of feeding the world population, applications of genetics to industrial and medical products, environmental pollution and the politics of Darwinian evolutionary theory. Lectures on the relevant basic biological sciences will be followed by seminar sessions addressing the societal impact of the scientific developments.

11, 12. *Current Concepts in Biology*

Messrs. BOWEN, ELLIS, HOLOWINSKY, KNOPE, MILLER, WAAGE, and Ms. THOMPSON.

Lecture and laboratory sequence intended to provide a broadly based, comprehensive foundation. Material covered in these courses emphasizes the experimental and conceptual nature of biology. Topics considered include the following: the chemical basis of life, cell structure and function, cellular and molecular mechanisms in heredity and development, and hormonal and neuronal mechanisms of cellular communication (fall semester); origin of life, transmission genetics, natural selection and evolution, comparative physiology, behavior and ecology (spring semester).

32. *Vertebrate Embryology*

Messrs. GOSS and COLEMAN.

An introduction to the developmental anatomy of vertebrate embryos, including humans. The course involves intensive microscope slide study of chick, frog, and pig embryos supplemented by lectures and discussion. Topics covered include gametogenesis, fertilization, cleavage, gastrulation, and the formation of embryonic tissues and organ systems. Lecture-lab format. Designed for freshmen and sophomores. Written permission.

36. *The Biology of Gender* (Special Themes and Topics 37)

Ms. FAUSTO-STERLING.

We will consider (1) the phenomenon of sexual dimorphism, (2) genetic and embryological causes of sex determination, (3) sex reversal in non-human vertebrates, (4) the evolution of sex differences in non-human vertebrates and (5) the development of gender differences in humans. The course teaches the basic principles of scientific analysis and provides the necessary background to use them in investigating an exceedingly complex aspect of human existence. Prerequisite: written permission. S/NC.

38, 37. *Experimental Morphogenesis*

Mr. GOSS.

Growth and regeneration of organs and tissues.

41. *Invertebrate Zoology* (formerly 61)

Mr. BERTNESS.

A survey of the invertebrate phyla emphasizing functional design, evolutionary patterns and ecological relationships. Functional morphology, physiology, reproduction, development, and behavior of invertebrates will be examined in relation to their environment. Laboratory exercises and two separate day-long field trips provide first-hand experience with the animals. Written permission.

42. *Principles of Ecology*

Mr. KINGSOLVER.

The principles, concepts and controversies involved in the study of the distribution and abundance of plant and animal populations and their integration into natural communities. Emphasis will be placed on the interactions among organisms and the hierarchical nature of ecological processes.

43. *Diversity and Adaptation of Seed Plants*

Ms. SCHMITT.

An introduction to the mechanisms and results of adaptive radiation in higher plants through a survey of the major groups. Weekly labs and field trips stress local flora, identification techniques, and family recognition.

44. *Plant Organism* (formerly 52)

Ms. COLEMAN.

Structural and functional design of higher vascular plants and its adaptive significance is studied in relation to the challenges posed by the organism's immediate environment. The organismal concept is examined through a discussion of developmental and reproductive strategies and the integrative factors of individual tissue and organ systems. Some taxonomy, anatomy, morphology, physiology and ecology are included.

45. *Animal Behavior: Ecological and Evolutionary Determinants*

Mr. WAAGE.

The role behavior plays in the survival and reproduction of animals in nature. The course will run the spectrum from ethology to behavioral ecology and sociobiology. Basic topics include: avoiding predation, obtaining food and mates, communicating, producing and caring for offspring and living in groups. Written permission.

46. *Genetics*

Messrs. ZIMMERING and LANDY.

An introduction to genetic phenomena at the molecular, cellular and population levels. Topics include transmission of genes and chromosomes, mutation structure and regulation of the expression of the genetic material, elements of genetic engineering and evolutionary genetics. May not be taken in addition to Biomed 47.

47. *Human Genetics*

Mr. HAGY.

Concepts of genetics with emphasis on man, including transmission, cytogenetics, biochemical and population genetics. Laboratory experiments utilize *Drosophila* and human or mammalian cell cultures. May not be taken in addition to Biomed 46. Written permission.

81. *Histology*

Ms. LEDUC and Mr. RIPLEY.

A study of the structure and function of the four basic types of tissue (epithelium, connective tissue, muscle, nerve) and their integration into organs. The course is developed during laboratory periods which are preceded by surveys of the material to be studied.

91. *Nervous System: Introduction* (Neural Science 1)

Mr. EBNER and STAFF.

II. FOR UNDERGRADUATES AND GRADUATES

Cell Biology, Physiology, Biophysics

101. *Radiobiology*

Mr. LEITH.

Biophysical effects of ionizing and non-ionizing radiations on cells and organisms. Topics include mechanisms of cellular injury, repair processes, cell transformation, and tumor radiobiology. Written permission.

105. *Biology of the Eukaryotic Cell*

Ms. GERBI and Mr. MILLER.

The organelles and components of eukaryotic cells are considered in detail within the context of major cellular activities. This course emphasizes the experimental basis for factual knowledge and current concepts in modern cell biology; accordingly, critical analysis of the recent research literature comprises the major class activity. Lectures are supplemented by discussions and demonstrations of research instrumentation. Recommended as an "ecology course of the cell" for Biochemistry concentrators. Written permission.

106. *Plant Cell Biology*

Mr. HEYWOOD.

A detailed survey of cell structure, function, and organelle evolution in algae, fungi, and higher plants. Topics include: structure and function of organelles, mitosis and meiosis, cell and organelle motility, morphogenesis, and cell wall formation. The potential of plant cells as experimental systems in biological research will be emphasized.

107. *Quantitative Models of Biological Systems* (Applied Mathematics 107)

Messrs. KINGSOLVER and BANKS.

110. *Cell Physiology and Biophysics*

Messrs. BUSATH, CHAPMAN, and DEGNAN.

Integration of structure and function in living cells. The fundamental properties of all cells and the function of specialized cells are approached by the application of physical and chemical principles to cellular biology. Topics include: metabolism, kinetics, nerve conduction and communication, and muscle contraction. Labs include osmotic behavior, bioinstrumentation, active transport, computer simulations, nerve conduction, and muscle contraction.

111. *Microbial Ecology in Aquatic Environments*

Ms. COLEMAN.

The nature and interactions of prokaryote and eukaryote (mainly algae) organisms in marine and freshwater environments. Offered in alternate years.

114. *Photobiology*

Mr. HOLOWINSKY.

A discussion of the principal biological photoresponses. The focus is on primary photoprocesses at the cell and molecular levels. Topics include biological effects of U.V. irradiation, photodynamic effects, carotenoid photoprotection, plant and animal vision, and bioluminescence. Offered in alternate years. Written permission.

117. *Mammalian Physiology*

Ms. CSERR and STAFF.

Organ system function with emphasis on human physiology. Topics covered include: cardiovascular, respiratory, renal, acid-base and gastrointestinal physiology. Material is presented through lectures, small group conferences and laboratory analysis of human and animal physiological responses. Enrollment limited.

118. *Comparative Animal Physiology*

Messrs. JACKSON and MAGINNISS.

Comparative and environmental approach to the function and regulation of animal systems with emphasis on vertebrates. Topics include circulation, respiration, nerve-muscle, excretion, fluid and ion regulation, and temperature regulation. Course examines the physiological adaptations and behavioral strategies which permit animals to exist in different and changing environments.

Biochemistry, Pharmacology and Developmental Biology

121. *Principles and Techniques in Biochemical Research*

Messrs. BOSTIAN, BRAUTIGAN and BOWEN.

Conceptual, theoretical and practical aspects of contemporary research methods in biochemistry and molecular genetics, with emphasis on the design and application of experimental techniques, lectures, demonstrations, data evaluation, and "hands-on" exercises. Offered in alternate years.

122. *Endocrinology*

Messrs. BOWEN, CANICK and MORRIS.

A basic course in endocrinology with emphasis on hormone biosynthesis, mechanism of action, physiological roles, and endocrine pathology. Topics include: mechanism of action of steroid, amine, and peptide hormones; neuroendocrinology; reproductive endocrinology; and endocrinology of metabolism and calcium homeostasis.

123. *Biochemistry and Molecular Biology of Plants* (pending EPC approval)

Mr. BEALE.

General principles of biochemistry and molecular biology as they apply to plants, including aspects unique to plants. Topics include respiratory and photosynthetic energy metabolism, biosynthesis of pigments and other natural products, biogenesis of mitochondria and plastids, nitrogen fixation, control of gene expression in plants, cytoplasmic and nuclear inheritance, host-pathogen interactions, and plant genetic engineering.

125. *Drugs in Our Society*

Mr. MIECH.

The properties and effects of drugs which are commonly used in our society, and of chemicals which affect our environment. Emphasis will be placed on abused and psychotherapeutic drugs, antibiotics, anticancer drugs, and environmental pollutants such as pesticides.

126. *Biochemistry*

Messrs. BOSTIAN, ZARET and Ms. LUSK.

An introductory course for students prepared in chemistry. Major areas covered are structure and function of macromolecules, energy transfer in cells, intermediary metabolism and its regulation at the cellular level, and information transfer.

127. *Advanced Biochemistry*

Messrs. BRAUTIGAN and BOSTIAN.

An advanced treatment of the biochemical control mechanisms which operate to coordinate genetic expression and metabolic activity in biological systems.

128. *Biochemical Pharmacology*

Messrs. SAVARESE, PARKS, CHA, PATRICK and Ms. MARSHALL.

A basic consideration of the biochemical and physiological factors that affect the actions of drugs. Topics include: drug receptor kinetics; pharmacokinetics; bioavailability of drugs; enzymes as sites of drug action; the absorption, distribution, and metabolism of drugs; the interaction of drugs with the autonomic nervous system; and the biochemical mechanisms of drug action in bacterial, viral and cancer chemotherapy. Enrollment limited.

130. *Medical Biochemistry*

Messrs. DAHLBERG, BRAUTIGAN and STAFF.

An advanced course in regulatory biochemistry with a medical orientation. Covers regulation of carbohydrate and lipid metabolism in muscle, liver and adipose tissue and biochemical aspects of inherited metabolic disorders, involving heme, amino acids, proteins and nucleic acids. Written permission.

131. *Analysis of Development*

Ms. FAUSTO-STERLING, Messrs. COLEMAN and HOLOWINSKY.

A critical analysis of developmental mechanisms with emphasis on the animal embryo. Topics considered include the initiation of development, morphogenetic movements, tissue interactions, morphogenetic patterning, cell differentiation, and gene action in development. The laboratory includes observation and experimentation with living embryos. The course assumes a basic background in morphology, cell biology, and genetics.

132. *Evolution and Development*

Mr. QUEVEDO.

Examines how populations of prebiological and living systems may have been channeled into various phylogenetic pathways by chance and through natural selection acting within constraints imposed by the genetic/developmental programs of evolving species. Major emphasis is given to recent findings on the causation and nature of developmental changes which may have played key roles in evolution above the species level.

Genetics, Ecology, Population Biology

141. *Behavioral Ecology: Evolutionary and Ecological Determinants of Animal Behavior*

Mr. WAAGE.

Current literature is examined on the evolutionary and ecological determinants of animal behavior: foraging behavior, predator avoidance, communication, competitive behaviors, mate finding, breeding systems, parental care and social behavior. Emphasis is on experimental and comparative methods for testing theory and resolving current debates. Assumes an understanding of ecological and evolutionary principles and background in organismal biology and behavior. Offered in alternate years. Written permission.

143. *Problems in Field Biology*

Mr. MORSE and STAFF.

Focus on the recognition, formulation and answering of questions about natural populations under field conditions. Emphasis is on experimental ecology. The first two-thirds of the course features field work on both plants and animals. The remainder stresses data analysis and the ecological literature. Written permission.

144. *Marine Ecology*

Mr. BERTNESS.

An examination of current topics in the ecology of marine organisms and communities. Topics to be covered will include community structure and dynamics, predation and competitive processes and life history phenomena. A field trip will be taken during the spring break. Written permission.

146. *Genetics and Human Disease*

Ms. ABUELO and STAFF.

An analysis of human diseases, including the elucidation of basic processes leading to genetic syndromes and birth defects, the cellular and molecular basis of selected genetic disorders; genetic counselling, screening and diagnosis.

147. *Population Genetics*

The STAFF.

Offered in alternate years.

150. *Plant Ecology*

Ms. SCHMITT.

An exploration of the special ecological and evolutionary problems related to the biology of plants. Topics include physiological ecology and adaptation, seed ecology, demography and population dynamics, competition, plant-animal interactions, ecological genetics, and community ecology. Labs emphasize experimental design and data analysis. Field trips introduce students to local plant communities. Offered in alternate years.

151. *Molecular Biology and Microbiology*

Messrs. LEDERBERG, SHANK, and Ms. GERBI.

The relationship of genetic elements to cellular and subcellular structures and functions. Emphasis on the regulation of gene expression and its dependence on the organization, mutation, recombination, and rearrangement of genes and chromosomes. Systems involving cells in culture are stressed with examples drawn from studies on viruses, bacteria, yeasts and animal cells.

153. *Experimental Cellular Immunology*

Mr. ROTMAN.

Offers a non-traditional approach to learning how individual immunologists have conceived, planned, and executed some of the now classical experiments. Discussion of research articles is supplemented by a computer-simulated laboratory in which the original experiments are "re-created." (This laboratory is used solely as a class demonstration, no computer manipulations are required from the students.)

154. *Parasitology* (formerly 182)

Mr. SENFT.

A review course which covers the most important parasitic and tropical diseases of man. Life cycles are discussed and pathology is illustrated by Kodachromes, histological specimens, and some live material. Biochemical, physiologic and chemotherapeutic aspects of various parasites are stressed. Laboratory sessions will include study of a comprehensive set of microscope slides and whole mount preparations. Written permission.

156. *Virology*

Mr. SHANK.

A unified treatment of animal viruses. Emphasis on the experimental basis of the present state of knowledge, the methods available for further investigations, and the use of viral systems as models for the regulation of biological information. Lectures and discussion of readings derived from current research literature. Offered in alternate years.

158. *Medical Microbiology*

Messrs. KNOFF, LEDERBERG, SENFT, and SHANK.

Emphasizes the experimental and theoretical basis for infectious disease. Bacterial, viral, fungal, and parasitic agents are considered as well as the immunological response of the host to these microorganisms. Written permission.

Neurobiology

162. *Experimental Neurobiology* (Neural Science 100)

Mr. DONOGHUE.

164. *Mammalian Neuroendocrine Physiology*

Messrs. CARLSON and ENGELAND.

Integrative function of the nervous and endocrine systems as it relates to homeostasis in mammalian organisms. Topics covered include: sensory afferent control of the neuroendocrine system, hypothalamic-pituitary relationships, autonomic and endocrine control of endocrine glands, and the integrated response to complex stimuli. Offered in alternate years.

167. *Neuropharmacology and Synaptic Transmission*

Mr. PATRICK.

Synaptic transmission will be studied from a pharmacological and biological point of view. Examination of the factors regulating neurotransmitter synthesis, storage, release, inactivation and receptor interaction. Proposed mechanisms of action of psychoactive drugs and biochemical theories of psychiatric disorders will be discussed.

Radiation Biology

171. *Introduction to Research Methods in Radiation Medicine, Physics and Biology*

Messrs. GLICKSMAN, AMOLS, GANDSMAN, and SHEARER.

Modern medicine relies heavily on recent advances in radiation physics, computers, and modern technology in the diagnosis and treatment of various diseases. In this course, special topics in radiation medicine, physics and biology will be discussed in weekly seminars given by faculty and students. Student research projects will be directed towards areas of current interest in radiation oncology, diagnostic radiology, nuclear medicine, and radiological physics and biology.

Morphology, Histology, Pathology

181. *Human Morphology* (double credit)

Messrs. ERIKSON, CORTRIGHT and KELLEY.

The functional anatomy of man in the perspective of his evolutionary and embryological development and in the focus of its relevance in medical practice and research. Teams of four students will carry out a complete dissection. Restricted to students in the first year of the Program in Medicine.

184. *General Pathology*

Messrs. FAUSTO, KANE and STAFF.

The mechanisms of disease production at the molecular, cellular, and organ level. The pathogenesis of cellular degeneration, inflammation, abnormalities of immune response, atherosclerosis, neoplasia, inborn disorders of metabolism, nutritional deficiencies and aging are analyzed in the light of current concepts in biology. Morphological and biochemical aspects of human diseases are described in lectures, seminars and laboratory sessions. Required for students in the first year of the Program in Medicine; others by written permission.

185. *Comparative Biology of the Vertebrates*

Ms. JANIS.

The basic biology, structure and evolutionary history of the vertebrates will be considered phylogenetically, with emphasis on the evolution of the major body systems. Emphasis is on an evolutionary approach to the correlation of structure and function with environment and mode of life. Laboratory sessions include the dissections of four vertebrates and a museum trip.

186. *The Primates*

Messrs. ERIKSON and CORTRIGHT.

The natural history and functional anatomy of man and his primate kin. The primary focus is on a close study of our rich collection of primate materials, with the intention of seeing first-hand the evidence constantly cited in discussions of the evolution of man and other primates. The course is largely anatomical but the lectures and independent laboratory can be adapted to the special interests of the participants. Written permission. Offered in alternate years.

187. *Biology of the Vertebrate Integument*

Mr. QUEVEDO.

The comparative anatomy and physiology of the integument in vertebrates is explored in the light of evolutionary principles and patterns and the developmental events through which they become established. Attention is focused on the normal and atypical features of human skin which contribute to an understanding of general skin biology. Offered in alternate years.

188. *Mammalian Adaptation and Radiation*

Ms. JANIS.

An overview of the morphological, physiological and ecological adaptations of the mammalian orders, including their evolutionary history and their past and present biogeographical distribution (emphasis will be on the larger carnivores and ungulates.) The course will include laboratories on the comparative osteology of living and fossil mammals, plus visits to zoos and museums. Offered in alternate years.

189. *Human Histology*

Ms. LEDUC, Messrs. ZACKS, LEV, LIBBEY, and SASKEN.

A course in human histology designed for first year medical students and advanced PLME students. Covers the microscopic structure of normal human tissues and organs in relation to their functions. Emphasis on personal microscope work with guidance from faculty and texts. May not be taken in addition to Biomed 81.

General Offerings

190. *Human Biology Senior Seminar*

Mr. HAGY.

Current topics in Human Biology, utilizing a seminar-discussion format to interrelate biological, psychological, sociological and anthropological views. Required of all students concentrating in Human Biology.

193, 194. *Special Topics*195, 196. *Independent Study*

The STAFF.

Special projects, predominantly laboratory oriented research, supervised individually by members of the faculty. Required of senior candidates for Honors and of candidates for the Sc.B. degree in Biology. This course may be taken more than once for credit, but no more than two semesters of independent study may be counted towards a student's concentration program. Proposal forms and a file of opportunities are available at the Biology Undergraduate Office. Written permission of Ms. Thompson.

III. PRIMARILY FOR GRADUATES

Cell Biology, Physiology, Biophysics

202. *Biophysical Problems in Radiation Biology*

Mr. LEITH.

Effects of ionizing and non-ionizing radiations on mammalian cells. Topics include discussion of current models of damage and repair, and use of techniques such as flow cytometry and elutriation centrifugation in analysis of cellular responses.

203. *Cellular Repair Processes in Mammalian Cells*

Mr. LEITH.

The course covers the current concepts associated with repair and recovery processes that lead to increased clonogenic survival or functional capacity in mammalian cells *in vitro* and *in situ*. These concepts include: sublethal damage repair, potentially lethal damage repair, and recovery as a set of competing biochemical and metabolic processes after treatment with ionizing and non-ionizing radiation or chemicals. Students will present one seminar and a paper in the form of a research proposal. Reading will be from original papers. (Alternates with 205).

205. *Molecular Repair Processes in Mammalian Cells*

Mr. LEITH.

The course covers current concepts associated with molecular repair processes in mammalian cells. Relationships between these repair processes and clonogenic survival, differentiation and aging will be developed. Types of repair pathways, types of repair enzymes and the production and removal of various lesions in the genetic material after treatment with ionizing or nonionizing radiation and chemicals will be covered. Students will present one seminar and a paper in the form of a research proposal. Readings will be from original papers. (Alternates with Biomed 203).

206. *Ultrastructure*

Mr. ELLIS

The principles and practice of the electron microscopy of biological systems.

208. *Advanced Physiology*

Ms. CSERR.

Seminar providing for intensive study of selected areas of physiology. The historical development and experimental bases of current physiological concepts will be emphasized. Topics include: membrane phenomena, neurophysiology, respiration, cardiovascular and renal physiology.

209. *Topics in Respiratory Physiology*

Messrs. JACKSON, HOPPIN, MAGINNISS, BRAMAN.

Detailed consideration of selected current and classical papers in respiratory physiology. Students will present seminars and participate in discussions. The course is open to advanced undergraduate, graduate and medical students and includes participation of postdoctoral fellows.

210. *Biomaterials*

Messrs. GALLETTI, CHIU, RICHARDSON and SASKEN.

The course will provide an overview of the materials considered as "biocompatible," i.e. capable of performing their role without compromising their environment; the strategies which favor positive interactions with hard and soft tissues; and the techniques employed in implant preparation, insertion, retrieval and evaluation. The disciplines involved include polymer chemistry, metallurgy, physiology, experimental surgery, cell biology and pathology. Alternates with Biomed 218.

214. *Principles in Experimental Surgery*

Messrs. HOPKINS, TRUDELL and STAFF.

An introduction to the principles and techniques of anesthesia, asepsis and surgical operations required for the preparation of animal models used in laboratory investigation. Techniques are introduced which elucidate essential principles and provide specific experimental models. Both standard experimental models and preparations developed in areas of students' specific research interests are used. Students should have a knowledge of physiology at the level of Biomed 117 or equivalent. Written permission.

218. *Theory and Technology of Artificial Internal Organs*

Messrs. GALLETTI, RICHARDSON and TRUDELL.

An introduction to the concept, design and development of mass transfer devices and energy transfer devices commonly known as artificial heart, lung, kidney, pancreas, liver and placenta. In addition to lectures and seminars, laboratory projects offer the student an opportunity to participate in the evaluation of prosthetic devices. Alternates with Biomed 210.

Biochemistry, Biochemical Pharmacology

220. *Bioenergetics*

Mr. BIGGINS.

Experimental and theoretical aspects of bioenergetics will be treated at an advanced level. Particular emphasis will be placed on electron transfer and energy coupling systems in mitochondria, chloroplasts, and micro-organisms. The course format will include introductory lectures by the staff and student-faculty seminars dealing with current research. Where possible advanced experimental techniques will be demonstrated. Offered in alternate years.

225. *Enzyme Chemistry*

Mr. CHA.

Principles of enzyme purification and assay, advanced treatment of kinetics and the mechanism of enzyme action. Topics include: derivation and analysis of the rate equations, initial velocity and product inhibition studies, effect of modifiers, subunit interactions, effect of pH, isotope exchange studies and reaction mechanisms. The course combines lectures with seminars. Offered in alternate years.

Development, Embryology, Evolution

232. *Topics in Developmental Biology*

The STAFF.

A critical evaluation of current research in developmental biology in a seminar or discussion group format. A specific topic is selected each year for detailed analysis.

234. *Continuity of Cytoplasmic Organelles*

Mr. HOLOWINSKY.

Inheritance and development of plastids and mitochondria. A critical review of pertinent research literature concerning the nature and informational content of organellar genomes, functional and structural differentiation of the organelles, regulatory interactions among various intracellular compartments, and theories of their possible evolutionary origin. Offered in alternate years.

Molecular Biology, Microbiology, Immunology

242. *Mathematics Models in Biology* (Applied Mathematics 222)

Messrs. KINGSOLVER and BANKS.

254. *Advanced Immunology*

The STAFF.

Original immunological research articles will be assigned and subsequently critically evaluated in class discussions. Students will be required to write a hypothetical research proposal and to defend it in an oral presentation. Offered in alternate years.

256. *Biochemical Genetics*

The STAFF.

Selected topics gathered from the current literature dealing with biochemical genetics in its broadest sense are analyzed. Recent topics have included somatic cell genetics, structure-function relationships of genetic regulatory elements, recombinant DNA techniques, ribosomal DNA, genetic dissection of microbial physiology. Offered in alternate years.

Neurobiology

264. *Physiology of Smooth Muscle*

Mr. BIANCANI and Ms. MARSHALL.

Contractile properties of gastrointestinal, genitourinary and vascular smooth muscle, particularly the biophysical and neural mechanisms for contraction. Emphasis on current research and literature. Open to graduates and students with appropriate backgrounds in physiology or bioengineering. Prior interview with instructors recommended. Offered in alternate years.

266. *Topics in Visual Physiology*

Mr. MCILWAIN.

Selected topics in visual physiology are examined through a close and critical reading of original research articles. Emphasis is on the optical, anatomical and physiological bases of visual function, particularly as they are related to transformations of spatial information. Primarily for graduate students with a strong background in neuroscience and a working knowledge of the anatomy and physiology of the mammalian visual system. Offered in alternate years.

General Offerings

291, 292. *Thesis*

The STAFF.

293, 294. *Special Topics*

The STAFF.

295, 296. *Graduate Independent Study*

The STAFF.

297, 298. *Seminar*

The STAFF.

Community Health

Courses for concentration credit in Health and Society.

BI/C007. *Community Health in an Environment of Cost Constraints*

Messrs. LEWIS, SMITH and STAFF.

Focus is on the structure and functioning of the health care system in U.S. Communities in an era of escalating health care costs. We will study how the health care system in the U.S. evolved historically, the major forces now at work that will influence its future, and alternative systems of health care and their impact on consumers, third party payers, employers, health providers, and society. No prerequisites. Freshmen and sophomores only; upperclassmen by written permission only. Enrollment limited to 20.

BI/C023. *Culture and Health* (Special Themes 105)

Ms. NEWMAN.

BI/C031. *Health and Society — Health Care in the U.S.*

Ms. MONTEIRO.

An introduction to Health and Society for concentrators and other interested students. Utilizing interdisciplinary collaboration, the course emphasizes the ramifications in society of health care activities; in the process, it will serve to introduce students to the basic scholarly disciplines which relate to health in society from the varied points of view of scholars, administrators, practitioners, and planners.

BI/C034. *Health and Human Reproduction: Anthropological Perspectives*

Ms. NEWMAN.

Review of anthropological perspectives on the human life cycle and health behavior relating to human reproduction. Cultural aspects of life cycle events will include fertility and fertility regulation, family formation and kinship structure, medical management and health care providers, ritual recognition of status change, pregnancy and birth, early human learning and interaction. While there are no required prerequisites, BI/C031 and ST/0105 are recommended. Offered in alternate years.

BI/C035. *Family and Medicine*

Ms. RETSINAS.

Will introduce a family-centered paradigm of medicine, where the role of the family in the etiology, impact, and treatment of illness will be considered. Each student will work with a family through the Family Care Center at the Pawtucket Memorial Hospital. This will provide the student with first-hand experience for evaluating the validity of the paradigm. The prerequisite is either an introductory biomed or introductory sociology course.

BI/C036. *The Hospital: Perspectives on a Social Institution* (Special Themes and Topics 36)**Ms. MONTEIRO.**

The modern hospital is an integrating part of and perhaps the center of the health delivery system in the United States. This social institution will be examined through the study of sociological and literary works on the hospital and through optional observation in the hospital. Emphasis on the relationship of the hospital to the health care system, health policy, funding for hospital care, and societal constraints on the hospital. The emerging role of for-profit hospital corporations will be discussed.

BI/C132. *Social Science Research in Health Care***Mr. FULTON.**

Emphasizes the development of sociological/demographic/epidemiological research skills appropriate to the health care field. Built around individual student survey projects with secondary emphasis on demographic and epidemiological measures. Intended as a junior-level course in preparation for the senior research projects of concentrators in Health and Society. Prerequisites: introductory statistics.

BI/C134. *Analytic Skills for Evaluation Research***Messrs. MOR and FULTON.**

A laboratory course presenting advanced analytic skills in health care evaluation research. Laboratory assignments include tests of group comparability, cleaning data sets, index construction, reliability, construct validity, correlation, partial correlation, experimental design, sample attrition, analysis of variance, and analysis of covariance. Prior experience with statistical software packages is strongly recommended. Prerequisites: Introductory statistics (Sociology 110 or equivalent); C132. Written permission.

BI/C168. *Social and Community Medicine***Messrs. CONSTANTINE and WACHTEL.**

A series of seminars in health care delivery including the various modes of health care delivery, i.e., hospitals, group practice, solo practice, health insurance, foreign medical systems, and public health responsibilities, with emphasis on primary care.

BI/C191. *Health and Society Senior Seminar***Mr. WESSEN.**

An intensive study of the research literature concerning a problem area in the field of this concentration. Required of all students concentrating in *Health and Society*; others by written permission.

BI/C195, 196. *Independent Study***The STAFF.**

A special project may be arranged in consultation with the Concentration Advisor and the individual faculty sponsor. One semester of independent research is required for concentration.

BI/C211. *Research Methods in Epidemiology***Mr. MORRISON.**

Principles of the design, analysis and interpretation of epidemiologic studies. Considers purposes and goals, planning, measures of disease frequency, experimental and non-experimental approaches, simple and multivariate analysis, and presentation of results. Emphasis is on practical applications; exercises are an integral part of the course. Assumes knowledge of basic probability and statistics.

BI/B071, BI/B072. *Introduction to Human Behavior***Mr. BAUERMEISTER.**

An integrated interdisciplinary study of the science and ethics of human behavior and intervention as reflected in a wide range of bio-psycho-sociological views of man. Seminar type instruction with emphasis on independent reading and writing. Two meetings a week with chief lecturer, one additional meeting in small group settings. Recommended for upperclassmen. Preference will be given to students in the Medical Education Program. No prerequisites. Written permission required. Enrollment limited to 30.

IV. FOR PROGRAM IN MEDICINE ONLY**Core Clinical Clerkships**

- 301. Medicine
- 316. Surgery
- 331A. Obstetrics and Gynecology
- 331B. Pediatrics
- 346. Psychiatry
- 381. Community Health

Integrated Medical Sciences

- 361. Neuroscience I (J. McILWAIN)
- 362. Neuroscience II (S. ARONSON)
- 363A,B. Organ System Pharmacology (R. MIECH)
- 364. Nutrition (M. CALDWELL)
- 369. Introduction to Clinical Psychiatry (E. FINK)
- 370. Introduction to Clinical Medicine (T. GILBERT)
- 371. Cardiology (E. BOUGH)
- 372. Endocrinology (B. LEY)
- 373. Nephrology (G. ABUELO)
- 374. Human Reproduction: Growth and Development (M. ARNOLD, W. CASHORE, D. COUS-TAN, R. HANING)
- 375. Respiratory Disease (M. PASSERO, W. CORRAO)
- 376. Gastroenterology (H. BODENHEIMER)
- 377. Hematology (M. STEINER)
- 378A. Infectious Disease (M. GINSBERG)
- 378B. Supporting Structures (E. LALLY, R. SCHER)
- 379A,B. Systemic Pathology (A. KANE, K. BOEKELHEIDE, N. FAUSTO)

Clinical Elective Offerings

Medicine

- 302A. Clinical Nephrology (DR. ABUELO and STAFF)
- 302C. Clinical Nephrology (DRS. R. SOLOMON, W. TREBBIN, J. CARVALHO, M. WEINBERG, and STAFF)
- 303A. Clinical Dermatology (DRS. McDONALD, ALPER, FLAXMAN, FRAGOLA, KERN, QUEVEDO, RIVERA, SCHER, and BASILE)
- 304C. Clinical Neurology (DRS. McENTEE, and STAFF)
- 304D. Clinical Neurology (DRS. MORGAN, McENTEE, FINELLI, and AMBLER)
- 304F. Consultative Neurology (DRS. FRIEDMAN AND RAFAL)
- 304G. Neurobehavior (DRS. MENDEZ and LILLY)
- 305A. Clinical Gastroenterology (DRS. THAYER, BEHAR, BODENHEIMER and STAFF)
- 305B. Clinical Gastroenterology (DRS. IANNUCCILLI and THAYER)
- 305C. Gastroenterology (DRS. LANCE, RAKATANSKY, and VAN ZUIDEN)
- 306A. Infectious Diseases (DRS. PETER, ZINNER, GINSBERG, MEDEIROS, and STAFF)
- 307A. Electrocardiography (DR. KITZES)
- 307B. Clinical Adult Cardiology (DRS. CHMIELEWSKI, CAPONE, MOST, and STAFF)
- 307C. Cardiology (DR. SHULMAN and STAFF)
- 307D. Coronary Care (DR. CAPONE and STAFF)
- 307E. Cardiology (DR. ARIF and STAFF)
- 307F. Clinical Cardiology (DRS. CARLETON, KHAN, HELLER, AND MIKLOZEK)
- 307G. Clinical Adult Cardiology (DR. K. LABRESH, S. SHARMA, A. SHURMAN, and R. RIFKIN)
- 308A. Introduction to Oncology (DRS. CUMMINGS, A. GLICKSMAN, M. WIEMANN, L. CULLEN, C. DOOLITTLE, R. GOLDBERG, M. DOSNER, M. TEFF and CALABRESI)
- 308B. Clinical Immunology and Oncology (DR. ZAWADZKI)
- 308C. Medical Oncology (DRS. MILLER, LEONE, AND SCHILLING)
- 309A. Rheumatology (DRS. KAPLAN, E. LALLY, HO, and STAFF)
- 310A. Clinical Endocrinology (DR. M. KOPPLEMAN)
- 310B. Clinical Endocrinology (DR. TUCCI and STAFF)
- 310C. Clinical and Endocrinology (DRS. I. JACKSON and R. LAMBERTON)
- 310D. Clinical Endocrinology (DR. B. LEY)
- 311A. Clinical Hematology (DRS. LICHTMAN, MAZUR, SCHIFFMAN, and WITTELS)
- 311C. Clinical Hematology (DRS. STEINER, MILLER, and ANAGNOSTOU)
- 311D. Clinical Hematology and Medical Oncology (DRS. KNISLEY and DiBENEDETTO)
- 311F. Clinical Hematology (DRS. ALBALA, CROWLEY, and STAFF)

- 311G. Clinical Hematology (DR. A. CARVALHO)
- 312A. Clinical Allergy (DRS. SETTIPANE, WELTMAN and D. KLEIN)
- 314A. Pulmonary Diseases (DRS. BRAMAN, CORRAO, FOX, DOWNING, and STAFF)
- 314B. Pulmonary Diseases (DRS. HOPPIN, MCCOOL, and ETTENSOHN)
- 314D. Pulmonary Diseases (DRS. ERIKSON, FEINSILVER, KAEMMERLEN and STAFF)
- 314E. Pulmonary Diseases (DR. PASSERO and STAFF)
- 315A. Advanced Clerkship in Clinical Medicine (DRS. WITTELS, KAPLAN, ERICKSON, ALBALA, LEY, and STAFF)
- 315B. Medical Intensive Care (DRS. HASAN, DONAT, CORRAO, BRAMAN, and STAFF)
- 315C. Ambulatory Care Internal Medicine (DR. KOPPLEMAN and STAFF)
- 315D. Pathophysiologic Concepts in Internal Medicine (DRS. ALBALA, WITTELS, KAPLAN, LEY, and ERICKSON)
- 315E. Critical Care Medicine (DRS. KAYE, and BODEN)
- 315F. Adult Ambulatory Medicine (DRS. WACHTEL, CYR, WARTMAN, NOVACK, REUBEN)
- 315G. Intensive Care Medicine (DR. B. LEY)

Surgery

- 317D. Surgery of the Alimentary Tract (DRS. BOWEN, DORMAN, SHAHINIAN, and SODERBERG)
- 317F. Principles of General Surgery (DR. FELDER)
- 317G. Surgical Intensive Care (DR. SLOTMAN)
- 318A. Orthopedic Surgery (DRS. LITCHMAN, MOTAMED, SILVER, SIMON, and DEUTSCH)
- 318B. Orthopedic Surgery (DRS. HERNDON and STAFF)
- 318C. Psychological Care of Orthopedic Patients (DRS. MARIOREZZI, and SPINDELL)
- 319B. Clinical Principles in Anesthesiology (DRS. MCNAMEE, BARCOHANA, and HAIRABET)
- 319C. Clinical Pediatric Anesthesia (DR. A. WEISSBURG)
- 320A. Neurosurgery (DRS. STOLL, GELCH, LAURELLI, MCOSKER, and WELCH)
- 320B. Neurosurgery (DRS. SELVERSTONE, PETERS and MCLENNAN)
- 321A. Ophthalmology (DR. KINDER and STAFF)
- 321B. Clinical Ophthalmology (DRS. GELTZER, BAHR, and DOWLING)
- 321C. Ophthalmology in a Missionary Hospital (DR. KINDER and STAFF)
- 321D. Clinical Ophthalmology (DRS. SCHINAZI, MCKENDALL, SCHINAZI, and STAFF)
- 321E. Ophthalmology, Office Based Practice (DR. RICHMAN and STAFF)
- 321F. Ophthalmology and Neuro-ophthalmology (DR. E. PERLMAN)
- 322A. Pediatric Surgery (DRS. DELUCA and WESSELHOEFT)
- 323A. Clinical Thoracic and Cardiovascular Surgery (DRS. KARLSON, COOPER, RIEMER, and SINGH)
- 323B. Principles of Cardiovascular and Thoracic Surgery (DRS. YASHAR and YASHAR)
- 323E. Endocrine Surgery (DR. MONCHIK and STAFF)
- 324A. Clinical Urology (DRS. LAWLOR, BRESLIN, IANOTTI, MACANDREW, MARCACCIO, MAYNARD, CALLAGHAN, and MOULE)
- 325A. Surgical Oncology (DRS. COLEMAN and ROBIDOUX)
- 326A. Plastic Surgery (DRS. VERSACI, SEXTON, STURIM, EDSTROM, BEVIVINO, and BOWEN)
- 326C. Advanced Clerkship in General Surgery (DRS. HOPKINS, FELDER, HERMAN, and STAFF)
- 326D. Advanced Clerkship in General Surgery (DR. GANN)
- 327A. Introduction to Clinical Otolaryngology (DR. WEXLER)
- 327B. Otorhinolaryngology (DRS. LEKAS, MCNELIS, BELLINO, BHAT, MCRAE, NIGRI, REGAN, WEXLER, and LANGENBRUNNER)

Pediatrics

- 332A. Pediatric Hematology-Oncology (DRS. FORMAN, FARNES, BARKER, and SMITH)
- 333A. Clinical Pediatric Neurology (DRS. SHETTY and BRUNGUILL)
- 335B. Child Development and Developmental Disabilities (DR. PUESCHEL, and STAFF)
- 335D. Adolescent Medicine (DR. RIGGS)
- 336A. Introduction to Pediatric Cardiology (DRS. WERNER, SINGH, and ROMPF)
- 336B. Pediatric Infectious Diseases (DRS. PETER and DENNEHY)
- 337A. Pediatric Endocrinology (DRS. ARNOLD and ORSON)

- 338A. Ambulatory Pediatrics (DR. O'SHEA and STAFF)
- 338B. The Care of Children and the Practice of General Pediatrics (DRS. BELLIN, FORMAN, BARRETT, GIUNTA, MARKS, MONTGOMERY, ORSON, O'SHEA, ROSENBERG, STEARN, TOSELLI, AND UTTER)
- 339A. Perinatal Medicine (DRS. OH, CASHORE, COWETT, WIDNESS, and STONESTREET)
- 339B. Maternal-Fetal Medicine (DR. D. COUSTAN)
- 340A. Advanced Clerkship in Pediatrics (DR. SMITH and STAFF)
- 341A. Clinical Gynecology (DRS. LATHROP, ANDERSON, and STAFF)
- 344A. Introduction in Gynecologic Oncology (DRS. McDUFF, LATHROP, TEFF and CALEBRESI)

Psychiatry

- 347B. Advanced Clerkship in General Psychiatry (DR. FINK)
- 348B. Treatment of Persons with Alcohol Problems (DRS. NOEL and FINK)
- 348C. Diagnosis and Management of Alcohol and Drug Related Problems (DRS. LEWIS, FEMINO and FOX)
- 348D. A survey of Medical and Community Interaction Strategies for the Alcohol Troubled Person (DR. DIMASE)
- 348E. Clinical Treatment of Alcoholic Families (DRS. LIEPMAN AND NIRENBERG)
- 352B. Community Psychiatry (DRS. SILVER, HAINES, NIRK, LAMBERT, GREENBERG, and STAFF)
- 352C. Family Concepts and Treatment in Medical Practice (DRS. BISHOP, N. EPSTEIN and social work staff)
- 353I. Child Psychiatry (DRS. B. MYERS and G. NIRK)
- 354A. Psychology in Medicine (DRS. DAAMEN AND C. MARTIN)
- 354B. Psychiatry in Medical Practice (DRS. GOLDBERG and SLABY)
- 354D. Psychiatry in a Private Practice Setting (DR. CAPONE)
- 354E. Consultation — Liaison Psychiatry (DR. R. SWIFT)
- 355C. Psychosocial Factors in Cardiology (DRS. MCCARTNEY, FOLLIICK and SHULMAN)
- 356A. Clinical Psychiatric Research (DR. W. BROWN)
- 356B. Therapy of Sexual Problems (DRS. QUALLS and WINCZE)
- 357A. Psychiatry of Late Life (DR. WESTLAKE)
- 358A. Behavioral Management of Chronic Pain (DR. FOLLIICK)

Community Health

- 382B. Chronic Diseases/Rehabilitation/Long-Term Care (DRS. FINDLEY and SPIVACK)
- 382C. Geriatric Medicine (DR. BECK)
- 382D. Rural Community Medicine (DR. J. BENNETT)
- 382E. Occupational Medicine (DRS. MCCUNNAY, KILEY, and PASSERO)
- 382F. Introduction to Geriatrics, A Health Systems Approach (DRS. HOLLMANN, FRETWELL, and GUEST SPEAKERS)
- 382G. Hospice Care of Terminally Ill (DR. BORENSTEIN)
- 383A. Research in Medical Care and Administration (DRS. WESSEN, MONTEIRO, and STAFF)
- 384B. College Student Health (DR. HOFFMAN)
- 385B. Preparation for Clinical Medicine (DRS. GILBERT, CUNNINGHAM, and STAFF)
- 385C. Teaching in Academic Medicine and Medical Practice (DR. T. GILBERT)
- 386. Alternate Modes of Health Care (DR. GREER)
- 386C. The Frontier Nursing Service, Leslie County, Kentucky
- 386E. Mississippi Family Health Center, Jackson, Mississippi
- 386F. Indian Health Service Unit, Hopi Reservation, Keams Canyon, Arizona
- 386G. Blue Hill Memorial Hospital, Hancock County, Maine
- 386I. Rural Health Care Delivery (DR. ST. PIERRE-ENGELS)
- 387A. Emergency Medicine (DR. FRANASZEK and STAFF)
- 387B. Emergency Medicine (DR. KREMBS and STAFF)
- 387D. Emergency Medicine (DR. KAPLAN)

Family Medicine

- 387C. Clerkship in Family Medicine (DR. GILBERT and STAFF)
- 388A. Primary Medical Care in an HMO Setting (DR. CUTLER and STAFF)
- 389B. Issues in Delivery of Primary Health Care (DR. GILBERT and STAFF)
- 389C. Applied Clinical Nutrition (MS. A. LASSWELL, M.S., R.D.)
- 389D. Family Medicine Community Preceptorship (DR. GILBERT)

Pathology

- 391B. Forensic Medicine (DR. STURNER)
- 391C. Applied Pathology (DRS. DIAMOND, DYCKMAN, MEISSNER, and STAFF)
- 391E. Research in Perinatal Pathology (DR. SINGER)
- 391G. Gynecologic Pathology (DR. LAUHLAN and STAFF)
- 391H. Pathology of the Neuromuscular System (DR. ZACKS)
- 391I. Seminar in Developmental and Pediatric Pathology (DRS. SINGER, O'SHEA, AMBLER, and STAFF)
- 391J. Neuropathology and Clinical Correlation (DR. AMBLER)
- 391K. Endocrine Pathology (DRS. MORRIS AND MOONAN)

Radiation Medicine

- 392A. Clinical Radiation Oncology (DRS. GLICKSMAN, TEFFT, and STAFF)
- 392B. Nuclear Medicine (DRS. GANDSMAN, and STAFF)
- 392C. Diagnostic Radiology Preceptorship (DR. UDIS and STAFF)
- 392D. Diagnostic and Nuclear Radiology (DRS. HALLMAN, RYAN, HUDSON, SOLL, JAMESON, and SCHWARTZ)
- 392E. Preceptorship in Diagnostic Radiology (DRS. SCOLA, and CRONAN)
- 392F. Clinical Nuclear Medicine Preceptorship (DR. FRATER and STAFF)
- 392G. Diagnostic Radiology (DRS. COLAIACE and ENTEZARY)
- 392H. Interventional Radiology (DRS. CRONAN and DORFMAN)
- 392I. Nuclear Medicine (DR. CLAUNCH and STAFF)
- 392K. Diagnostic Radiology (DRS. DEUTSCH, RYVICKER, COHEN, and SCHATZ)
- 392L. Computerized Tomography (DR. LAND)

Interdisciplinary

- 393C. Medical Jurisprudence (DR. STURNER)
- 393F. Caring for Terminally Ill Persons (DR. BORENSTEIN and REV. PARKER)
- 393H. Medical Statistics (DR. ARONSON)
- 393I. Analytical and Social Epidemiology (DR. ARONSON)
- 393J. Ethical Issues in Clinical Medicine (DR. LEDERER and REV. BURKE)
- 393K. Occupational Medicine (DRS. PASSERO, McDONALD, KAPLAN, WIEMANN, RYTER, JENKYN, FOX, KILEY, and OTHERS)
- 394H. Biochemical Basis of Pulmonary Disease (DR. PASSERO)

Bio-Medical Ethics

The program in Bio-Medical Ethics is administered by the Committee on Bio-Medical Ethics composed of Professor DAN W. BROCK (Philosophy), Associate Professor EDWIN N. FORMAN (Bio-Medical Sciences), Assistant Professor EDWARD M. BROWN (Psychiatry), Professor JOHN LADD (Chairman; Philosophy), Professor LEWIS P. LIPSITT (Psychology and Bio-Medical Sciences), and Professor SUMNER B. TWISS, JR. (Religious Studies).

UNDERGRADUATE PROGRAMS

The concentration in Biomedical Ethics focuses on interdisciplinary exploration of ethical problems associated with recent advances in biology and medicine and their impact on the individual as well

as on contemporary social and political life. The concentration is intended not only for students interested in a career in the life sciences, but also for those with a general interest in ethical issues arising from biomedical practice and research. Each student in consultation with at least one member of the Committee on Biomedical Ethics devises a concentration program. The student presents for approval by the Committee a written statement of the objectives of the program and a list of component courses. The program is expected to have a firm foundation in ethics and in the biomedical sciences. Each concentration program must have a total of 10 courses including: 1) at least two courses in ethics selected from Philosophy 19, 50, 55, 164, and Religious Studies 22, 125, 128; at least one of these must be Philosophy 158 or 164 (preferably by the end of the sophomore year); 2) at least two courses in biomedical science selected from Biomedical Sciences 46, 47, 108, 109, 117, 122, 124, 125, 126, 127, 128, 129, 130, 131, 132, 141, 142, 146, 148, 151, 158; one of these courses may be 11, 12, 81, 91, or 92; 3) at least two advanced courses in Biomedical Ethics. Students are also strongly urged to take at least one related course in the social sciences, such as Sociology 155 or Economics 136. Other recommended courses include Philosophy 51, 56, 65; Religious Studies 123, 138, Anthropology 281, and University 123. With the approval of the Committee other relevant courses in psychology and the social sciences, independent and group study projects, or graduate seminars may be used as part of the concentration program. A concentration in Biomedical Ethics with Honors requires, in addition, an Honors thesis (Biomedical Ethics 192, during one semester of the senior year) directed by a member of the Committee on Biomedical Ethics. Students interested in this concentration should contact Mr. Ladd in the Department of Philosophy.

FOR UNDERGRADUATES AND GRADUATES

Two courses from among Bio-Medical Ethics 150, 151, 152, 154, 155 and 156 will be offered in each year.

150. *Topics in Bio-Medical Ethics*

Messrs. LADD and FORMAN.

An interdisciplinary seminar devoted to an exploration in depth of some of the ethical problems arising out of medical care and delivery of health services. Particular topics to be covered include: a) the doctor/patient relationship; b) the notion of "informed consent"; c) ethical problems relating to death; d) the allocation of medical resources; e) ethical issues in health maintenance. Written permission required. Prerequisite: one course in ethics; previous work in bio-medical science desirable. S/NC.

151. *Ethical Problems in the Field of Mental Health*

Mr. BROCK.

This course will investigate a wide range of ethical problems which arise in the areas of mental health such as: the use of concepts of health, disease, cure, indoctrination, etc. in psychiatry; informed consent for treatment; involuntary treatment and commitment; privacy and confidentiality in mental health care; labeling and stigmatization of patients; behavior modification and control. Prerequisite: one course in ethics. Written permission required; inquire at Gerard 201.

152. *Ethical Issues in the Research and Use of Bio-Medical Technology*

Mr. TWISS

Ethics of Human and Animal Experimentation. Addresses issues including the moral justification for research on human subjects, the conflict between the rights of the individual versus the needs of the population, and the rights and protections accorded to nonhuman experimental subjects. Prerequisite: one course in ethics and prior course work in bio-medical sciences. Written permission required.

154. *Ethical Issues in Preventive Medicine*

Mr. LADD.

Concerned with questions relating to individual and social responsibility for promoting, maintaining and protecting health. Examines the concept of health and its relationship to medical science, to cultural norms, to ethics and to theory of value in general. Specific cases involving preventive medicine will be studied with a view to understanding their ethical implications. Ethical problems relating to the nature and types of control that are permissible and desirable in a democratic society will be considered. Written permission required. Prerequisite: one course in ethics. S/NC.

155. *The Rights of Children in Pediatric Medicine*

Mr. FORMAN and Mr. TWISS.

Moral dilemmas in the medical care of children and the concepts and arguments offered by philosophers to help resolve the dilemmas. The concept of rights and its application to the unborn, to future generations, to defective newborns, to experimentation with children and fetuses, to decision-making by parents and adolescents, to behavior modification and the use of drugs, and to the management of the dying child. Prerequisites: one course in ethics; one course in Bio-Medical Sciences.

156. *The Aims of Medicine*

Mr. LADD.

The aspects of philosophy of science relevant to contemporary medicine and the ethical implications of any particular philosophy of medicine. Typical issues are: the distinction between illness and disease; autonomy and reductionism in medical science; theories of medical explanation; the logic of diagnosis; and the social dimensions of medical science. No special knowledge of medical science will be presupposed. However, one course in biomedical science and one course in ethics are prerequisites. Written permission required. S/NC.

191. *Individual Study Project*

Directed reading and research in bio-medical ethics. Members of the Committee. Prerequisite: one course in Bio-Medical Ethics.

192. *Thesis Preparation*

Required of students in the Honors program. Open to others only by permission of the Committee. Members of the Committee. Prerequisite: one course in Bio-Medical Ethics.

Chemistry

Professors BAIRD, CANE (Chairman), CARPENTER, EDWARDS, ESTRUP, GREENE, LAWLER, MASON, PARKER, RIEGER, RISEN, STEIM, WOLD; Associate Professors DIEBOLD, LUSK, SWEIGART; Assistant Professors ANDERSON, MARICQ, SQUILLACOTE, STRATT, SUGGS, WILLIARD; Lecturer, Ms. MORSE.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

Chemistry. Foreign Language: A reading knowledge of one or more modern languages: German, Russian, or French are recommended. The requirements may be satisfied by: (1) presenting two years of credit upon entrance, or (2) passing a 3-level course in one of these languages, or (3) passing a 1R-2R sequence in one of the languages.

Courses: Chemistry 21, 22, 25, 26 or 31, 35, 36 plus 50, 114, 113 or 115, plus three advanced electives. Note that differential and integral calculus and physics are prerequisites for Physical Chemistry (113, 114, and 115).

See also descriptions of standard interdepartmental concentration programs in Biochemistry, and Geology-Chemistry.

STANDARD CONCENTRATION PROGRAMS FOR THE BACHELOR OF SCIENCE DEGREES

Chemistry. Foreign Language: Same as for the Standard Concentration Program for the Bachelor of Arts degree in Chemistry (see above).

Courses: Twenty semester courses in Chemistry, Mathematics, and Physics with a minimum of ten semester courses in Chemistry, four semester courses in Mathematics and two semester courses in Physics. One of the Chemistry courses must be Chemistry 97, 98 or independent study approved by the Department. Approved courses in Biological and Medical Sciences (at the 100-level or above), Computer Science, Applied Mathematics, Geological Sciences, and Engineering may be substituted for some of the twenty.

Other Specific Requirement: Six courses in the Humanities or Social Studies

Biochemistry. Foreign Language: Same as for Chemistry (see above).

Courses: Twenty semester courses in Biology, Chemistry, Mathematics, and Physics with a minimum of four semester courses in Biology (generally including Biomed 126 and a course in molecu-

lar biology, e.g. Biomed 151, 127, or 105), seven semester courses in Chemistry (generally including Chemistry 21, 22, 25, 26 or 31, 35, 36 plus 113, 124, and 127), three semester courses in Mathematics or Applied Mathematics, two semester courses in Physics, and one (preferably two) independent study courses (Biomed 195, 196 or Chemistry 97, 98).

Other Specific Requirement: Six courses in the Humanities or Social Studies.

Honors. Candidates for Honors should enroll in the Honors program prior to the Senior year. In the senior year, the program will generally include Chemistry 97, 98 or Biomed 195, 196.

Leallyn B. Clapp Prize. An award in chemistry for an undergraduate thesis of outstanding merit.

GRADUATE PROGRAMS

The graduate program in chemistry is intended for students of exceptional ability and interest who wish to study for the degrees of Master of Science and Doctor of Philosophy. Admission to graduate study is usually limited to candidates for the doctor's degree. The thesis, based on original research, may be written in the field of biochemistry, inorganic, organic, or physical chemistry. The research program is the most important, as well as the most stimulating, part of graduate study and is initiated in the first year. Formal instruction stresses fundamental principles and developments; it may include courses in mathematics, physics, and biology, as dictated by the student's interests and preparation. In addition, regular and informal seminars are conducted by the students and the staff in which research and other topics of current interest are discussed. Departmental colloquia are held throughout the year for outstanding chemists from universities and industries to present and discuss their work.

The Chemical Laboratories in the new research building provide generous laboratory space for each student. Among other facilities, they house an excellent shop staffed with skilled instrument makers, a glassworking shop with an able glassblower, and an electronics shop supervised by an expert electronics technician. The laboratories are well equipped with modern instruments which are supervised by a specialist in chemical instrumentation.

Admission to graduate study in chemistry is normally accompanied by the award of a teaching assistantship. Assistants devote about twelve hours per week to the supervision of undergraduate laboratories, which allows three-quarters of their time for research and study. Several University Fellowships are available to entering students. Research fellowships are seldom awarded for the first year, but are available for the later work of qualified doctoral candidates; they provide for full-time research and study. Summer research fellowships are available to graduate students in good standing. Candidates for the Ph.D. degree must have at least one year's experience in teaching (usually as a teaching assistant.)

Research in experimental physical and inorganic chemistry is conducted in a number of fields for which the laboratory is especially well equipped. These include: (1) molecular and crystal structure determination, utilizing spectroscopic and x-ray techniques; (2) molecular interactions and energy transfer, studied using the optical properties and dielectric behavior of matter; (3) studies of elastic, inelastic, and chemically reactive scattering with molecular beam techniques; (4) study of surfaces by electron diffraction, Auger electron spectroscopy, photoemission and related techniques; (5) observation of excited and transient molecular states by radiofrequency and optical methods; (6) studies of vibrational spectroscopy; (7) the structural and thermodynamic properties of materials; (8) catalysis of metalloporphyrin reactions; (9) spectra and magnetism of rare earth and transition metal complexes; (10) magnetic resonance studies of the chemistry of transition metal complexes; (11) reactions of and catalysis by transition metal complexes; (12) kinetics and mechanisms of inorganic reactions; (13) laser induced fluorescence studies of vibration-to-electron energy transfer and chemical reaction dynamics, (14) spectroscopy and reaction dynamics of ions; and (15) solid state chemistry.

The department is also active in theoretical research. Various chemical applications of quantum and statistical mechanics are being pursued. Among these are: (1) the study of transport properties in gases; (2) the statistical mechanics of molecules in solution and (3) the nature and properties of surfaces.

Research in organic chemistry includes work on the mechanisms and stereochemistry of organic reactions and on the synthesis, reactions, and bioorganic role of several classes of compounds. Areas of particular emphasis include (1) synthesis of natural products; (2) biosynthesis of natural

products; (3) synthetic methods; (4) organometallic reactions; (5) chemically induced dynamic nuclear polarization (CIDNP); (6) biochemical reaction mechanisms; (7) environmental chemistry; (8) radical chemistry; and (9) photochemistry.

Research in biochemistry emphasizes the structure and function of biological membranes and the mechanism of enzyme reactions. Current research includes studies of (1) the mechanisms of active transport and oxidative phosphorylation; (2) the development of active-site directed enzyme inhibitors and the mechanism of oxygenases; (3) the physio-chemical properties of phospholipids, lipoproteins, and biological membranes.

THE POTTER PRIZE IN CHEMISTRY

A fund of \$5,000 was established in 1942 under the will of William R. Potter. The income is awarded annually to the graduate student in chemistry who submits a doctoral thesis of outstanding merit.

I. PRIMARILY FOR UNDERGRADUATES

12. *Organic Chemistry*

Messrs. SQUILLACOTE, SUGGS, and WILLIARD.

Chemistry 12 will not be offered after 1985-86. Sequel to Chemistry 11. Attention to the constitution, properties, and reactions of additional classes of organic compounds at a fundamental level. The laboratory work is largely concerned with identification of organic compounds. Prerequisite: Chemistry 11.

21. *Introductory Chemistry*

Messrs. CARPENTER, MARICQ, RISEN and STEIM.

Stoichiometry, bonding and structure, solution chemistry, thermochemistry, introduction to kinetics. Prerequisite or corequisite: Mathematics 9. Three hours of lecture and four hours of conference and laboratory.

22. *Thermodynamics, Reactions, and Inorganic Chemistry*

Messrs. BAIRD, EDWARDS, and WOLD.

Kinetics and reactions, chemical thermodynamics, and inorganic chemistry. Three hours of lecture and four hours of conference and laboratory. Prerequisite: Chemistry 21.

25. *Chemistry of Organic Compounds*

Sequel to Chemistry 22. An introduction to functional group chemistry, stereochemistry, and synthesis of organic compounds with emphasis on their bonding and reactions. Laboratory: introduction to organic laboratory techniques and synthesis and properties of representative compounds. Three hours of lecture and five hours of laboratory. Prerequisite: Chemistry 22. (To be offered in 1986-87).

26. *Chemistry of Organic Compounds*

Sequel to Chemistry 25. The chemistry and preparation of organic compounds, including amino acids, sugars, and natural products. Laboratory: organic analytical techniques and identification of organic compounds. Three hours of lecture and five hours of laboratory. Prerequisite: Chemistry 25. (To be offered in 1986-87).

31. *Chemical Structure, Kinetics, Equilibrium and Analysis*

Messrs. RIEGER and STRATT.

Introduction to electronic and molecular structure, chemical kinetics and reaction mechanisms, solution equilibrium, electrochemistry, and separation techniques and applications to chemical analysis. Three hours of lecture, one hour of conference and four hours of laboratory. Enrollment limited to 100 students. Prerequisite: Mathematics 9 or equivalent and written permission of the instructor. Intended primarily for those students contemplating concentration in chemistry, biochemistry, or chemical engineering. Placement is determined on the basis of AP or Chemistry Achievement examination scores. May not be taken in addition to Chemistry 21/22.

35. *Organic Chemistry*

Messrs. ANDERSON and SQUILLACOTE.

Sequel to Chemistry 31. The constitution and properties of the different classes of organic compounds, with considerable attention to reaction mechanisms. The laboratory work involves an introduction to the major preparative and analytical techniques of organic chemistry and the preparation

of representative organic compounds. Three hours of lecture and five hours of laboratory. Enrollment limited to 100 students. Prerequisite: Chemistry 31. Intended primarily for those students contemplating concentration in chemistry, biochemistry, or chemical engineering. May not be taken in addition to Chemistry 25.

36. *Organic Chemistry*

Sequel to Chemistry 35. Constitution and properties of organic compounds at a fundamental level. Introduction to physical organic, bioorganic, and synthetic organic chemistry. Laboratory work concerned with the identification and characterization of organic compounds, including modern instrumental methods. Three hours of lecture and five hours of laboratory. Enrollment limited to 100 students. Prerequisite: Chemistry 35. Intended primarily for those students contemplating concentration in chemistry, biochemistry, or chemical engineering. May not be taken in addition to Chemistry 26. To be offered September 1986.

50. *Inorganic Chemistry*

Mr. RIEGER.

The chemistry of main group and transition metal elements with an emphasis on bonding and molecular structure. Three hours of lecture and five hours of laboratory attendance. Prerequisite: Chemistry 12 and written permission.

97, 98. *Research*

The STAFF.

II. FOR UNDERGRADUATES AND GRADUATES

106. *Advanced Inorganic Chemistry*

Mr. WOLD.

This course will deal with the chemistry of solids. Emphasis will be placed on the relationship between structure and the electronic properties of compounds which find use in a number of important industrial applications. Among the materials to be discussed will be semi-conductors, ferro- and ferrimagnetic compounds and several groups of catalysts used in the production of sulfur-free hydrocarbons from coal and petroleum. The laboratory part of the course will consist of individual research problems tailored to the needs of the individual student. Prerequisite: Chemistry 15 or 50.

113. *Physical Chemistry* (formerly 63)

Messrs. GREENE and STEIM.

The elements of classical physical chemistry. Chemical thermodynamics with applications to phase and solution equilibria; electrochemistry; transport phenomena; polymers; surface phenomena; reaction kinetics. Recommended for students in the biomedical sciences as well as in chemistry. Three hours of lecture and five hours of conference and laboratory attendance. Prerequisite: Chemistry 12, or 26 or 36, Mathematics 10. Prerequisite or corequisite: Physics 4, 6 or equivalent.

114. *Physical Chemistry: Quantum Chemistry*

Messrs. ESTRUP and GREENE.

An introduction to the quantum theory of chemical systems. Elements of non-relativistic quantum mechanics; electronic structure of atoms and molecules; study of molecular structure by spectroscopy and other techniques; chemical bonding. Fifth semester course for concentrators in chemistry. Three hours of lecture and four hours of laboratory attendance. Prerequisites: Chemistry 3, 5, or 31 or 21 and 22. Mathematics 29, or equivalent. Physics 4, 6 or equivalent.

115. *Physical Chemistry: Thermodynamics and Statistical Mechanics* (formerly 151)

Messrs. MASON and STRATT.

An introduction to the equilibrium and non-equilibrium behavior of physico-chemical systems from the microscopic point of view. Elements of kinetic theory and statistical mechanics; derivation of the laws of thermodynamics and selected applications. Recommended sixth semester course for chemistry concentrators. Three hours lecture and eight hours laboratory attendance. Prerequisite: Chemistry 114 or written permission.

124. *Biochemistry*

Mr. ANDERSON.

A close examination of several aspects of biochemistry emphasizing the relationship between chemical structure and biological function. Topics will be chosen from the following: protein structure, enzyme mechanisms, regulation, biosynthesis, and membranes. Prerequisite: Biomed 126.

127. *Biochemistry Laboratory*

Ms. LUSK.

Proteins, nucleic acids, carbohydrates and lipids will be isolated and their properties and metabolism will be studied. Techniques will include ion exchange, thin layer and gas chromatography, spectrophotometric assays, gel electrophoresis, cell fractionation, and the use of radioisotopes.

One lecture and nine hours of laboratory attendance. Prerequisite: Biomed 126 and written permission.

145. *Advanced Organic Chemistry*

Ms. PARKER.

The use of conformational analysis and elementary results from molecular orbital theory to explain the reactions of organic and organometallic molecules. The laboratory will include the isolation and synthesis of natural products and the use of infrared and nuclear magnetic resonance spectrometers. Ten hours laboratory attendance. Prerequisite: Chemistry 12.

156. *Topics in Advanced Chemistry*

The STAFF.

Lecture units on topics of current interest in chemistry, varying from year to year. The number of units taken may be arranged so that one course credit may be earned in one semester or over a period of two semesters. Prerequisite: written permission.

162. *Quantum Chemistry*

Mr. ESTRUP.

Identical to the lecture portion of Chemistry 114 plus additional written work. Prerequisite: written permission.

III. PRIMARILY FOR GRADUATES

201. *Advanced Thermodynamics*

The fundamental principles of thermodynamics are developed and applied to homogeneous and heterogeneous systems including those in which chemical reactions may take place or on which external forces may act. Offered every year, but taught alternately by the Engineering and Chemistry departments (Engineering 273). To be offered in 1986-87.

202. *Statistical Mechanics*

Introduction to the statistical mechanics of equilibrium phenomena for classical and quantum-mechanical systems. Ensemble theory: fluctuations; statistical interpretations of the laws of thermodynamics; applications to ideal and real gases, chemical equilibrium, simple crystals, magnetic and dielectric materials, radiation, and condensation phenomena. Offered every year, but taught alternately by the Engineering and Chemistry departments (Engineering 274). To be offered in 1986-87.

221. *X-ray Crystallography*

Mr. CARPENTER.

The determination of atomic arrangements in crystals, molecules, and ions by x-ray diffraction and related methods. Offered in alternate years.

231. *Advanced Inorganic Chemistry*

Mr. SWEIGART.

Modern synthetic inorganic and organometallic chemistry, emphasizing topics of current research interest such as rare gas compounds, bioinorganic chemistry, oxidative addition reactions, and homogeneous catalysis.

232. *Physical Inorganic Chemistry*

Mr. RISEN.

Electronic structure of inorganic molecules, with particular attention to coordination and organometallic compounds. Spectra, structure, and magnetism of inorganic compounds and materials.

241. *Physical Organic Chemistry*

Mr. SQUILLACOTE.

Principles of chemical bonding, of electron displacements within molecules, of steric effects of reactivity, of isotope effects, and of conformational analysis. Basic mechanisms of ionic and radical reactions.

242. *Synthetic Organic Chemistry*

Mr. SUGGS.

A survey of the classes of reactions used in synthesis. Emphasis on mechanisms and multi-step schemes; use of the organic chemistry literature.

243. *Topics in Organic Chemistry*

Mr. WILLIARD.

Advanced topics of current interest, varying from year to year.

277, 278. *Quantum Mechanics*

Messrs. MARICQ and BAIRD.

The principles of quantum mechanics are developed systematically, making considerable use of group theory, and applied to such problems as chemical bonding theory, molecular spectroscopy, chemical reactivity, and other topics of interest to chemists.

281, 282. *Seminars*

The STAFF.

Discussions by staff members and graduate students of topics of current interest. No credit.

287, 288. *Department Colloquia*

Invited speakers from other institutions. No credit.

291, 292. *Special Topics in Chemistry*

292A Chemistry and Physics of Surfaces

Messrs. ESTRUP and GREENE.

Discussion of the nature of surfaces and the techniques by which they may be studied. Topics to be covered include: geometric and electronic structure, bonding of adsorbed species, and kinetics of adsorption, diffusion and reaction. Intended for seniors and graduate students in chemistry, engineering, and physics. Prerequisite: written permission.

292B Special Topics in Inorganic Chemistry

Mr. EDWARDS.

The course will focus on the physical-inorganic chemistry of the main group elements. Specific areas will include reaction mechanisms, bio-inorganic chemistry, ligand displacement processes, and pi-bonding.

297, 298. *Research*

The STAFF.

Credit to be arranged.

Child Study Center

The Child Study Center — Founded in 1967, to succeed the Institute for Life Sciences, its initial responsibility was that of administering Brown University's participation in a large research program on the birth and development of infants born at Women and Infants Hospital of Rhode Island. A total of 4,000 children were extensively studied to eight years of age. Special sub-groups of these children are now followed up as adolescents and young adults. The follow-up unit, now located on the grounds of Butler Hospital, is the focal point of such studies, and serves also as a location for studies of newly born infants. Ongoing research within the Child Study Center includes studies of (1) sensory and learning development of infants and young children, (2) effects of perinatal risk factors, including adverse health behavior, on development, (3) crib death and its causes, (4) the precursors in adolescents of depression, suicide, and antisocial behavior, and (5) cultural determinants of birth style.

The Child Study Center provides laboratory resources for post-doctoral studies, graduate and undergraduate students, and for faculty members to engage in interdisciplinary studies relating to child development and behavior.

The Director of the Child Study Center is Dr. Lewis P. Lipsitt, Professor of Psychology and Medical Science.

Classics

Professors BOEGEHOLD, COOK,¹ DONOVAN,² FORNARA, HOLLOWAY,³ NUSSBAUM,⁴ PINGREE,¹ PUTNAM, RAAFLAUB (Chairman), SEGAL,¹ TOOMER,¹ WYATT; Assistant Professor NUGENT; Visiting Assistant Professor SCAFURO; Adjunct Assistant Professors HOLLINSHEAD, JOUKOWSKY; Lecturers GOODWIN, MINKOWSKI.

The Department provides both specialized training for those who wish to enter graduate school in preparation for a career in scholarship, and a broad liberal education for those of more general interests. Courses are offered in the principal fields of Greek, Latin and Sanskrit language and literature, including elementary courses in all three languages, and also courses in ancient history, classical art and archaeology, ancient philosophy and linguistics.

¹ On leave of absence, 1985-86.

² Dean of Freshmen and Sophomores, 1982.

³ On leave of absence, fall semester, 1985.

⁴ On leave of absence, 1986-87.

The Department of Classics offers graduate work in Greek and Latin literature, Greek and Latin linguistics, Greek and Roman history, classical art and archaeology, and Classics and Sanskrit, all leading to the degrees of Master of Arts and Doctor of Philosophy. The work of the Department is carried on in formal courses, seminars, and guided research, with considerable flexibility in the case of students' special interests and programs. An overall command of Greek and Latin language, literature, and history is stressed. Students are encouraged, especially at the beginning of advanced work, to select their courses from a reasonably wide area of interest, and to take account of appropriate study in related departments, such as Comparative Literature, Egyptology, History, History of Mathematics, Linguistics, Philosophy, Political Science, and Religious Studies. The Department is strongly represented on the Committees for Ancient and Medieval Studies and in the Center for Old World Archaeology and Art.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAMS FOR THE BACHELOR OF ARTS DEGREE

Prerequisites. Students presenting one or two years of Latin for admission may elect Latin 11 or 12; those presenting three or four years may elect a Latin course on the 100-level. Students presenting one year of Greek may elect Greek 11 or 12; those presenting two or three years may elect a Greek course on the 100-level.

Students with no previous preparation in Latin or Greek should register for Latin 1 or A and Greek 1 or A.

Courses: Programs of Concentration may be arranged with emphasis on the ancient languages and literatures, or on ancient history and civilization, or on classical archaeology. There are six standard Concentration programs. All save "Greek and Latin" require the satisfactory completion of eight courses as described below. These programs are flexible, and students are encouraged to discuss their plans with the Concentration Advisor. The introductory courses in Greek and Latin may not usually be counted toward Concentration.

Concentrators are strongly encouraged to integrate their studies in various fields of Classics during their senior year. Such integration may be achieved in various ways: by writing a senior thesis (which can be an Honors thesis) or another major paper (which is more demanding than an ordinary term paper and transcends the subject matter of one particular subdiscipline of Classics), by participating in a seminar for upperclassmen (which will be specifically designed to provide insight into the relationships among various parts of ancient studies), or by undertaking another kind of senior project that achieves the same goals and is acceptable to the Department. Students writing a senior thesis or paper may enroll in the relevant 191 courses.

Classics: 1) one course in Greek or Latin on the 100-level or above; 2) Classics 121, 122 or 131, 132; 3) five other courses in Classics, including classical archaeology, Greek, Latin, or related areas to be approved by the Concentration Advisor.

Classical Archaeology: 1) one course in Greek or Latin on the 100-level or above; Classics 3, 5, 6; four other courses in Classics or related areas approved by the Concentration Advisor.

Greek: 1) Four Greek courses on the 100-level or above, at least one of which is to be Greek 181 or 182; 2) Classics 121, 122 (Greek History); 3) Two additional courses in Classics, including classical archaeology, Greek, Latin, or related courses to be approved by the Concentration Advisor.

Latin: 1) Four Latin courses on the 100-level or above, at least one of which is to be Latin 181 or 182; 2) Classics 131, 132 (Roman History); 3) Two additional courses in Classics, including classical archaeology, Greek, Latin, or related areas to be approved by the Concentration Advisor.

Greek and Latin: 1) Four Latin courses on the 100-level or above, at least one of which is to be Latin 181 or 182; 2) Greek *ditto*; 3) Classics 121, 122 and Classics 131, 132.

Classics and Sanskrit: Four advanced courses in Sanskrit with the provision that two of the courses in Sanskrit may be included among the five additional courses in the Classics required of concentrators in the Classics, or as the two additional courses in the Classics required of concentrators in Greek and of concentrators in Latin, on the approval of the Concentration Advisor. Consult with Professor Pingree.

Honors. Students may earn Honors in each Concentration by presenting a satisfactory thesis, for the preparation of which they will ordinarily enroll in the relevant 191 courses; these courses may

not be used to satisfy the standard requirements for Concentration.

Related Courses. Attention is called to certain courses in allied fields, such as Ancient Studies, Anthropology, Art, Comparative Literature, Egyptology, History, History of Mathematics, Linguistics, Medieval Studies, Modern Languages, Philosophy, Political Science, and Religious Studies which may on occasion be included in a concentration program in Classics.

GRADUATE PROGRAMS

Master of Arts. For admission to candidacy students must present satisfactory evidence of completion of a substantial number of courses in Greek and Latin in their undergraduate program. The graduate program will consist of a minimum of eight courses including at least two Seminars in Greek or Latin or Classics, completion of a thesis which shall be an original investigation of some literary, historical, archaeological or linguistic topic. Competence must be demonstrated in French or German.

Doctor of Philosophy. In the course of residence, the candidate is expected to complete a minimum of four seminars. Before the Preliminary Examination, which is requisite to commencement of a doctoral dissertation, the following requirements must be met:

1. A demonstration of competence in French or Italian and German, established by examination or an honor grade in French or German 2R. Candidates should be competent in at least one of these languages, preferably German, upon entering the degree program.
2. Latin Prose Composition (by examination or successful completion of Latin 115).
3. Greek Prose Composition (by examination or successful completion of Greek 115).
4. Archaeology (by examination or successful completion of Classics 157).
5. History (by examination or successful completion of Classics 121-2, or 131-2).
6. Sight Translation in Latin. Examinations given twice yearly.
7. Sight Translation in Greek. Examinations given twice yearly. Candidates should write these as soon as possible.
8. Teaching practicum: it is an integral part of the graduate training and the professional preparation in Classics to gain teaching experience. Two semesters of teaching are required of all graduate students. This requirement will be satisfied by any form of teaching acceptable to the Department, such as tutoring of individual undergraduates or groups of students, co-teaching a course (or parts of a course) with a faculty member, serving as a teaching assistant, teaching a departmental or a Modes of Thought course, teaching a course in Brown's (or another institution's summer school), teaching a course at another university or college, or participating in any other instructional program of the Department.

The Preliminary Examination will consist of two written examinations, viz. 1) a Greek or Latin author, 2) a second author or topic to be approved in advance by the Graduate Advisor (this topic or author should be Greek if a Latin author is chosen under No. 1, and vice versa), and an oral examination in the history of Greek and Roman literature. After completion of all of the Prerequisites and the Preliminary Examination, and after research into a dissertation topic has begun, and within six months following successful completion of the oral examination, the candidate shall present *viva voce* the dissertation topic to the faculty of the Department for discussion and evaluation. A formal defense of the thesis will be required.

Doctor of Philosophy in Classical Archaeology. In the course of residence, the candidate in classical archaeology is expected to complete a minimum of four seminars and to pursue the archaeological reading list published by the Department. Before the Preliminary Examination, which is requisite to commencement of a doctoral dissertation, the following requirements must be met:

1. A demonstration of competence in French or Italian and German established by an examination or an honor grade in French or German 2R. Candidates should be competent in at least one of these languages, preferably German, upon entering the degree program.
2. A demonstration of competence in Latin and Greek established by an examination based on a set group of readings in the ancient authors and translation at sight.

The Preliminary Examination will consist of three written examinations, viz. 1) the archaeology of a major period, 2) a special field selected from Greek or Latin epigraphy, Greek or Roman numismatics, sculpture, architecture, ceramics, coroplastics or the topography and monuments of a major

Bronze Age or classical site, 3) Greek or Roman history (successful completion of a course or seminar in Greek or Roman history may be substituted); 4) the fourth examination, normally conducted orally, is a general examination in classical and related prehistoric archaeology.

Students specializing in classical archaeology have the opportunity of participating in the field work of the Brown University Archaeological Expedition to the Mediterranean with the support of travel grants from funds made available to the University by the Ford Foundation for the period 1968 through 1973. In recent years the Expedition has excavated in Athens and at Satrium and Buccino in South Italy, and is currently working at La Muculufa in Sicily.

Doctor of Philosophy in Classics and Sanskrit. The requirements for the degree of Doctor of Philosophy in Classics and Sanskrit will be identical with those for that degree in the Classics with the following differences:

1. The candidate must complete satisfactorily (or give evidence of having completed satisfactorily equivalent courses elsewhere) four advanced courses in Sanskrit.
2. The candidate must complete a minimum of five seminars, two of which shall be in Sanskrit.
3. In the Preliminary Examination, the second part shall be on an author or topic in Sanskrit to be approved in advance by the Graduate Advisor.
4. The dissertation topic shall be one that requires the significant use of material in Sanskrit as well as in Greek and/or Latin.

Related Activities. Graduate facilities at Brown are particularly rich in the fields of Greek and Latin literature, Greek and Roman history and epigraphy, and archaeology. Students may take related courses offered in Art, Comparative Literature, Egyptology, History, the History of Mathematics, Linguistics, Philosophy, and Religious Studies. In addition to normal fellowship support, the WILLIAM MICHAELIDES GRADUATE FELLOWSHIP, established in 1979, is awarded annually to a student who shows outstanding achievement and promise and whose major field preferably is in the area of Greek studies.

Brown University is a supporting institution of both the American School of Classical Studies at Athens and the American Academy in Rome (see page 384). Periods of study at one of these institutions are regularly undertaken by graduate students in the department. Attention is called also to opportunities for study at the American Numismatic Society in New York and various museums, including the Museum of the Rhode Island School of Design.

See also CENTER FOR OLD WORLD ARCHAEOLOGY AND ART (page 296).

I. PRIMARILY FOR UNDERGRADUATES

Classics

(No knowledge of Greek or Latin is required for these courses.)

1. *Great Periods in the Ancient History of Greece* Mr. WYATT.
A study of the political and cultural achievements of the Greek city-state.
2. *Great Periods in the Ancient History of Rome* Mr. WYATT.
A study of the political and cultural achievements of the Roman Republic and Empire.
3. *Foundations of Western Art in Antiquity* MSSRS. HOLLOWAY and WINKES.
Introduction to the fundamental forms and themes of Western Art derived from the Graeco-Roman world. Focuses on the mythological and religious motivation of Greek art; the synthesis of eastern and western ideas under the Roman Empire; and the transformation of the spiritual and esthetic values of antiquity during the Early Middle Ages. Also introduces architecture and figurative arts in terms of style, iconography, and historical context.
5. *Archaeological Field Work* Ms. JOUKOWSKY.
Focuses on the aims, scope, and tools of field archaeology, and the nature of archaeological evidence. Emphasizes interdisciplinary field work techniques and the composition, function, and responsibilities of an excavation staff. Teams will excavate model sites in a laboratory. Exposure to conservation and restoration, materials analysis and computer applications in archaeology.

6. *Archaeological Field Work* (Anthropology 160) Ms. RUBERTONE.
15. *Reason and the Human Good in Ancient Ethical Thought* (Philosophy 15) Ms. NUSSBAUM.
Ancient Greek views about the prospects and limits of reason in the human being's search for a good and valuable life. What the best life is; how, and how far, reason can provide for its rationalization; what social/political conditions it requires, how vulnerable it is (and should be) to uncontrolled happenings. Authors studied include Euripides, Thucydides, Plato, Aristotle, Epicurus, Lucretius, Augustine, Dante.
16. *Nature, Change and the Soul in Ancient Greek Thought* (Philosophy 13) Ms. NUSSBAUM.
Ancient Greek views about the structure of the world of nature and the human being's place in it. The nature and explanation of change; the overall structure and behavior of natural systems; what living creatures are, what faculties they have, and how they are related to the rest of the universe around them. We will read works of the Pre-Socratics (especially Heraclitus, Parmenides, and Zeno), Plato, Aristotle, Epicurus, Lucretius, the Stoics, and the Skeptics.
41. *Ancient Greek Drama* Mr. DONOVAN.
Course will consider (in translation) plays of Aeschylus, Sophocles, and Euripides. Attention will be paid to conditions of original presentation as well as value of plays for modern audiences. Enrollment limited to 20 freshmen who elect to participate in the Curricular Advising Program.
42. *The Ancient Novel*. Ms. NUGENT.
A study of the origin, purpose and themes of the Greek Romance and the Latin Novel. The relation of fiction to epic, drama, satire and history will be examined with special emphasis on Lucian, Chariton, Heliodoros, Petronius and Apuleius.
43. *Roman Art and Architecture* (Art H34) Mr. WINKES.
44. *Greek Art and Architecture* (Art H25) Ms. HOLLINSHEAD.
49. *The Intellectual and the Athlete: The Hero in Classical Literature* Ms. NUGENT.
The concept of heroism as it is developed and modified in Greek epic and tragedy and in Latin epic and novelistic forms. Texts to be read in translation include Homer's *Illiad* and *Odyssee*, Sophocles' *Oedipus* and *Ajax*, Virgil's *Aeneid*, and the *Satyricon* of Petronius. We will examine especially the tension between the hero as military/sports figure and the hero as an individual outstanding for wisdom and/or trickery.
50. *The Emperor Augustus and his Poets* Mr. PUTNAM.
The course will examine, in translation, certain masterpieces of Latin literature: Virgil's *Aeneid*, *Odes* and *Epistles* of Horace, Ovid's *The Art of Love* and *Metamorphoses*. We will study these poems to see what commentary they provide upon issues most pressing during the reign of the Emperor Augustus. Questions considered through this analysis include: the relation of poetry and power, the connection between the imagination and practical politics, the tensions between intellectual freedom and the constraints imposed by society.
51. *Ancient Greek Religion* (Religious Studies 51)
54. *City and Sanctuary in the Ancient World*. Mr. HOLLOWAY.
An examination of the physical dimension of the ancient city and the ancient sanctuary through archaeological evidence with special attention to aesthetic planning, urban planning, and management, the concept of public monumental art as developed in the ancient world, and ancient political theory. Detailed examination of the cities of Athens, Morgantina, and Rome and the sanctuaries of Olympia, Epidaurus and Praeneste.
55. *The Mediterranean Bronze Age* Mr. HOLLOWAY.
The Bronze Age of Crete and Greece studied in relation to foreign influence and internal development. The following topics receive particular attention: the coming of the Greeks, the decipherment of the Linear B script, the stratigraphy of the Palace of Knossos and the dissolution of the Mycenaean kingdoms. No Prerequisite.
58. *The Art and Architecture of Periklean Athens* Mr. HOLLOWAY.
The art of Periklean Athens seen against the intellectual life of the period. Intensive study of monuments of sculpture, painting and architecture and their influence in the ancient world. No Prerequisite.

62. *The Greek Drama in English*

Mr. SEGAL.

A survey of the works and different conceptions of tragedy of Aeschylus, Sophocles, and Euripides. Some attention to ancient comedy. The main emphasis will be on Greek drama as a literary form in its historical and social context. Provision will be made for students of comparative literature who wish to study later influences.

70. *The Beginnings of Political Thought in Ancient Greece*

Mr. RAAFLAUB.

Freshman/Sophomore seminar. The seminar will trace the development of political thought from its very beginnings in the 8th/7th cent. to Athenian democracy in the 5th cent. B.C. It will focus (in translation) on the manifestations of political thought in such literary masterpieces as Homer, Hesiod, Lyric poetry, Aeschylus, Sophocles, Euripides, Thucydides, and on the fragments of the pre-Socratic philosophers and the Sophists.

90. *Myth and Identity*

Mr. SEGAL.

Using classical myth as a focus, a study of how mythic forms and symbols help to understand the self. Modern literature, art, and the film will also be considered. Faculty in other departments may participate for short periods. Fuller description available in Department of Classics. Enrollment limited to 30. Written permission required.

Greek

1, 2. *Essentials of the Ancient Greek Language*

The STAFF.

A two-semester approach to Ancient Greek with special emphasis on developing facility in reading of Greek literature. Selections from Attic Greek authors. No previous knowledge of Ancient Greek is required.

A. *Introduction to Ancient Greek*

The STAFF.

Intensive one-semester introduction to Greek. No previous knowledge of Greek required.

11, 12. *Introduction to Greek Literature*

The STAFF.

An introduction to Greek literature through intensive reading of major authors in poetry and prose. Prerequisite: Greek I or its equivalent. Topic for 11: Plato; topic for 12: Homer.

Latin

1, 2. *Essentials of the Latin Language*

The STAFF.

A two-semester approach to Latin with special emphasis on developing facility in reading Latin literature. No previous knowledge of Latin is required.

A. *Introduction to Latin*

The STAFF.

Intensive, one-semester introduction. No previous knowledge of Latin is required.

5. *Rapid Review of Latin with Selections from Prose and Poetry*

The STAFF.

Designed primarily for students who wish to review their Latin and who wish a rapid introduction to Latin reading.

11, 12. *Introduction to Latin Literature*

The STAFF.

An introduction to Latin literature through intensive reading of major authors in prose and poetry with careful attention to grammar and style. Prerequisite: Latin I or its equivalent. Topic for 11: a) the Foundation Legend of Rome in Livy, Book I, and Virgil, *Aeneid* 8; b) Tacitus' *Agricola* and selections from Silver Latin Poetry.

Modern Greek

1, 2, or A. *Introduction to Modern Greek*

Mr. WYATT and STAFF.

Two or one-semester introduction to practice and reading in Modern Greek language and literature (elementary level).

11, 12, or B. *Modern Greek*

Mr. WYATT and STAFF.

Two or one-semester advanced course in practice and reading in Modern Greek language and literature.

Sanskrit

1, 2. *Introduction to Sanskrit*

Mssrs. GOODWIN and MINKOWSKI.

11, 12. *Intermediate Sanskrit*

Mssrs. GOODWIN and MINKOWSKI.

II. FOR UNDERGRADUATES AND GRADUATES

Classics

111. *Women in Antiquity*

Ms. SCAFURO.

The status of women in ancient Greek and Roman society. Topics include: the vestiges of matrilineal and matriarchal legends in epic and the growth of the patriarchal society: its characteristics (e.g., the heroic ideal, misogyny) and consequences (e.g. sexual antagonism in the Greek family) as witnessed in epic, archaic poetry and Greek tragedy. Legal texts, comedy (Aristophanes, Menander, Plautus and Terrence), oratory, and ancient historical narratives will be studied.

113. *The Archaeology of Early Italy*

Mr. HOLLOWAY.

The archaeology of the Italian peninsula to the Roman expansion and the study of its cultures as products of interacting influences in the setting of Mediterranean prehistory. Particular attention will be given to the problem of Etruscan origins and Greek colonization. No prerequisite.

114. *Archaic Greek Art and Archaeology*

Mr. HOLLOWAY.

115. *Religions of the Hellenistic Age*116. *Ancient Painting*

Mr. HOLLOWAY.

A study of selected topics from Greek painting, both vase painting and new discoveries of wall painting from Italy and Asia Minor, Etruscan tomb painting, Roman wall painting, the art of the Bronze Age, Aegean and paleolithic painting. The significance of graphic design to ancient art in general will be stressed. Prerequisite: one course in ancient art.

117. *Art and Archaeology of Mesopotamia*

Ms. JOUKOWSKY and HOLLINSHEAD.

A cultural and historical survey of Mesopotamia, tracing its origins and developments from prehistory to sixth century Babylon. Both archaeological sites and literature are examined, as works of art and sources for social and political history. Prerequisite: Classics 3/Art 3 (Foundations 12) or equivalent background in archaeology.

118. *The Archaeology of Anatolia and Iran*

Ms. JOUKOWSKY.

An archaeological survey of the origins and development of the Anatolian and Iranian civilizations. Analysis of settlements, history, art, architecture and characteristics of specific archaeological sites and their artifacts ranging from prehistory to the Hellenistic period.

119. *The Archaeology of Palestine*

Ms. JOUKOWSKY.

The prehistory of Palestine (modern Israel, Syria, Lebanon and Jordan) from its beginnings in the Palaeolithic (50,000 B.C.) to the end of the Byzantine period (636 A.D.). A survey of archaeological research in this area will enable the student to understand the art, architecture and mode of life humankind led from age to age, the changes that were introduced in the way of living from one period to another, and the causes and effects that brought about these changes.

121, 122. *The History of Greece from Archaic Times to the Death of Alexander*

(History 135, 136)

Mr. FORNARA.

A detailed examination of the history of the Greeks — political, economic and social — from Homer's time to the death of Alexander and the establishment of monarchy. The ancient sources of our information will be closely and critically studied (in translation).

126. *Plato (Philosophy 126)*

Ms. NUSSBAUM.

Several major works of Plato (Gorgias, Phaedo, Republic, Symposium, Phaedrus, Theaetetus, Sophist) will be studied in translation to understand the nature and development of Plato's thought about the soul, the good life, and knowledge or understanding. Classics students will read selections in Greek and meet once a week to discuss the Greek text; others will do additional reading in translation and will meet once a week for discussion.

126A. *Aristotle (Philosophy 125)*

Ms. NUSSBAUM.

129. *Ancient Medicine and Biology*

Messrs. WYATT and ERIKSON.

A chapter in the history of medical thought. Study of ancient doctrines and beliefs from Homer to Galen, both in Greece and Rome. Special attention to the relation of ethical, and scientific thought to other aspects of ancient culture, primarily philosophical and religious. Those wishing to do reading in Greek should register for Greek 129.

130. *Ancient Greek Political Theory and Practice*

Mr. BOEGEHOLD.

How in the course of three hundred years or so a notion of democracy came into being, how the notion became a form of government, and how the government worked, especially in its most developed form. Selections from Homer, Herodotus, Thucydides, Xenophon, Plato, and Aristotle in translation will trace the changes from kings, to aristocracy, to tyrants, to democracy. No prerequisites. Freshmen and sophomores by permission of the instructor.

131. *Roman History I: The Republic and the Emergence of the Principate*

Mr. RAAFLAUB.

The political and social history of Rome from its origin to the death of Augustus. Special attention to constitutional and ideological developments, to the beginnings of Roman law and historiography, and to other cultural achievements of the period. Aim is to understand the historical causes and specific conditions that led to the unification of the whole Mediterranean world under the rule of one city: Rome. The course work will to a great extent be based on ancient sources, read in translation.

132. *Roman History II: The Empire*

Mr. RAAFLAUB.

The social and political history of the Roman Empire from Augustus to the death of Theodosius the Great (A.D. 395). Main topics: the development of the Empire during the Principate, the organization and administration of the Empire, the economic and cultural effects of the Augustan Peace and the Romanization of the provinces, the barbarian invasions and the crisis of the 3rd century, the transition from Principate to Dominate, Constantine and his successor. Special attention to constitutional history, culture and religion.

134. *Influence of the Classics on English Literature*

The STAFF.

Through selected readings in English Literature and in Greek and Roman classics in translation and by lectures designed to explain the historical and literary significance of these works, this course is planned to introduce the student to the problem of literary influence and assimilation. No prerequisite.

136. *The Concept of Political Freedom in Greek and Roman Antiquity (History 104)*

Mr. RAAFLAUB.

The concept of political freedom came into existence for the first time in the history of mankind in the early 5th century B.C. in Greece. The developments of this fundamental concept will be traced from its beginnings through antiquity on the basis of the interpretation of the main texts (in translation) and in close connection with the social and political history of Greece and Rome. Students without background in ancient history are welcome but are required to participate in a "history section."

151. *Greco-Roman Historiography*

Mr. FORMARA.

Topics covered: the origin of "historical thought," pre-Herodotean historiography, Herodotus, Thucydides, Polybius. Study will be made of the Roman annalistic tradition, and its fusion with the Greek model, as exemplified by Sallust, Livy, Tacitus and Ammianus Marcellinus. The focus of the course will be on the development of the genre of historical writing rather more than on separate studies of each of the writers named above.

157. *Introduction to Research in Classical Archaeology and Art History*

Ms. HOLLINSHEAD, Messrs. HOLLOWAY and WINKES.

Materials, chronology, bibliographical orientation and trends of scholarship. Topics will vary according to the needs of the participants. Students intending to pursue work in classical archaeology on the 200-level should consult the instructor concerning the advisability of enrolling in the course. Written permission required.

171. *Forms of Artful Discourse* (Comparative Literature 181A) Mr. COOK.
 191. *Special Topics* The STAFF.
 199. *Conference: Especially for Honors Students* The STAFF.

Greek

105. *Euripides and Aristophanes* Messrs. BOEGEHOLD and SEGAL.
 Close literary study of three or four plays.
106. *Herodotus and Thucydides* Messrs. WYATT and BOEGEHOLD.
 The semester is divided about equally between two great historians. Their prose styles and their views of the world and of history will be considered in detail.
107. *Biblical and Patristic Greek* Mr. MATHIESEN.
 Selected readings in the Greek Old and New Testaments, the dogmatic writings of the Greek Fathers of the Church, and the Greek Orthodox liturgical texts. The course will stress accurate translation and explication of these texts; also covers the lower criticism of these texts, the descriptive and historical linguistic study of their Greek, and/or their use as sources in liturgies and dogmatic theology. The course may be repeated for credit. Prerequisite: Greek I or its equivalent; Greek II, 12, are strongly recommended.
108. *Attic Orators* Mr. FORNARA.
110. *Advanced Homer: The Odyssey* Mr. FORNARA.
111. *Selections from Greek Authors* The STAFF.
 Topic for 1985-86: Hellenistic Poetry. Ms. SCAFURO.
114. *History of the Greek Language* Mr. WYATT.
 A study of the history and structure of Greek from the very earliest times to the Koine. Brief consideration of Modern Greek.
115. *Greek Prose Composition* (formerly 215) Mr. BOEGEHOLD.
125. *Aeschylus and Sophocles* Mr. WYATT.
 Study in Greek tragedy, with emphasis on the different approaches to the tragedies of Aeschylus and Sophocles.
126. *Plato and Aristotle* Ms. NUSSBAUM.
181. *Early Greek Literature* Mr. SEGAL.
 The course will survey early Greek literature. Works to be studied will include the *Iliad*, *Odyssey*, the Hesiodic poems, archaic lyric and elegiac poetry. Emphasis on literary interpretation, the interpretive problems inherent in the study of archaic poetry, and the poetics of oral poetry. Students are expected to read extensively in the original.
182. *Greek Literature of the Fifth Century* Messrs. FORNARA and SEGAL.
 A survey of main trends and tendencies. Emphasis on literary analysis. Rapid reading of the major texts.
191. *Special Topics* The STAFF.
 199. *Conference: Especially for Honors Students* The STAFF.

Latin

101. *The Latin Lyric* Mr. PUTNAM and Ms. SCAFURO.
 A survey of Latin lyric poetry from Catullus and Horace through the secular and religious poetry of the Middle Ages. The course will also discuss more generally the nature and theory of the lyric impulse in poetry.
102. *Latin Prose: Oratory* The STAFF.
 A history of Roman oratory, concentrating on Cicero but surveying other famous orators through their fragments. Several speeches of Cicero and selected passages from his oratorical treatises will be read. Cicero's ideal "orator" will be examined in the light of the actual practice of oratory in the political arena.

103. *Roman Satire* The STAFF.
Through readings in Horace, Juvenal, Persius and Seneca, the student is introduced to a form of editorializing distinctly Roman yet influential on later journalism. Criticism of society, the establishment, and fondly cherished traditions. Exploration of the satiric spirit, paranoia, bitterness and the penchant for reforming society.
104. *Virgil* (Comparative Literature 143A) Mr. PUTNAM.
The nature and composition of Virgil's epic; growth and development of Virgil's poetry from the *Eclogues* to the *Aeneid*, relation to the classical epic tradition.
105. *Plautus and Roman Comedy* The STAFF.
A study of the form, internal construction, and language of Roman comedy as evidence alike of the Roman sense of humor, the borrowing from Greek models, and the manners and morals of a vigorous and boisterous society.
106. *Sallust, Livy, Tacitus* Messrs. RAAFLAUB, BOEGEHOLD and WYATT.
A study of the development and themes of Roman historical writing through a close examination of its major authors: Sallust, Livy, Tacitus.
- 111A. *Selections from Latin Authors*
1981-82: *Selections from Latin Prose Authors* The STAFF.
1982-83: *Medieval Latin Historiography*
1983-84: *Medieval Latin: Christian Myth and Legend*
1984-85: *Medieval Latin Epic*
- 111B. *Selections from Latin Authors*
1981-82: *Lucretius* Mr. FORNARA.
1982-83: *The Time of Caesar's Civil War in the Mirror of Political Writings of the Late Roman Republic* Mr. RAAFLAUB.
1985-86: *Latin Prose* (Caesar, Cicero) Mr. RAAFLAUB.
- 111C. *Selections in Latin Authors: 1982-82: Seneca — Philosopher and Tragedian* Mr. SEGAL.
1985-86: Silver Latin Poetry. Ms. NUGENT.
114. *The Structure of Latin* Mr. WYATT.
The Latin language. An investigation of the phonology, morphology, syntax and semantics of the Latin language in the age of Cicero. Earlier and later periods will also be treated briefly.
115. *Latin Prose Composition* Ms. SCAFURO and Mr. WYATT.
181. *Survey of Republican Literature* Ms. SCAFURO and Mr. PUTNAM.
182. *Survey of Roman Literature from Horace to Suetonius* Mr. PUTNAM.
191. *Special Topics* The STAFF.
199. *Conference: Especially for Honors Students* The STAFF.

Sanskrit

191. *Advanced Sanskrit courses by arrangement* Mr. PINGREE.
199. *Conference: Especially for Honors Students* Mr. PINGREE.

III. PRIMARILY FOR GRADUATES

Classics

201. *Seminar: Problems in Classical Archaeology* Mr. HOLLOWAY.
Topics in recent years have included Topography and Monuments of Ancient Rome, Ancient Pottery, the Parthenon, Numismatics, Archaic Greek Sculpture.
208. *Seminar: Ancient History* (History 208) Mr. RAAFLAUB.
Topics in recent years have included Augustus, The Gracchi, The Conflict of the Orders in Archaic Rome, Problems of Athenian Democracy, The Beginnings of Political Thought in Ancient Greece.

213. *Seminar: Ancient Philosophy* (Philosophy 213) Ms. NUSSBAUM.
Topics include Aristotle's Ethical Theory (1984-85), Hellenistic Ethics (1985-86).
232. *Seminar: Studies in Ancient Value and Exchange* Mr. HOLLOWAY.
The invention of coinage and the consequent economic revolution studied through antecedent practices of value and exchange and Greek coinage to the fourth century B.C. Application of economic anthropology and current discussions of ancient trade, as well as study of numismatic evidence.
243. *Seminar: Ancient Art History* (Art H235) Mr. WINKES.
Topics in recent years include Pompeian Frescoes, Classical Art and Architecture.
- 291, 292. *Reading and Research Thesis* The STAFF.

Thesis Preparation

For graduate students who have met the tuition requirement and are paying the Registration Fee to continue active enrollment while preparing for a preliminary examination.

Preliminary Examination Preparation

For graduate students who have met the tuition requirement and are paying the Registration Fee to continue active enrollment while preparing for a preliminary examination.

Greek

202. *Seminar: Aristophanes* Mr. BOEGEHOLD.
203. *Seminar: Greek Literature and Literary Criticism* Mr. SEGAL.
Topics in recent years include Euripides, Sophocles, Pindar and Bacchylides, Greek Tragedy and the Problem of Literacy in the 5th century, Ancient Greek Literary Criticism.
207. *Seminar: Greek Historians* Mr. FORNARA.
Recent topics include Herodotus, Thucydides, The Alexander Historians.
211. *Seminar: Greek Literature* The STAFF.
Recent topics include Hellenistic literature, The Greek Anthology, Presocratic Philosophy.
212. *Greek Historical Literature and Documents* Mr. BOEGEHOLD.
Recent topics include Thucydides, the Athenian Constitution, Greek Epigraphy, Early Greek Archives.
213. *Seminar: Image and Conceptualization in Pre-Classical and Classical Greece* Mr. COOK.
235. *Seminar: Greek Linguistics: The Language of Homer* Mr. WYATT.

Latin

202. *Seminar: Lucretius* Mr. SEGAL.
203. *Seminar: Roman Poetry* (Catullus, Propertius, Horace) Mr. PUTNAM.
204. *Seminar: Ovid* Ms. NUGENT.
211. *Seminar: Roman Prose Authors* Mr. FORNARA.
Topics in recent years include Livy, Cicero, Ammianus Marcellinus.
212. *Seminar: Reading Latin Manuscripts* Mr. TOOMER.
251. *Seminar: Roman Historians* (Tacitus) Mr. RAAFLAUB.
- 291, 291. *Reading and Research* The STAFF.
- See also related courses in Art, Philosophy, History of Mathematics, Religious Studies, Ancient World (Foundations 13, 14).

Institute for Cognitive and Neural Research

The Institute for Cognitive and Neural Research was created in May, 1981 and consists of affiliated faculty members interested in various aspects of cognitive and neural research. The disciplines represented include psychology, linguistics, neural science, computer science, applied mathematics, engineering, philosophy and anthropology. The Institute is administered by a Director and a five member Executive Committee of which the Director is an *ex officio* member, and which also includes the Directors of the Center for Cognitive Science and of the Center for Neural Sciences.

The main purpose of the Institute is to encourage research in various aspects of cognition and its neural correlates, and to facilitate the exchange of opinions and the collaboration among its members who bring their different disciplinary insights to this common area of inquiry. Particular emphasis is put on fostering the interaction between the Center for Cognitive Science and the Center for Neural Sciences.

Although the Institute does not offer any courses or programs leading to a degree, it does sponsor lectures, seminars and conferences, most of which are open to members of the University community. Those interested in the activities of the Institute should contact the Director, Professor Henry Kucera, Box E, Brown University.

Cognitive Science

The Center for Cognitive Science was formed in July, 1977 as a reflection of existing cooperative activities among a number of faculty and in anticipation of the growth of this interdisciplinary science. The Center aims to support all those interested in the human mind and has members from a number of fields including Anthropology, Applied Mathematics, Computer Science, Engineering, Linguistics, and Psychology. At present the core of the Center's activities concern speech perception, language learning and performance, models of memory including neural properties of memory, information processing models of psychological processes, computer simulation of cognitive and language behavior, and the role of culture in language and psychological processes.

The purpose of the Center is to encourage interdisciplinary research in cognitive science. In particular, the Center has assisted in obtaining support for students and faculty, supports a computer-based research facility (described below), established an undergraduate concentration in Cognitive Science, has proposed a graduate program for the M.A. and Ph.D. degrees, and has supported a number of visiting scholars.

The Center's major support has come from the Alfred P. Sloan Foundation in the form of two grants. (This support has been shared with the Center for Neural Science). The first, for two years, supported seminars and workshops in cognitive science on current issues in the field. The second, for three years, supports post-doctoral fellowships, faculty salaries, graduate students, computer facilities, and further seminar activity.

The Center's computer laboratory was established in January, 1980, from grants from the National Science Foundation, Digital Equipment Corporation, Alfred P. Sloan Foundation, and Brown University. It consists of a Digital Equipment Corporation VAX/780 computer connected to two special research peripherals: an LPA11-KK microprocessor for A/D and D/A processing and a Grinnell color-raster-scan graphics system. These devices are used for research on speech processing and visual information processing. The main system is used for research in cognitive simulation and artificial intelligence. The VAX is a part of the general university wide computer network.

A brochure describing the Center for Cognitive Science is available and can be obtained by writing Richard B. Millward, Director, Center for Cognitive Sciences, Box 1911, Brown University, Providence, R. I. 02912.

Comparative Literature

Professors AHEARN (Chairman), BARNOUW,¹ COOK,¹ CROSSGROVE, FIDO, LATTIMORE, NUSSBAUM, PUTNAM, SCHOLLES, SEGAL,¹ SPILKA, TERRAS, TRUEBLOOD, WEINSTEIN; Associate Professors BOSSY, MERRIM, NEWMAN;¹ Assistant Professors LEVY, VISWANATHAN; and members of cooperating departments.

The Department of Comparative Literature accepts qualified candidates for the degrees of Bachelor of Arts and Doctor of Philosophy. In addition to the offerings listed below, the candidate should consider such courses as may be pertinent to his particular interest in the departments of Classics, English, French Studies, German, Hispanic and Italian Studies, Linguistics, and Slavic Languages, and in the various programs.

UNDERGRADUATE PROGRAMS

The undergraduate programs for concentration in Comparative Literature enable students to study literature from a vantage point that offers perspectives on several national literatures. The aim of the program is to encourage students to study a varied and illustrative range of literary topics rather than the total development of a single literary tradition. Concentrators in Comparative Literature should be willing to try different literary approaches and to examine literary and aesthetic problems with sustained curiosity. There are three concentration programs, as follows:

- I. *Concentration in English and one foreign literature.* Prerequisite: completion before Semester V of prerequisites for taking 100-level courses in a classical or modern foreign literature. Program: a total of at least eight advanced literature courses (generally 100-level courses), including Comparative Literature 121, selected from offerings of Comparative Literature, English, and the appropriate foreign literature department. Honors may be undertaken by taking ten advanced literature courses and completing an acceptable Honors thesis.
- II. *Concentration in English and two foreign literatures.* (Honors). Prerequisites: (1) completion before Semester V of prerequisites for taking 100-level courses in a classical or modern foreign literature; (2) completion before Semester VII of the same prerequisites for another such literature. Program: a total of at least ten advanced literature courses (generally 100-level courses), including Comparative Literature 121, selected from offerings of Comparative Literature, English and the appropriate foreign literature departments; completion of an acceptable Honors thesis (for which the student may register in Comparative Literature 198, which will count as one of the ten required courses).
- III. *Concentration In Literary Translation.* (English and one foreign literature.) (Honors.) Prerequisite: completion before Semester V of prerequisites for taking 100-level courses in a classical or modern foreign literature. Program: (1) four or five courses in English composition, translation, and linguistics, as follows: at least two courses from among English 4, 6, 10, 11, 101, 102; one course from among English 103, 104, Linguistics 22, 53, 121; Comparative Literature 171 (in addition, students are urged to take Comparative Literature 272); (2) at least five advanced literature courses (generally 100-level courses), including Comparative Literature 121, drawn from among the offerings of Comparative Literature, English, and the appropriate foreign literature departments; (3) completion of a senior translation project, equivalent to an Honors thesis (for which the student may register in Comparative Literature 198, which will count as one of the ten required courses).

It is extremely important to begin planning early for a concentration program in Comparative Literature. Interested students should consult with the Concentration Advisor during Semesters III and IV, or earlier. More detailed descriptions of the programs are available from the Concentration Advisor.

To insure sufficient range, courses should be: (1) selected to include each of the three major literary genres: poetry, drama, and narrative; (2) distributed within at least three distinct periods (for instance, the eighteenth century, Romantic-Modern, antiquity); (3) drawn from at

¹ On leave of absence, 1985-86.

least two literature departments other than Comparative Literature. Courses may be drawn as well from non-literary fields related to literature.

To insure sufficient focus, students should build a number of courses around a particular coherent aspect of literary study (e.g., period, genre, theme, relation of literature to another discipline). Students not taking Honors are urged (but not required) to complete a senior essay, which may be less extensive in scope and length than an Honors thesis but which should constitute an integration of some aspect of their study.

GRADUATE PROGRAM

The graduate program in Comparative Literature enables students to approach literature from a vantage point that transcends national and linguistic boundaries. Through study of a range of materials from several literatures, it aims at an understanding of individual authors, influences, literary movements, forms and genres in a comparative critical context. To pursue such work students must have a good linguistic competence, wide-ranging interests, and sustained curiosity concerning the nature of literature. The program aims at developing these skills and interests so that the candidate will have strong competence in at least one national literature and also be well prepared to teach in such areas as Comparative Literature, literary theory, and world literature.

DOCTOR OF PHILOSOPHY. For admission to the doctoral program students will present evidence of literary study in two or three European languages. They will pursue study of their principal literature historically and in a cross-cultural context linking it with the other two diachronically or synchronically, in terms of literary currents, ideas or themes, and formal features of style and convention. They may also adopt a more theoretical or methodological focus, with emphasis on poetics, stylistics or semiology. The general requirements for the doctorate are:

1. *Language requirements.* The student will be expected to develop language skills sufficient for advanced work in at least the three literatures chosen. (The native language may be included, when appropriate.) Languages will be selected according to their appropriateness to the student's areas of concentration. Ordinarily two languages from the same group — Romance, Slavic, Germanic (exclusive of English), etc. — will not be selected. A knowledge of at least one ancient language is strongly recommended and will be required in some fields. For at least one of the foreign languages presented, a degree of competence close (in the case of a modern language) to native proficiency in speaking and writing will be expected. Language competence will be tested by course work or examination, the full requirement to be completed during the student's second year of study. A language which a student speaks as a native will not be tested.
2. *Course requirements.* The student will successfully complete 18 courses, spread over three years in the proportions respectively of 8, 6 and 4. Individual programs are worked out in consultation with an advisor so as to meet the following specifications:
 - A substantial core of courses in comparative literature and in one national literature along with significant related work in at least two others. (Courses may be taken in national literature departments.)
 - A spread of courses comprising work in all three major genres (poetry, drama, narrative) and in three distinct cultural epochs (medieval, Renaissance, Romantic, modern, and so forth).
 - Some work in literary theory, literary criticism, and literary translation.
 - If pertinent, courses relating literature to other fields of inquiry or expression; for example, linguistics, philosophy, psychology, music, the visual arts. Appropriate courses wholly within these fields may also be selected.
3. *Teaching.* Teaching experience, in comparative courses and where applicable in foreign language or English composition, is an integral part of the student's program. It is expected, circumstances permitting, that every graduate student will serve at least two years as a teaching assistant, and that most students successfully completing requirements will be funded in this way for several years.
4. *Major literature examination and comparative projects.* This combination of exercises is designed to allow students to develop competence in one national literature while at the same time fostering the approaches, skills and insights characteristic of the best comparative work.

During the third year of study, courses will be devised so that in Semester 1 students will take one regular course and one independent study course; in January they will take a written examination on their major literature; in Semester 2 independent study courses will prepare students in their major fields. At the end of that semester, a candidate will give an oral presentation based on a written comparative project. These projects will allow the student to demonstrate originality, scope and variety (e.g. organized around genre or period lines, theoretical issues, thematic concerns). This project may be developed thereafter into the doctoral thesis.

5. *The dissertation.* The doctoral thesis prospectus will be submitted by September 30 of the fourth year of study. Funding for the fifth year will be contingent on substantial demonstrated progress on the thesis by January of the fourth year.

THE MASTER OF ARTS DEGREE. The Department does not admit terminal Master of Arts candidates and does not require a Master's degree as a prerequisite for the doctorate. A student may, if he or she wishes, take an M.A. by completing one year of full-time course work in residence (normally four courses each semester), satisfying two of the three language requirements for the Ph.D., and completing a Master's thesis consisting of an essay of 50 to 60 pages. Upon advancement to doctoral candidacy, a student, upon request, will be awarded a Master of Arts degree.

I. PRIMARILY FOR UNDERGRADUATES

51. *Literary Creation and Critical Discourse*

Ms. NEWMAN.

Topic for 1986-87: Introduction to Comedy.

61. *The Functions of Literature*

71. *Literature and its History*

Topics for 1985-86:

A. Japanese Literature and Society.

Ms. VISWANATHAN.

B. The Far Side of the Old World: Perspectives on Chinese Culture

Ms. LEVY.

81. *Ideas, Myths, and Themes*

Topics for 1985-86:

A. Tales and Talemakers of the Non-Western World.

Ms. LEVY.

B. Love, Society and the Forms of Literature.

Mr. AHEARN.

II. FOR UNDERGRADUATES AND GRADUATES

121. *Introduction to the Theory of Literature*

Mr. AHEARN.

141. *Studies in Drama*

Topics for 1985-86:

A. Religion and Drama in India

Ms. WULFF.

B. Medieval Drama

Mr. BOSSY.

142. *Studies in Narrative*

Topics for 1985-86:

A. Love Triangles in the Early Novel

Ms. LEVY.

B. Proust, Joyce, and Faulkner

Mr. WEINSTEIN.

C. Visionary Fictions

Mr. AHEARN.

D. Birth of the Novella

Ms. FIDO.

E. Epic and Romance in Medieval Europe

Mr. BOSSY.

F. The Taboo on Tenderness in Modern Fiction

Mr. SPILKA.

G. Contemporary South American Narrative

Ms. MERRIM.

143. *Studies in Poetry*

Topics for 1985-86:

A. Virgil

Mr. PUTNAM.

B. Japanese Poetry Past and Present

Ms. VISWANATHAN.

161. *Studies in Criticism*

- A. Hegelian and Marxist Aesthetics and Criticism
- B. Comparative Poetics: Japanese and Western Aesthetics

Mr. TERRAS
Ms. VISWANATHAN.
Mr. TRUEBLOOD.

171. *Introduction to Literary Translation*

181. *Studies in the Literature of Ideas.*

Topics for 1985-86:

- A. Literature, History and Ideology in the 19th Century
- B. Nordic Legacy
- C. The Paternalistic Thriller and Other Studies in the Fiction of Prejudice.
- D. The Japanese Novel in Films
- E. Nietzsche

Mr. AHEARN
Mr. WEINSTEIN.

Ms. LEVY.
Ms. VISWANATHAN.
Ms. NUSSBAUM.

198. *Senior Conference*

Special work or preparation of senior theses under the supervision of the staff. Open to honors students and to others.

III. PRIMARILY FOR GRADUATES

251. *Seminar in Influences and Relations*

252. *Seminar in Forms and Genres*

Topic for 1985-86:

- A. Medieval Romance: Eros, Art, Politics
- B. Proust, Joyce and Faulkner

Mr. BOSSY.
Mr. WEINSTEIN.

Topic for 1986-87:

- A. The Ideology of Form: The Renaissance

Ms. NEWMAN.

253. *Seminar in Themes and Modes*

254. *Seminar in Schools and Movements*

265. *Theory of Literature*

272. *Theory and Practice of Literary Translation*

281. *Special Studies in Comparative Literature*

282. *Special Topics in Comparative Literature*

291. *Reading and Research*

Work with individual students in connection with special reading, problems of research, or preparation of theses.

Center for the Comparative Study of Development

The Center for the Comparative Study of Development, established in 1982-1983, consists of affiliated faculty members from different disciplines. It facilitates research, graduate training and undergraduate teaching on problems of socioeconomic development. The concentration program in Development Studies is housed in the Center. The Center sponsors a faculty seminar and occasional conferences.

The Director of the Center is Morris D. Morris, Henry R. Luce Professor in the Comparative Study of Development; its Associate Director is Peter B. Evans (Sociology). Other members of the Executive Committee are: Thomas Anton (Political Science), Lina M. Fruzzetti (Anthropology and Afro-American Studies), Sidney Goldstein (Sociology and Population Studies and Training Center), Robert M. Marsh (Sociology), Lucile Newman (Division of Biomedical Sciences), Robert C. Padden (History), Louis Putterman (Economics), Dietrich Rueschemeyer (Sociology), John D. Stephens (Sociology), and Van R. Whiting, Jr. (Political Science).

The Alan Shawn Feinstein World Hunger Program is the Center's most ambitious attempt to build

an integrated program of research and teaching around a specific set of policy-related analytical issues. The program approaches problems of long-term development in the context of the great risks and uncertainties which characterize poor societies. During the next few years, the program expects to establish a variety of specific research projects and will institute new seminars and courses on topics related to world hunger.

The MA Degree in Development Studies is designed to suit the needs of individual candidates while meeting the interdisciplinary and comparative objectives of the degree. Normally the program will consist of a minimum of eight courses taken from the instructional offerings of departments and centers which provide advanced instruction on development issues. These will include Development Studies 198, Sociology 215, Economics 151, and Anthropology 204 (or equivalent courses as approved by the Center's director), as well as a carefully chosen set of courses involving different disciplinary perspectives on development and including at least two additional 200-level courses. All candidates will write a thesis. Students will usually have a reading and speaking competence in a foreign language and are expected to acquire language skills as needed for research.

The joint BA/MA degree. Students may combine work toward a B.A. in Development Studies while simultaneously working towards the M.A. In this integrated BA/MA degree, candidates will write a single thesis and take a minimum of six courses in addition to those required for the B.A. These must include those specified for the M.A. degree which have not previously been taken. A preliminary version of the M.A. thesis will satisfy the requirements for the B.A. degree.

Computer Science

Professors SAVAGE (Chairman), CHARNIAK, VAN DAM, WEGNER; Associate Professors CHAZELLE, REISS, VITTER; Associate Professor (Research) DOEPPNER; Assistant Professors BAUDET, DEAN, KANELAKIS, ZDONIK; Lecturer SKLAR.

Computer Science combines the intellectual challenge of a new discipline with the excitement of being part of an innovative and rapidly expanding technology. Computer Science has been an active area at Brown for twenty years and became a department in 1979. The Department now occupies the Edward W. Kassir House, a Victorian building centrally located on the Brown campus, and an adjoining building constructed in 1982, the Gould Laboratory, which contains the Department's innovative instructional computing environment. A number of research computers and several networks of personal workstations with high-resolution graphics provide modern and powerful computing facilities for faculty as well as undergraduate and graduate students.

The Department of Computer Science offers standard Sc.B. and A.B. concentrations, an Sc.B. concentration in Applied Mathematics and Computer Science, a master's program, and a Ph.D. program.

The undergraduate program is designed to combine educational breadth in the areas of software, hardware, and theoretical Computer Science with deeper understanding of specialized areas such as software system design, programming languages, machine architecture, the analysis of algorithms, the theory of computation, computer graphics, and artificial intelligence. Undergraduates usually take at least one semester of independent study, working either on a project of their own choice or as a member of a team on a faculty-sponsored research project.

The Department also provides a wealth of opportunities for graduate research in Computer Science. Graduate students at Brown pursue research in analysis of algorithms, applied theory of computation, artificial intelligence, combinatorial optimization, compilers, computational geometry, computer graphics, database systems, distributed computing, office automation, operating systems, parallel processing, programming languages, software systems, text processing and VLSI, in addition to a variety of application areas. The established coordination between the Department of Computer Science and other departments of the University provides an unusual opportunity for advanced research both in traditional "core" Computer Science and in areas interfacing between Computer Science and such fields as Applied Mathematics, Engineering, or Psychology.

UNDERGRADUATE PROGRAMS

Undergraduate concentrations in Computer Science encourage students to take both theoretical courses which develop logical and mathematical reasoning abilities and practical courses which provide experience in the construction, design, and implementation of real computing systems.

In addition, all computer science concentrators are required to take an approved English writing course. Computer programming is a methodical expression of complicated ideas. An appropriate writing course serves not only to sharpen this ability, but also to facilitate the description of programs to others, which is an integral part of the programming task. Each student is expected to meet with the departmental advisor who will direct the student to an appropriate course or waive the requirement when indicated.

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF SCIENCE DEGREE

The standard Sc.B. concentration in Computer Science has the following specific course requirements: Mathematics 9, 10 or 17; two courses in Mathematics or Applied Mathematics beyond Mathematics 10; an approved two-course sequence in Physics, Chemistry, Biology, Engineering, or Geological Sciences; and thirteen approved courses in Computer Science or related areas, including Computer Science 11 (or 4), 12, 21, 52, 132, 141, 152, 153, Engineering 163, 164 and one of Computer Science 126, 128, 169, or 191. Computer Science 132 and Engineering 163 are design courses which satisfy the general requirement for independent study, research, or design for the Sc.B. degree.

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

The standard A.B. concentration in Computer Science requires: Mathematics 9, 10, or 17; Computer Science 11 (or 4), 12, 21, 52, 132; and three approved courses in Computer Science or related areas, including one of the following pairs of courses: Computer Science 152, 153; Engineering 163, 164; Computer Science 126 or 128, 191; or Computer Science 141 and Psychology 152.

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF SCIENCE WITH CONCENTRATION IN APPLIED MATHEMATICS AND COMPUTER SCIENCE

Prerequisites: Mathematics 9, 10.

Requirements: Applied Mathematics 33, 34 or Mathematics 25, 26; Computer Science 11 or 4, 12, 21, 152, 153; Applied Mathematics 117 or 118, 116 or 121, 165; Computer Science 132 or Applied Mathematics 193 or 194; seven additional courses, approved by the concentration advisors, from the courses offered by Computer Science and Applied Mathematics. Of the unspecified courses, at least four shall be 100-level or higher level. Concentrators are reminded that many 100-level and higher-level Computer Science courses presume a background in discrete mathematics at the level of Computer Science 52. Students who have not acquired this background elsewhere are encouraged to consider Computer Science 52 when choosing courses to fulfill the quantity requirement of the concentration. Courses from other departments may be substituted for the unspecified Applied Mathematics and Computer Science courses if such courses stress the use of mathematical or computer models and if the advisors approve of the substitution.

GRADUATE PROGRAMS

Brown University offers two graduate degrees in Computer Science: an Sc.M. for persons who wish to improve their professional competence in Computer Science or to prepare for further graduate study; and a Ph.D. Specific requirements for these degrees are outlined below.

MASTER OF SCIENCE. Sc.M. students must satisfactorily complete eight approved courses and either a project or a thesis. Two of the courses may be reading and research courses leading to the project or thesis. Of the remaining six courses, two must be "practice" courses with a substantial programming requirement, and two must be "theory" courses. These will normally be chosen from a list of approved practice and theory courses specified by the department. This leaves two elective courses, which should be chosen so that the overall program provides depth in an area of specialization. The six practice, theory, and elective courses must be 100-level or 200-level courses other than reading and research courses. At least two of these courses must be 200-level courses.

DOCTOR OF PHILOSOPHY. Ph.D. students must pass a comprehensive examination, fulfill minor and major requirements, and present a thesis that embodies the results of original research and gives

evidence of high scholarship.

The comprehensive examination includes a written test that examines breadth of understanding of computer science at the undergraduate and beginning graduate levels, a programming assignment that tests programming ability, and a research project that tests ability to do research. This examination normally must be completed by the end of the student's second year.

Satisfactory completion of the comprehensive examination and of eight course credits entitles the student to receive the Sc.M. degree. Upon completion of the comprehensive examination the student will formally be admitted to candidacy for the Ph.D. degree in computer science.

The student must complete two minor requirements, normally one inside and one outside the field of computer science. Each minor requirement is normally met by the satisfactory completion of two approved one-semester courses.

The major requirement is normally met by a thesis proposal document and oral presentation describing the student's plans for thesis research. The student should demonstrate breadth in the thesis area as well as the potential to complete the proposed research. The major requirement will normally be completed by the end of the student's third year in residence.

The student must present a dissertation which embodies the results of original research and gives evidence of high scholarship. The dissertation research will normally be done under the supervision of a member of the faculty of the Department of Computer Science. The dissertation will be read by the dissertation supervisor and two readers appointed by the graduate committee upon the recommendation of the dissertation supervisor.

The Final Examination will normally consist of an expository talk, open to the public, followed by defense of the dissertation. This defense will be conducted by the dissertation supervisor, the readers, and the Computer Science faculty attending the examination. They will determine satisfactory completion of the examination.

After the dissertation has been accepted by the Graduate School and the student has satisfactorily completed the Final Examination, the Department will recommend in writing to the Graduate Council that the degree be awarded.

I. PRIMARILY FOR UNDERGRADUATES

1. *Computers and Society*

Mr. SAVAGE.

Basic properties of computers and computer systems. Simple interactive programming exercises. Examples of computer use in commercial, scientific, military and personal applications. Future outlook: potential impact of computers on everyday life. This literacy course is intended to give a broad survey of basic issues for students in any field and does not aim for programming competence.

4. *Introduction to Computing*

Mr. SKLAR.

An introduction to computer programming in Pascal. Emphasizes structured problem-solving techniques and scientific applications of computer programming. Intended primarily for concentrators in the natural and social sciences who want a single programming course.

11. *Computer Programming, Problem Solving and Applications*

Mr. VAN DAM.

A rigorous introduction to computer programming in Pascal on workstations, analysis of problems for computer solution, applications of computers in various areas. Directed toward those students who want both a broad and deep introduction to the field, including those intending to be Computer Science majors.

12. *Fundamentals of Programming*

Mr. BAUDET.

Machine organization, assembly language programming. Introduction to data structures, algorithms, systems software, and programming languages. Intended for those who expect to be serious computer users. Prerequisite: 11 or 4.

21. *Algorithms and Data Structures*

Mr. KANELAKIS.

Fundamental methods for problem solving by computer. Representative algorithms (and their data structures) from a variety of application areas will be implemented in Pascal on workstations. Examples include numerical algorithms, sorting and searching, geometric algorithms, graph algorithms, pattern matching, and encryption methods. Prerequisite: 11 or 4. Recommended: 12.

52. *Discrete Mathematics*

Mr. CHAZELLE.

Development of basic concepts in areas of discrete mathematics relevant to computer science. Introduction to logic, set theory, algebraic structures, graph theory, and combinatorics. Prerequisite: 11 or 4.

II. FOR UNDERGRADUATES AND GRADUATES

126. *Introductory Compiler Construction*

Mr. REISS.

Lexical analysis, syntactic analysis, code generation, code optimization, translator writing systems. Prerequisites: 12, 21 and 52.

128. *Database Management Systems*

Mr. ZDONIK.

Introduction to database structure, organization, and retrieval. Network, relational and high-level models. Query languages, normalization, file structures, concurrency control and recovery algorithms, and distributed databases. Studies of actual systems. Prerequisites: 12, 21, and 52.

132. *Introduction to Software Engineering*

Mr. ZDONIK.

Problems of programming in the large, the software life cycle, the C programming language, data abstraction, procedural abstraction, iteration abstraction, exception handling, informal and formal specifications, validation, verification, program design, modern programming languages, project management.

141. *Introduction to Artificial Intelligence*

Mr. CHARNIAK.

How computers can be made to behave "intelligently." Particular topics include: the programming language LISP, natural language parsing, computer vision, search techniques, AI databases, story comprehension, medical diagnosis, problem solving, and learning. The course will stress the relation between AI theory and its use in working programs. Prerequisites: 12 and 52.

152. *Introduction to the Theory of Computation*

Mr. KANELAKIS.

Introduces the student to a broad range of theoretical topics in computer science. Topics covered include finite-state machines and regular expressions. Turing machines, pushdown automata and context-free languages, operations on automata and languages, computability, and computational complexity. Prerequisites: 21 and 52.

153. *Introduction to Analysis of Algorithms*

Mr. VITTER.

Techniques for efficient implementation and precise analysis of computing algorithms. Combinatorial mathematics and asymptotic methods of analysis. Emphasis on obtaining exact closed-form expressions describing the time and space requirements for particular computer programs when it is possible to do so. Prerequisites: 21 and 52.

159. *Introduction to Computational Complexity*

Mr. SAVAGE.

An introductory treatment of theoretical topics related to finding the intrinsic difficulty of solving various problems by computer. Concrete models of computation. Upper and lower bounds for various algebraic and combinatorial problems. Problem classification, including NP-completeness. Prerequisites: 21 and 52.

169. *Systems Architecture*

Mr. DOEPPNER.

Operating systems facilities. Introduction to operating systems principles. Advanced systems programming. I/O programming. Distributed systems, computer networks. Emphasis on understanding the operation of actual systems; representative systems will be examined in detail. Prerequisite: 12.

191. *Software System Design*

Mr. SKLAR.

A course in which students working in small teams implement significant software applications. Students learn and practice techniques of project management, specification, analysis, design, coding, documentation, testing, and maintenance. Prerequisites: 21, 132.

193, 194. *Senior Seminar*

Independent study in various branches of Computer Science, supervised by the Staff.

195, 196. *Special Topics in Computer Science*

III. PRIMARILY FOR GRADUATES

201. *Introduction to Computer Science Research* Messrs. VITTER and SAVAGE.
Departmental research projects and tools. Designed to introduce the incoming student to the department and its facilities, and to supplement an undergraduate Computer Science background. Prerequisite: 21 or equivalent.
222. *Topics in Operating Systems* Mr. DOEPPNER.
Advanced treatment of topics of current interest in operating systems: distributed file systems, distributed operating systems, workstation operating systems. Offered in alternate years. Prerequisite: 169.
224. *Interactive Computer Graphics* Mr. VAN DAM.
Interactive raster and vector graphics: hardware, fundamental algorithms, support software, user interface, and applications. The mathematics of transformations, 3D viewing, surface descriptions, solids modeling, and image synthesis. Color theory. Emphasis on the use of a high-resolution color raster display. Prerequisite: 132 or written permission.
225. *Advanced Topics in Compiler Construction* Mr. REISS.
Advanced parsing concepts and techniques. Code optimization. Compiler models. Translator writing systems. Automatic compiler production. Automatic error recovery. Attribute grammars. Offered in alternate years. Prerequisite: 126.
227. *Topics in Database Management* Mr. ZDONIK.
In-depth treatment of issues concerning database management systems. Office information systems. Topics include database security, distributed databases, and the efficient implementation of relational database systems. Offered in alternate years. Prerequisite: 128.
234. *Software Engineering* Mr. WEGNER.
System analysis and design, data abstraction, exception handling and reporting, implementation and testing strategies including: structured programming, program specification, verification and testing, development libraries, approaches to project management and documentation, advanced systems programming. Prerequisite: 191.
236. *VLSI* Mr. BAUDET.
Emphasis on architecture and design of VLSI circuits. Topics include: CAD systems and automated design tools, VLSI algorithm design, computational models and complexity results for area-time tradeoffs of VLSI circuits. Prerequisite: 52, 153 or written permission.
242. *Artificial Intelligence* Mr. DEAN.
Advanced treatment of fundamental topics such as: knowledge representations, problem-solving languages, data dependencies, unusual control structures. These will be illustrated with examples drawn from: syntactic parsing of English, speech comprehension, automatic programming, plan and context recognition, medical diagnosis. Emphasis will be on programming AI theories, possibly including a team-effort final project. Prerequisite: 141.
253. *Analysis of Algorithms* Mr. SAVAGE.
Advanced topics in the design, implementation and analysis of algorithms. Topics include: data structures, sorting, searching, algorithms on graphs, matrix multiplication and related problems, the Fast Fourier Transform, NP-complete problems, space-time tradeoffs, tradeoffs for VLSI. Prerequisite: one of 152, 153, 159.
254. *Mathematical Analysis of Algorithms* Mr. VITTER.
Advanced methods for obtaining precise descriptions of the time and space requirements of particular computer programs. Advanced combinatorial mathematics, transform methods, approximation methods. Detailed analyses of well-known combinatorial algorithms. Offered in alternate years. Prerequisite: 153. Recommended: 253.
256. *Applied Theory of Computation* Mr. SAVAGE.
A variety of advanced topics in the performance of algorithms on concrete models of machines, including: space-time tradeoffs for straight-line algorithms on uniprocessor machines, performance of algorithms for algebraic problems and others characterized by concentration properties, concrete complexity measures such as circuit complexity. Also included are algorithm design and analysis for VLSI and parallel machines. Offered in alternate years. Prerequisite: 253.

257. *Computational Geometry*

Mr. CHAZELLE.

Introduces the basic concepts of geometric computing, illustrating the importance of this new field for a variety of application areas (e.g., graphics, pattern recognition, statistical analysis, etc.) Presents algorithms for many geometric problems: convex hull and visibility; intersection, inclusion and point location; searching and decomposing geometric structures; closest-point problems, Voronoi construction and extremum problems; parallel implementations. Prerequisite: 253 or written permission.

258. *Combinatorial Optimization: Algorithms and Complexity*

Mr. KANELLAKIS.

A variety of efficient graph algorithms and complexity results for combinatorial optimization problems are presented in detail. Topics include: the complexity of linear programming, path, tree and flow problems in graphs, matching and matroid theory, integer programming, NP-complete problems and approximation algorithms. Offered in alternate years. Prerequisite: 253 or written permission.

272. *Semantics of Parallel Computation*

Mr. DOEPPNER.

A study of recent work in parallel computation, focusing primarily on asynchronous parallelism. Topics include: axiomatic and denotational semantics for parallel programs, nondeterministic models of computation, first-order and second-order correctness, distributed computation, data-flow machines. Offered in alternate years. Prerequisites: 152, 153 and Engineering 164, or written permission.

273. *Programming Languages*

Mr. WEGNER.

The design, analysis, implementation, and comparative study of programming languages. Topics include: runtime storage management, garbage collection, block structure, data types and operations, parameter passing, macro processing, co-routines and multitasking. Languages covered include: LISP, ALGOL 60, ALGOL 68, C, SNOBOL, and ADA. Emphasis on concepts shared by many languages. Prerequisites: 21 and 52.

274. *Programming Language Theory*

Mr. WEGNER.

Theoretical models for the study of programming languages, including semantic models, logic and automatic theorem proving, program verification for sequential and parallel programs, program schemes and flowchart models, mathematical semantics, fixed points and recursive programs, lambda calculus models, language definition techniques. Offered in alternate years. Prerequisite: 152.

295, 296. *Special Topics in Computer Science***297, 298. *Reading and Research***

Development Studies

For standard interdepartmental concentration program leading to a Bachelor of Arts degree, see page 82.

I. FOR UNDERGRADUATES AND GRADUATES

198. *Senior Seminar in Development Studies*

The STAFF.

An integrative seminar designed for concentrators working on senior projects. Others with comparable backgrounds may enroll with written permission of the instructor. Begins with a review of theoretical and methodological literature on development studies. Also features guest presentations on approaches to development research by development studies faculty. Written and oral presentation of student research projects will be the central focus of the latter part of the course.

RELATED COURSES

AFRO-AMERICAN STUDIES

15. *African History and Society I (Pre-Colonial and Colonial Africa 1450-1957)*

Mr. DAVIS.

16. *African History and Society, II (Independent Africa 1957-1980)* Mr. DAVIS.
21. *Blacks in Latin American History and Society* Mr. DZIDZIENYO.
103. *Politics and Religion: Contemporary North African Societies* Ms. FRUZZETTI.
- 106A. *Seminar in Afro-American Studies: Civilian and Military Politics in West Africa: Ghana and Nigeria 1966-1984* Mr. DZIDZIENYO.
121. *Afro-Brazilians and the Brazilian Polity* Mr. DZIDZIENYO.

ANTHROPOLOGY

13. *Ecology and Development* Mr. HEATH.
104. *Islamic Communities: Culture and Ideology in Asia and North Africa* Ms. FRUZZETTI.
112. *Peoples of Latin America* Mr. HEATH.
115. *The Middle East in Anthropological Perspective* Mr. BEEMAN.
117. *Peoples and Cultures of India* Ms. FRUZZETTI.
135. *The Anthropology of Economic Life* The STAFF.
138. *Women in Socialist and Developing Countries*
(Sociology 138) Ms. FRUZZETTI and Ms. RUSCHEMEYER.

ECONOMICS

111. *The Price System and Resource Allocation* The STAFF.
(This course may be counted as part of the major only by concentrators who also take at least one of the other listed economics courses.)
121. *Money, National Income, and the Price Level* The STAFF.
(This course may be counted as part of the major only by concentrators who also take at least one of the other listed economics courses.)
125. *Economic History of the North Atlantic Economy: 1500 to the Present* Mr. MORRIS.
151. *Economic Development* The STAFF.
158. *Comparative Economic Systems* Mr. PUTTERMAN.

HISTORY

90. *Development and Modernization in a Colonial Society: Origins of the Third World in Brazil* Mr. PADDEN.
118. *European Social History in the Eighteenth and Nineteenth Centuries* Mr. LITCHFIELD.
121. *The Ethnohistory of European Expansion to the Americas* Mr. PADDEN.
122. *The Expansion of Europe* Mr. PADDEN.
127. *National Mexico* Mr. PADDEN.
- 143, 144 *China in Revolution, 1800 to the Present* Mr. GREIDER.
145. *Modern History of Inner Asia* Mr. WIDMER.
- 147, 148. *History of Japan* Mr. MCCLAIN.
149. *Modern Southeast Asia* Mr. WILLIAMS.
155. *Slave Societies in the English Speaking Caribbean* Mr. JONES.

POLITICAL SCIENCE

121. <i>Latin American Politics</i>	Mr. WHITING.
126. <i>The Political Economy of Development in Latin America</i>	Mr. WHITING.
128. <i>Industrialization and Development in Latin America</i>	Mr. WHITING.
129. <i>Chinese Politics and Government</i>	Mr. KAU.
130. <i>Comparative Politics of East Asia: Japan, China, and Korea</i>	Mr. KAU.
135. <i>Modern African Political Systems</i>	Mr. STULTZ.
145. <i>International Political Economy/North-South Relations</i>	Mr. WHITING.
182K. <i>Latin American Revolutions</i>	Mr. WHITING.

SOCIOLOGY

15. <i>Economic Development and Social Change</i>	Mr. EVANS.
20. <i>Population and Society</i>	Mr. CASTERLINE.
120. <i>Population Growth and the Environment</i>	Ms. MILLMAN.
130. <i>Urbanization in World Perspective</i>	Mr. MEYER.
160. <i>Modernization: Comparative Analysis of Developing Countries</i>	Mr. MARSH.
170. <i>Theories of Imperialism and Colonialism</i>	Mr. MORRIS.
187B. <i>Principles of Demography</i>	Mr. GOLDSTEIN.
187D. <i>Industrialization, Democracy, and Dictatorship</i>	Mr. RUESCHEMEYER.
187J. <i>Social Structure and Social Change in Contemporary Brazil</i>	Mr. EVANS.
UC107. <i>Burden of Disease</i>	Mr. ARONSON.

Dynamical Systems

The Lefschetz Center for Dynamical Systems was established by Solomon Lefschetz and J. P. LaSalle at Brown University in the Fall of 1964 to carry out a program of research and advanced study in the theory and applications of differential equations, dynamical systems and stochastic processes. Areas of application include theoretical mechanics, economics and biological modelling, control and communication theory, engineering systems, and operations research. Permanent members of the Center serve on Faculties of the Division of Applied Mathematics, the Division of Engineering, the Division of Biomedical Sciences, and the Department of Mathematics. In addition, members of the Center collaborate with scientists in the Department of Economics.

The Center attracts distinguished visiting scientists and promising young scientists from the United States and abroad.

The Journal of Differential Equations, published by Academic Press, Inc., is edited within the Center as is the SIAM Journal on Control and Optimization. Members of the Center also serve on the editorial board of numerous other journals including: Journal of Mathematical Analysis and Applications, Journal of Nonlinear Analysis, Theory, Methods, and Applications, Journal of Mathematical Biology, Stochastics, Indiana Journal of Mathematics, Archive for Rational Mechanics and Analysis, Journal of Thermal Stresses, and Mathematics and Mechanics.

Members of the Center have been supported in their research efforts by the Air Force Office of Scientific Research, the United States Army Research Office, the Office of Naval Research, the National Science Foundation and NASA.

The Center was dedicated to the memory of Solomon Lefschetz in August, 1974.

East Asia Language and Area Center

The Center is a multi-disciplinary enterprise designed to support the study of East Asia within the departments of American Civilization, Anthropology, Comparative Literature, History, Linguistics, Music, Philosophy, Political Science, Religious Studies, Sociology and Theatre Arts. Faculty members and the Curator of the Chinese collection comprise the Professional staff. The Center administers degree programs in East Asian Studies. In addition to assistance to departments in staffing and curricular planning, the Center invites visiting scholars to an annual series of colloquia. The Charles Sidney Gardner Collection of Chinese and Japanese materials and the Western language works on Asia in adjacent areas of the John D. Rockefeller, Jr. Library are unique resources.

For further information, consult the East Asia Language and Area Center or see, elsewhere in this catalogue, listings of programs and courses offered by the departments affiliated with the Center.

Economics

Professors BECKMANN, BORTS, GARBER, GROSSMAN, HENDERSON, POOLE, RYDER, STEIN; Associate Professors FELDMAN, MOFFITT, PUTTERMAN; Assistant Professors BERGMAN, GALOR, LEE, MUURINEN, RUNKLE, SKILLMAN, VOHRA, YASUHARA; Visiting Assistant Professors AHMED, DIBA, GERLACH; Joukowsky Post Doctoral Fellow HSIEH.

UNDERGRADUATE PROGRAMS

The main objective of the undergraduate programs is to develop understanding of why economies perform the way they do; specifically, to explain how society uses scarce resources and distributes the resulting product. The undergraduate courses emphasize both the development of the tools of theoretical and empirical economic analysis and the application of these tools to the study of specific economic phenomena.

Economics Concentration Program: Economics 111 or 113, 121, 122, and at least five other one-hundred level economics courses.

Business Economics Concentration Program: Prerequisites: Economics 71 and Mathematics 7 or 9. Course Requirements: Economics 111 or 113, 121, 122, and at least five other 100-level economics courses, with at least four of these chosen from Economics 145, 146, 161, 165, 167, 172, 177, 178, or 179.

Interdepartmental programs emphasizing development of theoretical and empirical analysis:

Applied Mathematics-Economics: see page 78.

Engineering and Economics: see page 82.

Mathematical Economics: see page 87.

Operations Research-Economics: see page 88.

Interdepartmental programs emphasizing applications of economic analysis:

International Relations: see page 85.

Development Studies: see page 82.

Organizational Behavior: see page 88.

Urban Studies: see page 89.

GRADUATE PROGRAM

The graduate program emphasizes training in economic theory and in the mathematical and statistical tools of economic research. The main objective is to develop skill and judgement in the analysis of economic problems. The program includes advanced courses in economic theory and econometrics, as well as courses that focus on applications of theoretical and empirical analysis.

The primary objective of the program is preparation for the Ph.D degree. The Ph.D. requires two years of course work, followed by supervised research and writing of a doctoral dissertation. The first year involves core courses in microeconomic theory (205, 206) and macroeconomics (207,

208) and courses in quantitative methods (201, 202, 204). Students take written core examinations at the end of the first year. The second year involves seven advanced courses. Many students elect to take additional courses in economics and related subjects, especially mathematics. Work on the dissertation usually takes two additional years, but some students finish sooner. Students working on dissertations participate actively in workshops. After a faculty committee has approved the dissertation, the student takes a final oral examination on the subject of the dissertation. There is no foreign language requirement.

The Department does not have a formal M.A. program. Students can earn the M.A. on the way to the Ph.D. or can receive the M.A. if they choose not to complete the Ph.D. program, but have passed eight courses and the core examination.

I. PRIMARILY FOR UNDERGRADUATES

1. *Elements of Economics* Messrs. RYDER, RUNKLE and POOLE.
Economic theory, policy, and institutions examined on an elementary level, with emphasis on their application to current social problems.

71. *Financial Accounting* Messrs. EVANGELISTA, FORSYTHE, MONTI, and Ms. BARONE.
Basic accounting theory and practice. Accounting procedures for various forms of business organizations.

II. FOR UNDERGRADUATES AND GRADUATES

111. *The Price System and Resource Allocation* Messrs. GALOR, SKILLMAN, FELDMAN, DIBA, PUTTERMAN, and Ms. MUURINEN.
Tools for use in microeconomic analysis, with some public policy applications. Theory of consumer demand, theories of the firm, market behavior, welfare economics, and general equilibrium.

113. *Microeconomics* Messrs. VOHRA and DIBA.
A survey of topics in microeconomics, including theories of the consumer and firm, competitive equilibrium, factor-markets, imperfect competition, investment and capital theory, uncertainty, and welfare economics. May not be taken in addition to 111. Prerequisite: Mathematics 9 or equivalent.

117. *Welfare Economics*
A survey of theories of economic optimality. Topics covered include efficiency and competition, externalities, social welfare functions, the Arrow impossibility theorem, theories of the second best, and compensation criteria. Prerequisite: 111 or 113.

121. *Money, National Income, and the Price Level* Messrs. GERLACH, DIBA, and AHMED.
Macro-economic concepts and problems. Theory of national income and price level. The dynamics of inflation. Prerequisite: 111 or 113.

122. *Monetary and Fiscal Policy* Messrs. GARBER, STEIN, YASUHARA, and GERLACH.
Empirical analysis of consumption, investment, and money demand. Commercial banking, central banking, and the supply of money. Assessment of the performance, potential effectiveness, and limitations of macroeconomic policy. Prerequisite: 121.

125. *Economic History of the North Atlantic Economy: 1500 to The Present* Mr. MORRIS.
Analysis of the preconditions and consequences of industrialization, examining the significant similarities and differences of British, Continental, and United States development patterns. Prerequisite: 111 or 113.

128. *The History and Philosophical Context of Economic Thought* (University Course 128) Mr. PUTTERMAN.
Evolution and variety of economic thought from Adam Smith to the present. Alternative views on the proper focus of "economics." Methodology and epistemology of economics as a social science. Relations to Western social and political philosophy and ideas on property, justice, and liberty. Prerequisite: 111 or 113.

129. *Methodology of Economics*

The construction and evaluation of economic theories and empirical testing. Comparative analyses of several methodologies drawn from the philosophy of science. Developing working approaches to a variety of economic problems. Examples drawn from micro and macro economic theory. Prerequisite: Economics 121.

132. *Labor Economics*

Mr. SKILLMAN.

The supply and demand for labor services; job search; unemployment; effects of unions. Prerequisite 111 or 113.

134. *Energy and Resource Economics*

Analysis of the extraction of renewable and nonrenewable resources, applied to energy markets and to fishery and forest management. Prerequisite: 111 or 113.

135. *Environmental Economics*

The problem of achieving an efficient allocation of resources when externalities are present. Examination and comparison of policy instruments such as taxes, standards, subsidies and assignment of property rights. Application to the study of environmental quality and common property resources. Prerequisite: 111 or 113.

136. *Health Economics*

Ms. MUURINEN.

Analysis of market behavior, institutions, and public policy in the provision of health services. Prerequisite: 111 or 113.

138. *Economics and the Law*

Mr. FELDMAN.

A topics course on the economic basis for legal decisions. Cost-benefit analysis, social costs, the Coase Theorem and the assignment of property rights. The economics of liability, monopoly, and regulation, tort law and the valuation of human life and limb. Prerequisite 111 or 113.

141. *Urban Economics* (Urban Studies 141)

Messrs. HENDERSON and BECKMANN.

An analysis of cities and metropolitan areas with emphasis on the spatial distribution of population and employment within and across such areas. The following urban problems and their associated policy issues are developed in detail: housing, transportation, inter-governmental structure, and the fiscal situations of local governments.

142. *Topics in Urban Economic Policy* (Urban Studies 142)

Designed for either Economics or Urban Studies concentrators. Will examine urban public policy in developing countries, as well as the United States. A major emphasis will be placed on analyzing particular situations using available data. Policy areas include housing, transportation, and industrial location. Students are expected to do a project.

145. *The Economics of Regulation*

Mr. BORTS.

The theory and practice of regulation. Emphasis on the regulation of natural monopolies like electrical utilities. Prerequisite: 111 or 113.

146. *Industrial Organization*

Mr. SKILLMAN.

The structure and performance of industries. Standards for economic efficiency. Particular attention to antitrust policy, the patent system, and technological change. Prerequisite: 111 or 113.

148. *Public Finance*

Mr. FELDMAN.

An analysis of the role of government in the allocation of resources. Topics covered include a review of welfare economics, problems of social change, the evaluation of public expenditures and taxation. Prerequisite: 111 or 113.

151. *Economic Development*

Mr. PUTTERMAN.

A study of economic growth and emphasis on the roles which agriculture, industry, and foreign trade play in economic development. Government policy making including social discount rates, investment criteria, choice of techniques and financing methods. Prerequisite: 121 or permission of the instructor.

154. *International Trade*

Mr. GALOR.

The determinants of the pattern of international trade and comparative advantage, tariffs and other trade restrictions, the gains from trade, trade and growth, the costs and benefits of international borrowing and lending, and the multinational corporation. Prerequisite: 111 or 113.

155. *International Finance* Messers. BORTS and GERLACH.
The balance of payments; identification and measurement of surpluses and deficits; international monetary standards; the role of gold and paper money; government policies; free versus fixed exchange rates; international capital movements; war and inflation; the International Monetary Fund. Prerequisite: 121.
156. *Monetary History of the United States* Mr. STEIN.
Use of aggregative economic theory to explain the major monetary disturbances that have occurred during the past century. Prerequisite: 121.
158. *Comparative Economic Systems* Mr. PUTTERMAN.
Recent histories, institutional structures, and performance of industrialized economies. Prerequisites: Economics 121 or permission of the instructor.
159. *Economic Development of China* Ms. HSIEH.
161. *Managerial Economics* Messers. BECKMANN and BORTS.
Analysis for making policy decisions within a firm. Goals of the firm, analytical methods for optimizing under constraints. Production decisions, pricing strategies, and investment plans. Advertising, diversification, and research and development. Effect of non-market constraints, governmental and self-imposed. Treatment of risk and uncertainty. Prerequisites: 111 or 113 and Mathematics 7 or 9.
163. *Econometrics I* Mr. AHMED and Ms. HSIEH.
An examination of the mathematical and statistical procedures required for the testing of economic hypotheses. Prerequisite: Applied Mathematics 165.
164. *Econometrics II* Mr. RUNKLE.
165. *The Economics of Organizations* Mr. BECKMANN.
Problems of hierarchical forms of organization typical of business, educational, and military organizations. Particular attention to information, personnel allocation, span of control, career patterns, salary structures, efficiency of operation, and the implications for the economic theory of the firm. Prerequisites: 111 or 113 and Mathematics 7 or 9.
167. *Financial Institutions* Mr. POOLE.
A study of financial institutions (commercial and savings banks, savings and loan associations, insurance companies, etc.) and their roles in the allocation of capital and business cycle processes. Regulatory issues. Flow of funds analysis. Prerequisite: Economics 122.
175. *Location Theory* Mr. BECKMANN.
Examines the spatial side of economic activities: Interaction at a distance; market and supply areas; spatial price policy; relocation, entry and exit; facility location; localized and dispersed industries; agricultural and urban land use; central places; spatial equilibrium. Prerequisite: 111 or 113.
177. *Capital Markets* Mr. YASUHARA and STAFF.
The function and operation of capital markets; the determinants of the price of stocks, bonds, options, and futures; the relations between risk, return, and investment management; the capital asset pricing model, normative portfolio management, and market efficiency. Prerequisite: Economics 111 or 113.
178. *Analysis of Financial Investments* Mr. AHMED.
An empirically oriented economic analysis of financial markets. Topics include the following: evidence on the determinants of the prices of financial assets, particularly the Capital Asset Pricing Model; fundamental and technical analysis; the theory of and evidence on the Efficient Markets Hypothesis; evaluation of portfolio performance and trading rules; Inflation and Taxes; Primary Distribution of stocks; International Diversification. Prerequisite: Economics 177.
179. *Corporate Finance (formerly Economics 149)* Mr. YASUHARA.
Models of corporate financial management including the net present value rule of corporate finance under certainty and the capital asset pricing model valuation of risky assets. The efficient market hypotheses, capital budgeting, capital structure and dividend policies, agency costs of debt issues, corporate capital structure, and the effect of inflation on corporate finance. Prerequisites: Economics 177.

181. *Advanced Macroeconomics*

Mr. GARBER.

Development of dynamic economic models under uncertainty to understand economic fluctuations and effects of monetary and fiscal policies. Prerequisites: Economics 122 and Mathematics 7 or 9.

186. *The Theory of General Equilibrium*

Mr. VOHRA.

Modelling producer and consumer behavior, efficiency, existence of equilibrium, the core of an economy, uniqueness, comparative statics, stability. Prerequisites: Economics 111 or 113 and Mathematics 29 and 52 or Applied Mathematics 33, 34.

II. PRIMARILY FOR GRADUATES

201, 202. *Mathematics for Economists*

Messrs. RYDER and DIBA.

Techniques of mathematical analysis useful in economic theory and econometrics. Linear algebra, constrained maximization, difference and differential equations, calculus of variations.

204. *Econometric Methods*

Mr. MOFFITT.

Applications of mathematical statistics in economics. The nature of economic observations, cross-section and time series analysis, the analysis of variance and regression analysis, problems of estimation.

205. *Theory of Price I*

Mr. VOHRA.

Consumer theory and theory of the firm using the traditional and the dual approach. Theory of industry structure. Competitive general equilibrium and welfare analysis.

206. *The Theory of Price II*

Mr. SKILLMAN.

Topics in general equilibrium and welfare economics, risk and uncertainty, economics of information, capital theory, Econometric modelling of discrete and continuous consumer choices.

207. *Theory of Employment and Inflation I*

Mr. RUNKLE.

Output and employment under non-market clearing conditions. Capital and financial assets. Inflation and rates of return. Inflation and unemployment. Macroeconomic models incorporating incomplete information, rational expectations, and risk-shifting arrangements.

208. *Theory of Employment and Inflation II*

Mr. GARBER.

Problems in the formulation and estimation of stochastic macroeconomic models. Emphasis on expectations and information, monetary and fiscal policy, and theories of consumption and investment.

210. *Aggregative Economic Growth*

Mr. STEIN.

Monetary and fiscal policies in a growing economy with an endogenous capital stock. Keynesian, Monetarist and Neoclassical models of the dynamics of unemployment and inflation.

212. *Monetary Economics*

Mr. GARBER.

213. *Advanced Topics in Macroeconomics*

Mr. GROSSMAN.

Recent developments in the analysis of macroeconomic fluctuations: equilibrium vs. non-market-clearing models, rational expectations, positive analysis of monetary policy, real vs. monetary models, consumption behavior.

215. *Speculative Markets*

Mr. STEIN.

Analysis of futures markets in commodities, foreign exchange, and financial instruments. Hedging and speculative behavior, dynamics of spot and futures prices, stochastic properties and informational content of futures prices, evaluation of market performance in terms of social welfare criteria.

216. *Risk, Uncertainty, and Information*

Theory of resource allocation under incomplete information.

217. *Welfare Economics*

Mr. FELDMAN.

General equilibrium, the core, non-tatonnement process, theorems of welfare economics. Externalities, public goods, social choice theory, strategic behavior.

219. *Public Finance*

Mr. VOHRA.

Role of government in the allocation of resources; criteria for public expenditure; incidence and economic effects of taxation; sources of demand for public goods; impact of government on the private sector.

220. *Public Finance in the Urban Sector* Mr. HENDERSON.
The theory of local public finance: multiple jurisdiction models, community development models, externalities, fiscal federalism, impact of the property tax, and models of capitalization.
232. *Labor Economics* Mr. MOFFITT.
Theory and empirical analysis of labor markets; labor supply; job search and turnover; compensating wage differentials; life-cycle theory.
236. *Health Economics* Ms. MUURINEN.
Economic aspects of medical care and health-related behavior: medical insurance, demand for medical care, the economics of professions, models of nonprofit firms, the political economy of health.
241. *Urban Economics* Mr. HENDERSON.
Models of location and pricing in a spatial context; the internal structure of cities; systems of cities and city size, urban development and economic growth, housing economics and land markets; and transportation economics.
244. *Financial Economics* Mr. BERGMAN.
Option pricing model, intertemporal consumption-investment optimization, demand for risky securities, theory of the term structure of interest rates. An introduction to stochastic calculus.
247. *Industrial Organization and Market Structure*
Theoretical and empirical descriptions of markets; applications to welfare analysis; innovations, research and development, and the patent system; implications for government regulation of business.
249. *Corporate Finance and Financial Markets* Mr. YASUHARA.
Utility theory under uncertainty; state-preference model of financial markets; the capital-asset-pricing model, the market model, and the arbitrage-pricing model of financial markets; corporate investment decisions under uncertainty; corporate capital structure; agency-cost theory of financial contracting; life-cycle consumption and portfolio decisions under uncertainty.
251. *Economic Development* Mr. PUTTERMAN.
Growth within the framework of the developing economies; the role of the agricultural, industrial and international sectors; government policy planning and investment criteria.
253. *Economic Analysis of Nonmarket Institutions* Mr. PUTTERMAN.
257. *Theory of International Finance* Mr. BORTS.
The balance of payments and its adjustment under different currency standards, exchange rate determination; capital movements.
258. *Theory of International Trade* Mr. GALOR.
International specialization under trade, determination of prices and wages; welfare aspects of trade; tariffs and quotas.
263. *Econometric Theory* Mr. MOFFITT.
Standard and generalized linear models, simultaneous equations, maximum likelihood, panel data, nonlinear models, asymptotic theory, discrete choice and limited dependent variable models.
266. *Macroeconometrics* Mr. RUNKLE.
Application of econometric methods to analysis of macroeconomic data and testing of macroeconomic models.
283. *Dynamic Optimization and Economic Growth* Mr. RYDER.
Saving and consumption decisions, optimal intertemporal allocation of resources, personal distribution of wealth.
296. *Workshop in Macroeconomics and Related Topics* Mr. GROSSMAN.
Non credit course.
297. *Workshop in Macroeconomic Analysis* Mr. MOFFITT.
Non credit course.

Education

Professors ARCHAMBAULT, ESCHENBACHER, SIZER (Chairman); Assistant Professors ANDERSON, BLISS, MILLER; Lecturers EVANS, HOUSTON, SHAW, WIGGINS.

The Department offers both individual courses for students in the University at large who are interested in aspects of education and two special programs for undergraduates — a concentration in Educational Studies and the Undergraduate Teacher Education Program. At the graduate level, a program for prospective secondary school teachers leading to the Degree of Master of Arts in Teaching is offered.

THE CONCENTRATION IN EDUCATIONAL STUDIES

A concentrator in Educational Studies must focus his or her study in two foundation areas — the humanities (for example, carefully selected courses in history, philosophy, and literature) and the behavioral and social sciences (courses, for example, in psychology, sociology, and anthropology) — as these illumine the processes of growing up, learning and going to school. At least ten courses must be taken in these foundation areas, on a plan approved by the student's advisor and by the Educational Studies Committee. At least four of these must be taken in the Department.

An oral examination arising from and tying together the work of these courses will be given prior to the student's start on his or her Senior Essay, ordinarily at the end of the Junior or start of the Senior year, by the candidate's advisor and members of the Educational Studies Committee. This examination will also include consideration of the student's plan for the Senior Essay.

The Program culminates in a Senior Essay (ordinarily taken as an Independent Study course with an appropriate member of the Department) which focuses on a significant issue in education and uses analytic skills in the humanities or social and behavioral sciences. The Essay will be rooted in one of the basic academic disciplines (e.g., philosophy, history), and the pattern of courses in this particular field earlier taken by the student must provide the necessary scholarly background for preparing the Essay. The Essay is read by the advisor and a second reader selected by the Educational Studies Committee.

Departmental Honors are awarded when at least seven of the student's courses in the two foundation areas have grades of honors' quality and when the Senior Essay is assessed "with distinction".

Concentrators will be expected from time to time to meet informally as a group, to discuss work in preparation for the oral examination or the progress of the Senior Essays.

UNDERGRADUATE TEACHER EDUCATION PROGRAM

Preparation for public secondary school teaching requires: (1) a background of broad general education, (2) specialization in one or more subjects in which the teaching is to be done, and (3) study in the field of education. It is possible for students to complete full licensing requirements for public school teaching on the undergraduate level, provided they plan their course program with the approval of the Education Department at Brown, preferably prior to registration for the sophomore year. Minimum undergraduate preparation in the field of education includes: Education 105; 106; 107, 108; and appropriate electives chosen in consultation with Education Department Staff.

In most states certificates are required of all teachers in schools supported in whole or in part by public money. To secure certificates college graduates must have credit for subjects covered by courses in educational foundations, Education 106, 105, and a number of other courses, including practice teaching. Due credit toward certificates is given for separate courses. Those who seek to meet the requirements for the various states should consult the Department. All teacher education programs offered by the University have been approved by the Interstate Certification Compact.

MASTER OF ARTS IN TEACHING PROGRAM

Brown offers a twelve month (summer plus academic year) program to prepare liberal arts college graduates for careers in secondary education, this leading to the degree of Master of Arts in Teaching. The program involves courses taken in the student's teaching field (e.g. History, Biology, English) and in Education, including summer and academic year experience as student teachers in local schools. The program involves several departments and is administered by the Education Department. Undergraduates who wish to plan a five (or, possibly, a 4 1/2 year) BA-MAT program

should consult with the Director of Programs in Teaching.

A detailed description of the requirements for the Master of Arts in Teaching degree, and of procedures for applying for candidacy are available from the Office of the Graduate School.

I. FOR UNDERGRADUATES AND GRADUATES

100. *Going to High School in America, 1930 to the Present* Mr. SIZER.
A study of the modern adolescent, and an analysis of the American high school as it has emerged since the Great Depression.

101. *The Craft of Teaching* Mr. SIZER.
An analysis of the practice and profession of school teaching.

102. *History of Education* Mr. ESCHENBACHER.
A study of the historical background of modern education, elementary, secondary, and higher; the relation of education to other historical developments; emphasis on the modern period and the evolution of present-day American educational institutions.

103. *The Literature of Educational Reform* Mr. ESCHENBACHER.
A study of the principal literature seeking change in American educational agencies from 1850. The emphasis is on the twentieth century, particularly stressing contemporary reform movements as a reflection of broader social change. A discussion-lecture course. A research paper, a final examination, and occasional short papers are required.

104. *Comparative Education* Mr. ESCHENBACHER.
A comparison of national systems of education, with an emphasis on contemporary developments. The educational systems of the United States, England, and the Soviet Union will be considered.

105. *The Psychology of Teaching* Mr. SHAW and Ms. MILLER.
Develops theoretical analysis through small group classroom activities and observational activities in local high schools. The foci include a study of adolescent behavior and principles of classroom instruction. Required of and restricted to students seeking secondary school teaching certification through the Undergraduate Teacher Education Program. Ordinarily elected in Semester II of the junior year.

106. *Methods of Teaching*
Restricted to students seeking a secondary school teaching certificate through the Undergraduate Teacher Education Program. Prerequisite: Education 105. Ordinarily elected in Semester I of the senior year. Written permission required.

Sections:

- | | |
|------------------------------------|---------------|
| 1. English. | Mr. ANDERSON. |
| 2. Social Studies. | Ms. BLISS. |
| 3. Mathematics. | The STAFF. |
| 4. Science. | The STAFF. |
| 5. Foreign Languages and Classics. | The STAFF. |

107. *Practice Teaching*
Provides not less than 180 hours of practice teaching and observation, equivalent to 6 semester hours of credit in institutions operating on a semester hour basis, and fulfills the supervised student teaching requirement for secondary certification in most states. Prerequisite: Education 106. Ordinarily open to seniors only. Written permission required.

Sections:

- | | |
|-----------------------------------|---------------|
| 1. English. | Mr. ANDERSON. |
| 2. Social Studies. | Ms. O'BRIEN. |
| 3. Mathematics. | The STAFF. |
| 4. Sciences. | The STAFF. |
| 5. Foreign Languages and Classics | The STAFF. |

108. *Analysis of Teaching*

A critical analysis of the activity of teaching, required to be elected concurrently by those students taking Education 107, Practice Teaching. The course emphasizes the analysis of teaching experience from several theoretical perspectives. Cannot be elected independently of Education 107. Written permission required.

Sections:

1. English.	Mr. ANDERSON.
2. Social Studies.	Ms. O'BRIEN.
3. Mathematics.	The STAFF.
4. Sciences.	The STAFF.
5. Foreign Languages and Classics.	The STAFF.

109. *Education and Psychology*

Mr. SHAW.

The course will examine the relationships between educational research and current issues in educational practice. Students are required to tutor a student or a group of students in a local school.

156. *Philosophy of Education* (Philosophy 156, Foundations F98)

Mr. ARCHAMBAULT.

A critical examination of the major conceptions of education from Plato to Dewey. Special attention will be given to the philosophical principles underlying these conceptions.

157. *Philosophical Analysis of Educational Concepts* (Philosophy 157)

Mr. ARCHAMBAULT.

Analysis of certain concepts central to educational theory, including ways of knowing, modes of valuing, and methods of analysis. Specific problems include the definition and description of aims, the relation between means and ends, subject matter, moral education, and curriculum.

173. *History of Higher Education in the United States*

Mr. ESCHENBACHER.

An examination of the development of American Higher education as an expression of social change in the United States; topics include the European background and the Colonial experience, the Revolution and the early national period, the classical college, the land-grant college movement, the rise of the university, and contemporary problems.

III. PRIMARILY FOR GRADUATES

205. *The Psychology of Teaching*

Mr. SHAW and Ms. MILLER.

Develops a theory of instruction through class discussions and activities in the Brown Summer High School. Required of students in the Master of Arts in Teaching program; available to undergraduates by special permission only. Offered in the summer only.

206. *Methods of Teaching*

Develops a theoretical understanding of the rationale for and approaches to the teaching of a specific discipline. Required of and restricted to students in the Master of Arts in Teaching program. Offered in the summer only.

Sections.

1. English.	Mr. ANDERSON.
2. Social Studies.	Ms. BLISS.

207. *Practice Teaching Apprenticeship*

Apprentices teach and observe for the equivalent of three periods per day for the semester under the direction of appointed supervising teachers in the schools and University supervisors. The apprenticeship provides for at least 180 clock hours of practice teaching, equivalent to 6 semester hours of credit, and fulfills requirements for practice teaching of most state boards of education. This course also includes conferences with supervising teachers in the schools and consultations and group meetings with University supervisors. Offered for students in the Master of Arts in Teaching program.

Sections:

1. English.	Mr. ANDERSON.
2. Social Studies.	Ms. O'BRIEN.

210. *Practice Teaching Internship*

The STAFF.

Interns are expected to assume responsibility for equivalent of a full-time teacher's duties for a school semester under the direction of appointed supervising teachers in the schools and University supervisors. The internship provides for at least 360 clock hours of practice teaching, equivalent to 12 semester hours of credit, and fulfills requirements for practice teaching of most state boards of education. This course also includes conferences with supervising teachers in the schools and consultations and group meetings with University supervisors. Offered for students in the Master of Arts Teaching program.

216. *Independent Study: Senior Essay*

217, 218. *Case Studies in Education*

The STAFF.

For students prepared for the investigation of major problems in education: critical evaluation of current contributions in this field.

Egyptology

Professor LESKO (Chairman); Assistant Professor CRUZ-URIBE

The Department of Egyptology offers regularly scheduled courses in the language, history, religion and culture of Ancient Egypt from the earliest period of human life in the Nile Valley to the Islamic conquest.

As the only Department of Egyptology in the Western Hemisphere, the facilities for in depth work, including graduate study and research, are exceptional. The University library contains all publications of primary sources, as well as all the relevant separate monographs, journals and series. The field expeditions, basic research and translation projects of the staff also provide a nucleus for work with primary material and for independent research.

Graduate and undergraduate students are encouraged to take courses in related subjects (e.g., Anthropology, Art, Classics, History, Linguistics, Old World Archeology, Religious Studies, Judaic Studies and History of Mathematics) in order to experience diverse approaches that will help them to achieve a better understanding of the Egyptian civilization.

UNDERGRADUATE PROGRAM

A concentration in Egyptology is offered for undergraduates who wish to pursue the Bachelor of Arts degree. There are no prerequisites. For a major in Egyptology, students are encouraged to learn German (or French) early in their college careers in order to expand their access to secondary materials. The core of Egyptology concentration is two years instruction in ancient Egyptian (language) plus a senior seminar (EG191). In addition to these five courses, four courses are to be taken from related offerings in either language or lecture courses. The department presently offers three variants of its concentration program, but further options can be considered.

1) PROGRAM IN EGYPTIAN LANGUAGES AND LITERATURE

Eight courses are required: Middle Egyptian I & II (EG131, 132), Egyptian Texts (EG131A, 132A), Egyptian Literature (EG143A), Egyptian Religious Literature (EG143B), as well as two 200-level language courses (Old Egyptian, Late Egyptian, Demotic or Coptic) as approved by the advisor. This program may be supplemented by courses in Greek, Latin, Linguistics, Hebrew, Arabic and Aramaic.

2) PROGRAM IN EGYPTIAN CIVILIZATION

Eight courses are required: Middle Egyptian I & II (EG131, 132), Egyptian Texts (EG131A, 132A),

Egyptian History I & II (EG143, 144), Egyptian Literature (EG143A) and Egyptian Religious Literature (EG143B).

3) PROGRAM IN EGYPTIAN HISTORY

Eight courses are required: Egyptian History I & II (EG143, 144), Middle Egyptian I & II (EG131, 132), Egyptian Texts (EG131A, 132A), and two courses in Greek, Roman, Early Christian, Judaic or African History.

HONORS: Honors in Egyptology may be recommended by the department on the basis of a better than average academic record (particularly in Egyptology) and an acceptable senior thesis.

Repetition of courses: Students may repeat Egyptian Hieroglyphic Text (EG131A) and Egyptian Hieratic Texts (EG132A) as well as a senior seminar (EG191) for additional credit.

GRADUATE PROGRAM

A competent reading knowledge of both German and French is recommended before admission as a graduate student and an examination in German must be passed by graduate students in their first year. Undergraduate students interested in the Graduate program in Egyptology are recommended to take, if possible, at least two semesters of ancient Egyptian languages. When that is not possible, the student is urged to take three semesters of ancient, classical or Near Eastern art, archaeology, language and/or history. Students interested in the graduate program are encouraged to contact the Department prior to admission. An applicant who lacks a background in Egyptian language may be admitted either on probation or as a Post-Baccalaureate Special Status student.

Graduate programs leading to the M.A. and Ph.D. degrees are not rigidly formulated. They are arranged with regard to each student's needs, interests and previous training.

I. FOR UNDERGRADUATES AND GRADUATES

131, 132. *Middle Egyptian*

An Introduction to Egyptian Hieroglyphs and the Classical Stage of the ancient Egyptian language.

131A. *Selections from Middle Egyptian Hieroglyphic Texts*

Prerequisite: 131, 132.

132A. *Selections from Middle Egyptian Hieratic Texts*

Prerequisite: 131, 132.

143, 144. *History of Egypt*

143A. *Ancient Egyptian Literature*

143B. *Egyptian Religious Literature*

II. PRIMARILY FOR GRADUATES

221. *Introduction to Coptic*

No prerequisites, but a knowledge of Middle Egyptian and/or Greek would be very helpful.

241. *Late Egyptian Grammar*

Prerequisite: 131, 132.

261. *Introduction to Demotic*

Prerequisites: 241 or 221.

281. *Old Egyptian Grammar*

Prerequisite: 131, 132.

Engineering

Professors ASARO, AVERY, CASWELL, CLARKE, CLIFTON, COOPER, DAFERMOS, DOBBINS, DUFFY, FREUND, GLICKSMAN, GURLAND, HAZELTINE, HELLER, KARLSSON, KORNHAUSER, LIU, LOFERSKI, MAEDER, MASON, MORSE, NEEDLEMAN, NURMIKKO, PEARSON, RICHARDSON, RICHMAN, SIBULKIN, SILVERMAN, TAUC, WEINER, WOLOVICH; Professors (Research) FINDLEY, KESTIN, KOLSKY, SYMONDS; Visiting Professor STUART, VARDENY; Adjunct Professors TAYLOR, WHITE, ZIEGERT; Associate Professors CALO, DANIELS, SHIH, SUUBERG; Assistant Professors BULTERMAN, LAWANDY, ORTIZ, ROSENBERG, SURESH; Lecturer PATTERSON; Senior Research Engineers: Messrs. BONNER, COMETTA (Executive Officer), CRISMAN, HAWLEY, HERMANN, KERSHAW; Research Engineers: Messrs. BULL, KIRST.

The Brown University Engineering Curriculum emphasizes an in-depth understanding of the fundamentals of physical science, mathematics, and engineering science which underlie technical work in all fields of engineering. The Curriculum consists of a common five semester program, called the common core program, required of all Sc.B. candidates in Engineering, and upper level programs in the areas of engineering specialization. The common first year of the core program includes instruction in physical sciences, chemistry, mathematics and computation. The remainder of the common core program includes courses in materials science, electronics and digital systems, mechanics of deformable bodies, thermodynamics, electricity and magnetism, optics, and applied mathematics. The emphasis on fundamentals provides preparation for dealing with the rapid pace of technological change and with the interdisciplinary demands of modern engineering design and analysis. In addition, a broad exposure to the engineering sciences prior to selection of an area of specialization enables a student to make a well-informed choice of the branch of engineering in which he or she wishes to specialize. Degree programs are offered in Biomedical, Chemical, Civil, Electrical, Materials, and Mechanical Engineering.

The Division of Engineering offers courses of graduate study leading to the degrees of Master of Science and Doctor of Philosophy. These programs are available in the general fields of electrical sciences; fluid mechanics, thermodynamics, and chemical processes; materials science; and the mechanics of solids and structures. In addition, there are joint programs with the Division of Applied Mathematics and the Division of Biomedical Sciences. Interdepartmental programs are easily arranged with the departments of Chemistry, Geology, and Physics. Well equipped laboratories are available for both research and instruction in each of the above fields. The Prince Engineering Laboratory houses many of the experimental facilities, including subsonic wind tunnels, a stratified flow wind tunnel, a small supersonic wind tunnel, shock tube facilities, equipment for hot wire anemometry, and Doppler laser velocimetry equipment; a radiation laboratory containing a Van de Graaff accelerator, a fluid-thermodynamics laboratory, a chemical engineering laboratory, and part of the laboratories of Applied Mechanics. The latter include facilities for studies of stress wave propagation and impact phenomena, general stress analysis, creep of metals and plastics, fatigue and fracture of solids, and soil mechanics. Facilities for work in materials science include laboratories for materials preparation, x-ray diffraction, transmission and scanning electron microscopy, field ion microscopy, optical and infrared spectroscopy, and electron microprobe analysis. There is also a microelectronics facility, and laboratories for quantum electronics, microwave and millimeter wave propagation, and antiferromagnetic resonance. The computer engineering laboratory is dedicated to undergraduate and graduate research on advanced computer architectures, computer vision, automatic speech recognition, digital control systems, computer graphics, and digital signal processing. The Division of Engineering maintains two VAX11/780 digital computers, one dedicated to research in computational mechanics, and the other to research in computer engineering and digital systems. Library facilities are provided by the Sciences Library which contains an outstanding collection of books and periodicals in mathematics, physics, engineering, geology, biology and chemistry.

The Barus and Holley Building houses both the Division of Engineering and the Department of

Physics. The building contains additional engineering laboratories as well as offices for professors and graduate students.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF SCIENCE DEGREE

Candidates for the Sc.B. degree are expected to complete successfully the eight courses Engineering 3, 4, 10, 41, 51, 52, 72, and either 31 or 81. Also, they must complete successfully the five courses Chemistry 21 (or 31), Mathematics 17, 18 and Applied Mathematics 33, 34 (or comparable courses in Mathematics). For students entering without one year of preparation in calculus at the secondary school level, Mathematics 9, 10 is recommended instead of Mathematics 17, 18. In addition, they must complete successfully a minimum of four courses in the humanities and/or social sciences.

The concentration is completed by passing a coherent set of eight courses in one of the specialized areas of Engineering. One of these eight courses must be an advanced science course. Also, one of the eight courses must be selected from among the group of courses devoted exclusively to engineering design and identified by the word "design" in the course title. At least five of the eight upper level courses required to complete the concentration must be 100-level Engineering courses. The program of each student must be approved by the Engineering Concentration Committee which issues more detailed guidelines and program suggestions.

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE.

Candidates for the degree of Bachelor of Arts with concentration in Engineering should complete at least eight Engineering courses, including Engineering 3, 4 and 10 plus two 100-level courses, one of them a design course. The sequential nature of Engineering courses requires that the remaining Engineering courses be chosen to prepare the student for the 100-level courses selected. The program should be developed through consultation with an Engineering faculty advisor and it will be subject to approval by the Engineering Concentration Committee. The program should also include a course in basic chemistry (e.g., Chemistry 21 or 31) and mathematical preparation equivalent to Applied Mathematics 33 and 34.

PROGRAM FOR COMBINED DEGREES OF BACHELOR OF SCIENCE, CONCENTRATION IN ENGINEERING, AND BACHELOR OF ARTS.

Students who wish to combine the study of mathematics, physical science and engineering with study in the humanities, arts or social sciences can arrange a five-year program leading to an Sc.B. in Engineering and an A.B. in a nontechnical field. Such a program must meet all requirements for an Sc.B. degree with concentration in Engineering, as well as all requirements for an A.B. degree with concentration in the second, nontechnical field. Normally, the first year courses in such a program would include Engineering 3 and 4 (or 10), and Mathematics 17, 18 (or 9, 10). The other courses usually taken by Sc.B. in Engineering students, Chemistry 21 (or 31) and Engineering 10 (or 4), would be postponed until the second year of study. The program should be developed through consultation with an Engineering faculty advisor to be certain that proper attention is paid to the sequential nature of the Engineering curriculum in postponing various courses in order to spread the customarily four-year Sc.B. in Engineering program over a five-year period.

INTERDEPARTMENTAL CONCENTRATION PROGRAM IN ENGINEERING AND ECONOMICS LEADING TO THE BACHELOR OF ARTS DEGREE.

This program is offered jointly with the Department of Economics, and it is intended for students who want to prepare for positions in management and administration. The first year should be identical to the first year of the Sc.B. in Engineering program. Toward the end of the freshmen year, the student should design the Engineering part of the program to include at least eight Engineering courses. Included among these eight courses would be Engineering 3, 4 and 10 plus two 100-level Engineering courses, one of them a design course. The program should be developed through consultation with an Engineering faculty advisor and is subject to review by the Engineering Concentration Committee. Economics 111 or 113, 121 and 122 are required and a minimum of three additional courses should be selected from among the 100-level Economics courses. The Economics portion of the program should be prepared with the help of an Economics faculty advisor. The remaining Engineering courses must be chosen to satisfy prerequisites for the 100-level courses which are

selected. The program should include a course in basic chemistry (e.g., Chemistry 21 or 31) and mathematical preparation equivalent to Applied Mathematics 33 and 34. Engineering 90 is recommended for this option, in addition to the above required courses.

HONORS.

At the time of graduation, the University grants a degree with Honors to any student whose work in his or her field of concentration has been superior and who has prepared an Honors Thesis of distinction based on independent work. The designation "Honors" is included on the transcript and diploma. Students who have a strong academic record and who wish to be candidates for Honors in Engineering should consult with the Honors supervisor in the Division of Engineering during their junior year. Admission into the Engineering Honors Program will be decided on the basis of a student's academic record and a one-page project proposal. The proposal will be developed in conjunction with an Engineering Faculty member who is willing to supervise the experimental or analytical project. A written thesis and an oral examination based on the work are required near the end of the senior year. Course credit for work done as an Honors project can be received by concurrently registering for Engineering 195 and/or 196.

INTEGRATED PROGRAM FOR THE DEGREES OF BACHELOR OF SCIENCE (WITH A CONCENTRATION IN ENGINEERING) AND MASTER OF SCIENCE.

Undergraduates in Engineering with high academic standing may enter an integrated program leading to the award of a Master of Science degree at the end of the academic year following receipt of the Bachelor of Science degree. They will normally include in their senior year, courses designated as "Primarily for Graduates," in addition to advanced undergraduate courses. During the fifth year, the student in the integrated program can achieve an unusually strong academic program for the Master of Science degree. Work toward the doctorate, for those so inclined and qualified, would be facilitated for those in the program. The Master of Science degree granted under this program is available under either the thesis option or non-thesis option described below.

The Master of Science in Biomedical Engineering, sponsored jointly by the Division of Engineering and the Division of Biology and Medicine, is an example of such an integrated program but has special requirements as noted below.

GRADUATE PROGRAMS

MASTER OF SCIENCE (Thesis Option). Candidates must complete a coherent plan of study consisting of eight courses and an acceptable thesis. The thesis must be sponsored or co-sponsored by a member of the Faculty of the Division of Engineering. Two of the required courses are Applied Mathematics 205, 206 (Mathematical Methods of Applied Science) or their equivalent and no more than two 100-level courses may be used to fulfill the Sc.M. course requirements. Normally, students will be required to complete at least two courses in the Division of Engineering other than Engineering 297, 298 (Special Projects: Reading, Research and Design). Engineering 297, 298 are acceptable but not required for the Sc.M. degree. All available financial assistance from the University in the form of a fellowship, teaching assistantship, or a research assistantship is preferentially awarded to students who plan to continue for the Ph.D. degree. These students normally follow this option.

MASTER OF SCIENCE (Non-Thesis Option). Candidates must complete a coherent plan of study consisting of eight course of which two must be Applied Mathematics 205, 206 or their equivalents, and at least three must be 200-level Engineering courses excluding 297, 298. Up to three 100-level Engineering, Applied Mathematics, Mathematics, Computer Science or other approved science courses may be offered for this option. There is no residency requirement but all work toward the Master's degree must be completed within five years. The non-thesis option Master of Science degree will normally be a terminal degree.

A student seeking a Master of Science degree under the "Thesis Option" cannot convert to the "Non-Thesis Option" without written consent of the faculty thesis advisor concerned and the Chairman of the Division of Engineering. However, a student can convert from the "Non-Thesis Option" to the "Thesis Option" at any time upon obtaining the sponsorship of a thesis advisor from the Faculty of the Division of Engineering.

Candidates for the Master of Science degree in the integrated program for the Bachelor of Science degree in Engineering and the Master of Science degree in Bioengineering must complete the requirements for the Sc.B. degree in Engineering with concentration in Bioengineering, or have completed an equivalent program elsewhere. The requirements for the Sc.M. degree are (a) satisfactory completion of at least 5 advanced level or graduate courses, (b) 8 course credits, not more than 3 of which are obtained for thesis research, and (c) an acceptable thesis sponsored or co-sponsored by a member of the Faculty of the Division of Engineering.

DOCTOR OF PHILOSOPHY. There are no formal course requirements for the Ph.D. degree. The student with the approval of his or her advisor will devise an appropriate program of study in a major and two minor areas. For a student entering with a Bachelor's degree this will normally result in a program of 12 to 16 courses (not including thesis research). Such a program of study must reflect both the breadth and depth in subject matter commensurate with the objectives of a Doctoral program.

A student is required to pass the Preliminary Examination to establish Candidacy for the Ph.D. degree and is also required to complete a thesis and present an oral defense of the research work. The dissertation must embody the results of original research and significant creative thought and give evidence of high scholarship. A student must register for the equivalent of three years (two years when entering with an Sc.M.) of full time study.

A student's progress is reviewed early in the program of studies. This Progress Review includes an oral examination which usually will be of two hours duration. The recommendation as to whether or not a student will be allowed to continue will be based on an evaluation of the research, achievements in formal course work, and performance in the Progress Review. Since students enter the graduate program with a great diversity of backgrounds, this Review should establish whether or not deficiencies still exist in a student's preparation and he or she will be so advised. The subsequent program can then be planned to correct such deficiencies prior to the taking of the Preliminary Examination. Thus, the Progress Review is designed to evaluate the student's progress in his or her field of study and is of a diagnostic nature. A student entering in the fall semester will appear before a Review Committee no later than December 15th of the following year while the progress of a student entering in the spring semester will be reviewed before March 15 of the third semester in residence.

The Preliminary Examination follows the completion of a major portion of the course work, and should be taken by the end of the sixth semester in residence for a student entering with a Bachelor's degree and the fourth semester for a student entering with a Master's degree. The Examination is designed to test the student's knowledge of the major field of study as well as the associated minor subjects. He or she is expected to have a sound grasp not only of the fundamentals of the field but also of the general concepts and techniques in the major area of study. The examination will presume that the student has the knowledge equivalent to one year of advanced study in two minor subjects. Upon passing the Preliminary Examination a student is officially certified by the Faculty of the Division of Engineering as a Candidate for the degree of Doctor of Philosophy in Engineering.

The maximum number of courses that may be transferred is eight and the maximum residence equivalence granted is one year. Students entering from abroad with advanced degrees should establish Sc.M. equivalency at the end of their first year in residence. Forms for this purpose are available from the Registrar's Office.

SPECIAL PROGRAMS. Students may petition the Graduate Committee of the Division if they wish to follow special advanced programs of study. In such a case the petition must have the sponsorship of three faculty members, at least one of whom shall be from the Division of Engineering. When a significant amount of work is taken in another Division or Department, one faculty member from each Division or Department must act as a sponsor. If one of the original sponsors leaves the university, another sponsor will be appointed by the Graduate Representative after consultation with the student and the remaining Advisors.

I. PRIMARILY FOR UNDERGRADUATES

3. *Introduction to Mechanics and Electricity*

The use of vectors in the formulation and solution of physical problems. Principles of statics and mechanical equilibrium. Force systems and applications to the analysis of machines and structures. Concept of potential energy and the principle of virtual work. Pressure in a fluid; hydrostatics. Centroids and center of gravity. The fundamental laws of linear electric circuits. Lectures, recitations, and laboratory. Corequisite: Mathematics 17 (or 9).

4. *Dynamics and Vibrations*

Study of the kinematics and dynamics of particles and rigid bodies. Principles of motion of mechanical systems. Concepts of inertia, work, kinetic energy, linear momentum, angular momentum, and impact. Applications to engineering systems, satellite orbits, harmonic vibrations of one and two degree of freedom systems. Lectures, recitations, and laboratory. Prerequisite: 3. Corequisite: Mathematics 18 (or 10).

6. *Introduction to Electronic Circuits and Applications*

Elementary circuit theory. Semiconductor physics. Transistor characteristics. Graphical analysis of transistor circuits. Amplifier design, tuning circuits. Feedback principles, digital circuits, amplitude and frequency modulation. Lectures and laboratory. Not taken by candidates for the Sc.B. degree with concentration in Engineering.

9. *Management of Industrial and Non-Profit Organizations*

The objective of this course is to give an exposure to the concepts and techniques of management. Topics include marketing, strategy, finance, operations, organizational structure, and human relations. Guest lecturers will describe aspects of actual organizations. Lectures and discussions.

10. *Fundamentals of Engineering Computation*

Introduction to programming in Pascal and Fortran, including program design and documentation. Use of the computer as a problem-solving tool in engineering problems. Introduction to numerical methods of integration and solution of ordinary differential equations. Data base management, flow-of-control techniques and computer architecture. Lectures and laboratory. Corequisites: 4, Mathematics 18 (or 10).

23. *Surveying*

Theory and practice of plane surveying; use of the tape, level, transit, stadia, and plane table; triangulation and topography. Lectures, field work, and drafting. Recommended for students interested in civil engineering. Hours arranged. Time required, about 10 hours. No course credit.

26. *Mechanical Technology*

Machine shop practice and welding techniques by individual arrangement. The student will learn to fabricate some simple metal objects. Especially recommended for students interested in mechanical engineering and materials engineering. Hours arranged. Time required, about 10 hours. No course credit.

31. *Mechanics of Solids and Structures*

Mechanical behavior of materials and analysis of stress and deformation in engineering structures and continuous media. Topics include concepts of stress and strain; the elastic, plastic, and time-dependent response of materials; principles of structural analysis and application to simple bar structures, beam theory, instability and buckling, torsion of shafts; general three-dimensional states of stress; Mohr's circle; stress concentrations. Lectures, recitations, and laboratory. Prerequisites: 3, 10; Applied Mathematics 34.

41. *Materials Science*

Relationship between the structure of matter and its physical engineering properties. Topics include chemical bonding in molecules, crystals, and networks; the electrical and magnetic properties of materials; crystallography, glasses and plastics; defects in crystals; mechanical behavior of crystalline matter; deformation of materials; cold working and annealing; thermodynamics and phase transformations of alloys; the relation of microstructure to properties; diffusion, corrosion, and oxidation. Lectures, recitations, and laboratory. Prerequisites: 3, 4; Chemistry 21 (or 31). Corequisite: Applied Mathematics 33.

51. Electricity and Magnetism

Fundamental laws of electricity and magnetism, and their role in engineering applications. Concepts of charge, current, potential, electric field, magnetic field. Resistance, capacitance and inductance. Electric and magnetic properties of materials. Electromagnetic wave propagation. Lectures, recitation and laboratory. Prerequisites: 3, 4, 10. Corequisite: Applied Mathematics 33 (or equivalent).

52. Electrical and Optical Systems

The high and low frequency approximations to the fundamental laws of electricity and magnetism. The high frequency approximation includes the study of light: physical and ray optics. The low frequency approximation includes linear circuits and systems described by ordinary differential equations, application of Fourier analysis and Laplace transformations to circuits, basic transistor circuits and operational amplifiers. Lectures, recitation and laboratory. Prerequisites: 3, 4, 10, 51 or equivalent. Corequisite: Applied Mathematics 33 or equivalent.

72. Thermodynamics

An introduction to macroscopic thermodynamics and some of its engineering applications. Basic concepts related to equilibrium, and the zeroth, first and second laws for both closed and open systems are presented. Examples include analysis of engines, turbines, and other engineering cycles, phase equilibrium and separation processes, chemical reactions, surface phenomena, magnetic and dielectric materials. Lectures, recitations and laboratory. Prerequisites: 3, 4, 10. Corequisite: Applied Mathematics 34.

81. Fluid Mechanics

Properties of fluids, dimensional analysis. Fluid statics, forces on submerged surfaces, kinematics. Conservation equations. Frictionless incompressible flows, Euler's equations, Bernoulli's equation: thrust, lift, and drag. Velocity potential and stream function; elementary solutions to Laplace's equation. Vorticity and circulation: lift and drag. Navier-Stokes equation, applications. Laminar and turbulent boundary layers, flow separation. Steady one-dimensional compressible flow. Sound, velocity, flow with area change, normal shocks. Lectures, laboratory. Prerequisites: 3, 4, 10; Applied Mathematics 34.

90. Managerial Decision Making

Ways of making effective decisions in managerial situations, especially situations with a significant technological component; techniques useful in analyzing such situations; the context of decision making such as manufacturing, transportation, health care, education, etc.; decision analysis; planning and scheduling; technological forecasting. Prerequisite: 9 or Mathematics 10.

93, 94. Technology and Society Course Series

Intended primarily for students in the liberal arts; no scientific or mathematical background is required. See also Engineering 6 and 131.

93B. Electrical Communication

The problem of human communication is treated from the engineering point of view and an introduction given to modern communication theory, including such concepts as the definition of information, coding, modulation, noise, and channel capacity. The historical development of communications systems and devices from the telegraph to satellites is evaluated in this light. No mathematical preparation beyond the high school level is required.

93C. Electrical Energy

We shall examine questions like the following: How is the electrical energy used? Could the same final goal be achieved more efficiently by using fuel differently? How long will known supplies of fossil and nuclear fuels last? How do fossil and nuclear plants work? We will also examine questions of safety, pollution, fusion and solar energy.

93D. An Introduction to Structural Analysis and Design

This course is designed primarily for students who are not Sc.B. candidates and who are interested in architecture and more generally in the principles of structural design at an introductory level. Surveys methods and techniques used in the design and construction of steel and reinforced concrete buildings. Prerequisite: Mathematics 9, 10 or equivalent.

93E. *Yacht Design*

A course in the design and analysis of a complex engineering system. Lectures will cover the aerodynamics, hydrodynamics and structure of the modern sailing yacht. The major work will be an individual design project with complete drawings backed up by engineering calculations. Designed for non-engineering majors but some background in either sailing or physical science is desirable.

93F. *Theory and Design of Sound Reproduction Systems*

The basic engineering considerations involved in the electronic, mechanical, and acoustical aspects of high fidelity audio systems. Amplifier, tuner, loudspeaker, and enclosure design will be discussed along with techniques for measurement of audio component performance. No prerequisites except high school algebra and trigonometry. This course is not taken by candidates for the ScB. in Engineering.

93G. *Intermediate Technology*

Is small beautiful? Do developing countries need full scale modern industry or something else — an intermediate technology? Some examples of intermediate technology are hand-made windmills, or earth dams, or solar ovens, or tricycle carriages, or fish ponds. Students will design a device or a project. We will discuss the implications of intermediate technology, for developing countries and our own society. Seminars, field trips, optional laboratory.

94E. *Product Liability: the Engineer, the Lawyer, and the Consumer*

The true nature of strict products liability in tort, negligence and design and/or manufacture, and breach of warranty and how they apply to both the manufacturer and the consumer. The role of the engineer in both the design and manufacture of a product and when acting as legal expert.

94F. *The History of Materials: Technology and Culture*

The utilization of materials has been the means by which man has extended his control over nature, expressed his artistic sense and left the artifacts by which ancient cultures have been reconstructed. The course will examine the use and processing of materials in the ancient world focusing on the technological evaluation of archaeological materials in the lab and in relation to their impact on culture.

II. FOR UNDERGRADUATES AND GRADUATES

110. *Chemical Engineering Thermodynamics*

The role of thermodynamics in chemical processes. Applications of the first law and conservation of mass to chemical process design and analysis. Thermodynamic properties of pure fluids and mixtures. Estimation of properties from limited data. Phase equilibrium. Chemical Equilibrium. Prerequisite: 72.

111. *Transport Processes*

Diffusivity and the mechanisms of mass transport in binary and multicomponent mixtures. Heat and mass transfer in turbulent flow. Coupled heat and mass transfer. Transport phenomena in packed beds. Applications to separation processes and chemical process equipment. Prerequisites: 110 and 171.

112. *Chemical Reactor Design*

Chemical kinetics, mechanisms, and the reaction rate expression in homogeneous and heterogeneous systems. Basic concepts in homogeneous reactor design and ideal reactor models. Optimization. Temperature and energy effects in chemical reactors. Non-ideal chemical reactor design. Introduction to heterogeneous chemical reactor design. Corequisite: 111.

114. *Chemical Process Design*

Chemical process synthesis, flow charting, and evaluation of design alternatives. Process equipment sizing as determined by rate phenomena, economics, and thermodynamic limitations. Introduction to optimization theory and chemical process control. Applications of these principles to case studies. Prerequisites: 111 and 112.

121. *Biomechanics*

Foundations. Diffusion and convection. Material properties of bone and muscle. Cardiac mechanics. Circulation: steady and unsteady flow, compliant tubes. Macro- and microrheology of blood. Thrombosis and hemostasis. Respiration and ventilation. Convective transport of solutes swim-

ming. Thermal response and control. Locomotion and flight. Prerequisite: Applied Mathematics 34 or equivalent. Lectures and laboratory.

122. *Neuroengineering — Control of Movement*

Mechanical properties of muscle fibers. Relationship between motoneuron activity and muscle contraction. Proprioceptive feedback from muscle spindles. γ -control. Reflexes. Coordinated movement. Cerebellum and motor cortex. Hair cells in the vestibular apparatus. Vestibuloocular reflex. Eye movements: fixation, tracking, saccades and vergence. Perception of movement. Suppression of perception during saccades. Mathematical and conceptual models for nerve cells and muscle, and for feedback control of guided movement, and central algorithms for the generation of ballistic movements. Prerequisite: Applied Mathematics 33.

130. *Structural Analysis*

A unified study of truss, beam, frame, plate, and shell structures. Emphasis on principle of virtual work and numerical methods of elastic structural analysis by matrix methods. Includes calculation of deflections and reactions in beam structures, beam vibrations, and column buckling. Theorems of plastic limit analysis. Plate bending. Membrane stresses and local bending effects in axially symmetric shells. Lectures plus supplementary sessions on computer methods and, occasionally, laboratory experiments. Prerequisite: 31.

131. *Planning and Design of Systems*

The application of tools of operations research to optimization and decision-making using discrete deterministic models. Theory and computational methods of linear programming. Applications to transportation and assignment problems, network analysis and design, critical-path scheduling. Particularly suitable for juniors and seniors in Engineering, Applied Mathematics, and Economics. No prerequisites.

132. *Transportation Systems Analysis*

Congested network models arise in many fields such as transportation and communication theory, energy distribution, spatial economics. The course provides a formulation of congested network models and develops methodology and numerical methods, based on non-linear programming theory, for studying and solving complex problems. Applications to transportation networks and spatial economics. Prerequisites: Mathematics 10 or 17.

134. *Water Supply and Wastewater Treatment*

Unit operations and unit processes of water supply and waste-water treatment. Topics in the distribution and collection of waters; statistical estimates of extreme flow rates and storage requirements, hydraulics of closed and open channels, pipeline networks. Topics in two-phase flow; groundwater flow into wells, sedimentation, and filtrations. Topics in treatment plant design; mixing, residence time distributions, aeration, chlorination, bacteriological and chemical treatment processes. Prerequisite: 81.

136. *Soil Mechanics and Principles of Foundation Engineering*

Classification and identification of geological materials; mechanical and physical properties and methods of testing. Elements of the analysis of stress and strain in rock and soil masses; theories of failure, theory of seepage. Problems of building foundations; consolidation and settlement; stability of earth slopes and embankments. Includes geotechnical laboratory. Prerequisite: 31.

137. *Advanced Engineering Mechanics* (Applied Mathematics 125)

A unified study of the dynamics of particles, rigid bodies, and deformable continua. Topics include generalized coordinates and Lagrange's equations; variational principles; stability of equilibrium; vibrations of discrete systems and of elastic continua, and wave propagation. The concepts are applied to harmonic and non-linear oscillatory motion; orbital mechanics; gyroscopic phenomena; shock and impact, and the stability and vibrations of elastic structures. Prerequisite: 4, 31, Applied Mathematics 34, or equivalent.

138. *Design of Civil Engineering Structures*

The design and detailing of rolled and built-up steel members; riveted and welded connections. The selection and design of concrete mixes, and the design and detailing of reinforced and prestressed concrete elements. Elastic and plastic design of continuous beams, arches, and plane frames. Emphasis on modern numerical methods of solving complex structural problems. Limit design methods. Prerequisite: 130.

141. *Physical Chemistry of Solids*

Application of physical chemistry and solid state chemistry to the structure and properties of engineering solids as used in solid state devices, ceramics and metallurgy. Topics included are: Equilibrium and free energy of heterogeneous systems, thermodynamics of solutions, chemical kinetics, diffusion, catalysis and corrosion, solid state transformations. Case studies will be taken from industrial practice. Prerequisites: 41, 72.

143. *Experimental Methods of Materials Science*

Theory and practice of modern techniques of structure analysis and materials preparation, such as: quantitative metallography, x-ray diffraction, electron microscopy and diffraction, thermal analysis, calorimetry, crystal growth and purification, and in general the preparation of well characterized materials. Laboratory. Prerequisite: 41.

144. *Design and Application of Engineering Solids*

Application of structure-property relations for mechanical, optical, electrical, and magnetic functions of metals, ceramics, semiconductors, ferrites, and others. Solution of industrial materials problems, particularly processing and failure analysis. The course is directed toward the use and control of phenomena in materials applications. Lectures plus laboratory. Prerequisite: 41.

146. *Fundamentals of Materials Processing*

Application of the principles of materials science and engineering to various broad categories of materials processing, such as solidification, crystal growth, sintering, mechanical forming, machining, synthesis of composite materials, and diffusion doping of semiconductor materials. The aim is a basic understanding of the production processes of the materials components of devices and structures. Prerequisites: 31, 41, 72 or equivalent.

156. *Radiation and Guided Waves*

Maxwell's equations, scalar and vector potentials, the retarded potential solution, waves in free space and material media. Application to problems of transmission lines, waveguide propagation and radiation. Microwave devices, networks, cavities and antennas are treated, with concurrent experimental study in the laboratory. Lectures plus laboratory. Prerequisite: 52.

157. *Linear System Analysis*

Analysis of discrete and continuous electrical signals and systems in both time and frequency domains. Modulation, sampling, spectral analysis, analog and digital filtering. Fourier, Laplace and z-transforms, and the state-space approach. Prerequisite: 52.

158. *Digital Communication Systems*

Sampling theorem. Entropy measure of signal content. Pulse code modulation. Probability theory. Stochastic processes and their use in modeling physical phenomena arising in communication systems. Power spectra, autocorrelation functions, and the propagation of stochastic processes through linear systems. Digital communications over noisy channels. Coding principles. Communication networks. Prerequisite: 157.

159. *Introduction to Semiconductor Devices*

An introduction to the physics of fundamental electronic processes that underlie the operation of semiconductor devices. Electronic properties of semiconductors and effects at interfaces such as p-n junctions. Schottky barriers and MOS structures are discussed. On this basis a variety of semiconductor devices are analyzed. Prerequisites: 41 and 52.

162. *Analysis and Design of Electronic Circuits*

Elementary device physics and circuit characteristics of semiconducting diodes, bipolar junction (BJT's) and field effect (FET's) transistors. Analysis and design of practical circuits using discrete semiconductor devices. Constraint on and techniques for linear integrated circuit (IC's) design and the use of linear IC's as circuit building blocks. Weekly laboratory. Prerequisites: 51, 52 or equivalent.

163. *Digital Electronics Systems Design*

Truth tables. Logic families. Counters. Memory. Timing. Analog switches. A-D conversion. Binary arithmetic. CPU organization. Microprocessors. Microprogramming. Machine intelligence. Each student is issued a kit of 25 integrated circuit chips and the student is evaluated by his or her performance on a series of lab challenges, including successive approximation A-D con-

verter, and 4-bit multiplier. Juniors and seniors preferred.

164. *Design of Computer Systems*

A design method is presented and demonstrated through the in-class design of a general purpose computer. Topics include: review of combinatorial and sequential circuit design; central processor: registers, counters, decoders; arithmetic methods and hardware: bussing schemes and microprogramming. Memory. Input/output system: I/O devices. System coordination. Advance machine concepts. Prerequisite: 163 or written permission.

166. *Automatic Control Systems*

Analysis and design of linear continuous and discrete feedback control systems involving both frequency and time domain methods. Sampled data systems. Root loci, Bode plots, and the Nyquist stability criterion. Sensitivity and error correction in feedback systems. Compensation design techniques. Introduction to nonlinear systems analysis, including the describing function and phase plane techniques. Engineering 157 is recommended.

167. *Energy Conversion*

In the first half of the course, transformation of electric and magnetic energy into mechanical energy is analyzed for both incremental transducers and rotating machines. The second half considers the conversion of thermal, nuclear and solar energy by means other than electromechanical, including solar energy conversion via the photovoltaic effect, thermoelectric and thermionic conversions and fuel cells. A brief treatment of nuclear reactors is included.

168. *Design of Semiconductor Devices*

Contemporary practice in the design of discrete and solid state devices. The realization of basic analog and digital circuit functions in semiconductor silicon is a central theme in a coordinated lecture and laboratory sequence. Topics include microcircuit photolithography; layout and design scaling rules for integrated circuits; and techniques in semiconductor and thin film processing as they apply to large-scale-integrated circuit manufacture. Prerequisite: 159 or permission of instructor.

169. *Laser Applications and Modern Optics*

Principles and application of contemporary coherent optical techniques and devices. Topics include interferometric measurements, aspects of modern spectroscopy, holography, detection and modulation of light, optical waveguides and fibers together with other examples from integrated optics and optical communication methods. Non-engineering students will need some background in electromagnetic theory and materials science. Lectures and laboratory. Prerequisites: 52 or Physics 47, Engineering 41 or a more advanced materials course (e.g., Engineering 159).

170. *Applied Thermodynamics*

Control volume formulations of thermodynamic principles applied to the study of compressible fluids as working fluids in engines and thermodynamic devices. Applications include compressors and turbines, gas turbines, jet and rocket engines, steam plants, refrigeration and internal combustion engines. Combustion and flames are also considered. Prerequisites: 72 and 81.

171. *Heat and Mass Transfer*

Heat Conduction: Steady and unsteady heat conduction equation with heat generation in two and three dimensions, numerical solutions. Radiant Heat Transfer: Kirchhoff's Law and the perfect emitter, radiation intensity and surface emissive power, real surface radiation; view factors for black and gray surfaces. Convective Heat Transfer: laminar and turbulent flow heat transfer. Mass transfer. Lectures plus lab. Prerequisite: 81.

172. *Design of Engines and Turbines*

Criteria in engine design. Engine cycles: 3, 4, and n-process cycles; refinement by heat exchange and supercharging. Configurational, kinematic, dynamic, fluid-dynamic and materials aspects. Lubrication. Combustion, fuels, flames. Internal and external pollution. Integration of design and practical constraints. Patents and proprietary aspects. Lectures, laboratory and design projects with oral and written reports. Prerequisites: 72 and 81.

175. *Advanced Mechanics of Solids*

Continuum mechanics of solids and its application to the mechanical response of machine and structural elements. Elasticity, plasticity and failure criteria. Elastic stress analysis in torsion, plane stress and plane strain, stress concentrations. Fracture mechanics, principle of virtual work and var-

ational theorems. Finite-element method of numerical stress analysis. Theorems of plastic limit analysis. Lectures, computational exercises, and occasional laboratory experiments. Prerequisite: 31.

176. *Machine Design* (including Vibrations and Automatic Control)

Design of mechanical devices utilizing techniques developed in Engineering 175 is the primary theme of part of this course. Additional subjects include material failure criteria, vibration of multi-mass systems, and control systems. Prerequisite: 175, plus 137 and 130, which may be taken concurrently.

177. *Design of Thermal Power Plants*

Design and operation of large plants. Energy sources: fossil, nuclear, solar. Design of major components: boilers; high-temperature heat exchangers, condensers and cooling towers. Turbomachinery for steam and gas cycles. Feedwater heater chains. Computer simulation and optimization. Materials, fabrication. Safety and legal issues. Power plant design project with oral and written reports. Prerequisites: 170 and 186 or permission of the instructor.

186. *Advanced Fluid Mechanics*

To give Mechanical Engineering students a deeper and more thorough grounding in principles and basic applications. Topics include review of the conservation principles; inviscid flow; viscous flow, including lubrication theory; laminar boundary layers; introduction to turbulent flow; wave motions and wave drag. Lectures, assignments, computational projects, laboratory. Prerequisites: 72 and 81.

193. *Special Topics in Engineering*

193B. *Combustion Fundamentals*

Survey of combustion phenomena. Chemical reactions in gases: heat of reaction, adiabatic flame temperature; reaction kinetics. Thermal and branching-chain explosion theory. The well-stirred reactor. Gas phase diffusion flames; combustion aerodynamics. Premixed gases: laminar flame propagation, flammability limits, minimum ignition energy. Flame holders and gas turbine combustors. Prerequisites: 72 and 81.

194. *Special Topics in Engineering*

195, 196. *Independent Studies in Engineering*

III. PRIMARILY FOR GRADUATES

Attention is also directed to courses in Applied Mathematics, Chemistry, Mathematics and Physics.

203. *Advanced Dynamics*

Kinematics and dynamics of systems of particles and rigid bodies. Euler's dynamical equations. Lagrange's equations and their integration. Variational principles. Hamilton's principle. Hamilton's equations of motion. Applications are emphasized and may include: orbital mechanics, mechanisms, gyroscopic phenomena, stability of equilibrium, theory of small vibrations. Canonical transformations and Hamilton-Jacobi theory and wave propagation.

204. *Mechanics of Structures*

Variational methods and their application in continuum mechanics. Derivation of approximate theories of structures (beams, plates, and shells) by variational methods. Theory of linear elastic vibrations. Elastic stability theory, including the effects of nonconservative forces. Approximation methods based on variational principles. The theory of nonlinear vibrations, random vibrations. Liapunov stability theory, impact loading of structures, aspects of wave propagation theory.

221. *Foundations of Continuum Mechanics* (Applied Mathematics 233)

An introduction to the mathematical foundations of continuum mechanics. Vectors and tensors, properties and basic operations. Kinematics of deformation. Conservation laws, Thermodynamics. Stress. Constitutive equations. Elastic, viscous, and viscoelastic response. Linearization. Simple problems in finite and linear elasticity, and in Navier-Stokes flows. Creep and relaxation in linear viscoelasticity.

222. *Mechanics of Solids*

A unified introduction to the engineering mechanics of elastic, plastic, and time-dependent solid materials and structures. Stress and equilibrium. Kinematics of deformation, strain, and compatibility. Tensor representation and principal values. Principle of virtual work. Formulation of stress-strain relations in elasticity, plasticity, and viscoelasticity. Uniqueness. Extremum and minimum principles, including energy methods.

224. *Linear Elasticity* (Applied Mathematics 234)

General theorems in linear elasticity. Basic singular solutions. Boussinesq-Papkovich and Galerkin representations. Curvilinear coordinates. Cavity, inclusion, crack, and contact problems. States of plane strain, plane stress, and axial symmetry. Complex variable techniques. Torsion. Thermoelasticity.

225. *Viscoelasticity* (Applied Mathematics 239)

Creep. Stress relaxation. Sinusoidal oscillations. Boltzmann's principle of linear superposition. Memory functions. Relaxation and retardation spectra. Time and temperature dependence. Second order transitions. Experimental determination of linear viscoelastic properties. Relation between molecular structure and macroscopic properties. Volume viscosity. Non-linear behavior.

226. *Stress Waves in Solids* (Applied Mathematics 238)

Elastic wave propagation theory with an introduction to waves in viscoelastic and plastic media. Waves in unbounded media, half spaces, layered media, plates, rods and beams. Solutions to transient problems. Relation of theory to experiment. Stress waves and fracture.

227. *Advanced Elasticity* (Applied Mathematics 235)

Large elastic deformations. Controllable deformations of incompressible materials. Initial stress problems. Elastic stability. Additional topics may include membrane theory, fiber-reinforced materials, second-order elasticity.

228. *Topics in Continuum Mechanics* (Applied Mathematics 236)

Devoted to one or more advanced topics in continuum mechanics not covered in detail by the regular courses. Examples are: non-linear viscoelastic constitutive equations, strain gradient and micropolar theories of elasticity, coupled mechanical and thermal or electromagnetic phenomena, continuum thermodynamics.

229. *Plasticity* (Applied Mathematics 237)

Theory of the inelastic behavior of materials with negligible time effects. Experimental background for metals and fundamental postulates for plastic stress-strain relations. Variational principles for incremental elastic-plastic problems, uniqueness. Upper and lower bound theorems of limit analysis and shakedown. Slip line theory. Representative problems in structural analysis, metal forming, indentation, strain and stress concentrations at notches, and ductile failure.

232. *Experimental Mechanics*

The design and evaluation of experiments in solid mechanics. Consideration of methods for experimental stress analysis, and for the mechanical testing of materials. Topics covered include photoelasticity, creep and relaxation tests, high-speed testing, stress wave propagation, fatigue, and fracture. Techniques, instrumentation, and recording systems for the static and dynamic measurement of mechanical parameters such as forces, displacements, velocities, accelerations, and strains.

233. *Advanced Theory of Structures*

A unified study of truss, beam, plate, and shell structures, with emphasis on static elastic and plastic behavior and structural stability. Geometrical relations. Generalized stresses and equations of equilibrium. Generalized strains and strain rates. Elastic stress-strain relations and representative solutions. Large geometry changes and buckling, imperfection sensitivity. Plastic stress-strain rate relations and limit analysis. Optimal design procedures.

234. *Computational Methods in Structural Mechanics*

Fundamentals of the finite element method of structural analysis. Nodal points, element design, and consistent formulation for assumed functions. Principle of virtual work, formulation of element stiffness and master stiffness matrices. Relation to variational and minimum principles. Linear elastic analysis for static problems; direct and iterative procedures. Non-linear static analysis with piecewise linearization; elastic-plastic behavior, large geometry changes. Time dependent behav-

ior. Dynamic analysis, consistent mass matrix. Eigenvalue problems. Plate and shell structures.

235. *Structural Dynamics*

Response of engineering structures to dynamic loading, including impact, blast, and seismic loading. Elastic, plastic, and viscous behavior of one- and two-dimensional structures are studied by appropriate mechanical approaches, including approximate analytical methods, numerical techniques, and bound theorems. Experimental and theoretical results are critically examined together.

237. *Topics in Solid and Structural Mechanics*

Devoted to one or more advanced topics in solid and structural mechanics not covered in detail by the regular courses, such as: numerical methods in solid mechanics, theory of optimal design, shell structures and instability, or other topics of interest to the staff or visitors.

238. *Fracture Mechanics*

The mechanics of brittle and ductile fracture in structural materials. Elastic stress fields near cracks, theories of brittle fracture, elastic fracture mechanics. Techniques of stress analysis. Elastic-plastic analysis of crack extension. Plastic instability. Dislocation mechanisms, cleavage, ductile fracture by void growth. Transitional behavior, rate sensitivity, running cracks. Fatigue toughness testing and structural design considerations.

240. *Microscopic Aspects of Inelasticity*

The inelastic behavior of solids is studied by analysis of idealized atomistic models of single dislocations followed by study of continuum models with continuous distributions of dislocations. Atomistic models of dislocations: Peierls stress calculations, athermal motion of dislocations, thermally activated motion of defects. Continuous distributions of dislocations: differential geometry preliminaries, use of directors and oriented media, static and dynamic theories.

241. *Materials Science I: Structure and Thermodynamics of Solids*

The molecular, crystalline, and microscopic structure of solids. Application of quantum mechanics to atomic bonding in molecules, crystals, and non-crystalline materials. Crystallography and molecular structure of non-crystalline solids. Imperfections in crystals. Electronic structure of crystals. Physical properties of crystals. Application of classical thermodynamics to chemical and phase equilibria. Phase diagrams and heterogeneous microstructures in polycrystals and alloys.

242. *Materials Science II: Control of Microstructure and Properties of Engineering Solids*

The interrelation of materials processing, microstructure, and resulting physical properties of solids. Development of microstructures. Application of statistical mechanics and rate theory to kinetic processes in solids; theory of solid state diffusion, nucleation and growth during phase transformations, precipitation and spinodal reactions, order-disorder transformations, and martensitic reactions. Growth and purification of crystals. Recovery, recrystallization, and grain growth. Microstructural design. Electrical and mechanical properties of polycrystalline and multi-phase aggregates. Control of microstructure by processing.

243. *Topics in the Mechanical Behavior of Materials: Crystalline and Polymeric Solids*

Atomistic models are applied to the mechanical behavior of both crystalline and polymeric solids. The relevant portions of classical equilibrium statistical mechanics and their relation to classical macroscopic thermodynamics are applied first to crystalline materials: concept of stress in lattice systems, harmonic and quasi-harmonic approximations, thermoelastic stress-strain relations, temperature-dependence of elastic moduli, Cauchy relations; then to polymeric solids.

244. *Strength of Solids*

Mechanical behavior of solids as interpreted through atomistic mechanisms. Theory and characteristics of dislocations in continuous and crystalline media. Intrinsic and extrinsic stacking faults, extended dislocations, point defects, nodes and networks, disclinations, crystal boundaries. Applications of dislocation theory to single and polycrystal plasticity, work-hardening, stress-corrosion, creep, fatigue, hardening mechanisms, etc. Laboratory projects.

245. *Advanced Crystallography and Modern Diffraction and Imaging Techniques in Materials Science*

A review of elementary x-ray diffraction principles. Advanced topics are selected from: Fourier analysis of peak profiles and convolution, particle size and strain broadening, stacking faults, order-disorder transformations, temperature diffuse and short-range order scattering. The dynamical

theory of x-ray diffraction is extensively developed in the electromagnetic (Laue-James) formalism. Applications to x-ray topography and semiconductor device characterization are included. Laboratory projects.

246. *Failure Analysis and Analytical Metallography*

Analytical techniques such as optical metallography, x-ray diffraction, and quantitative electron microscopy will be applied. Examination of fractures at both the macroscopic and microscopic levels will be combined with an understanding of the mechanisms of deformation and fracture, the effect of thermal treatment, and the chemical reactions due to environment in order to develop the proper technique of failure analysis. Open to students in materials science and solid mechanics.

247. *Structure and Properties of Non-Metallic and Non-Crystalline Materials*

A study of the kinetics and mechanisms of formation of amorphous and semi-crystalline media, physical properties of amorphous metals, polymers, glasses and ceramic materials. This course may be offered in conjunction with an undergraduate course of the same title, but will require an extension of depth and scope from students taking this course for graduate credit.

248. *Environmental Effects in Material Behavior*

Discussions of the effects of environments on the mechanical, chemical, and electrical behavior of solids. The course deals with environmentally influenced mechanical behavior including studies of metallic corrosion and passivation, stress corrosion cracking, and hydrogen assisted fractures. Detailed discussions of surface and interfacial thermodynamics and kinetics including absorption, along with analyses of the micromechanics of plasticity and fracture.

249. *Special Topics in Materials Science*

250. *Special Topics in Materials Science*

250C. *Photovoltaic Solar Cells*

Semiconductor photovoltaic cells intended for direct conversion of sunlight into electricity. Topics to be discussed: properties of semiconductors (resistivity, minority carrier lifetime, surface recombination velocity; interface states and interface recombination; energy gap, optical absorption and reflection and electron affinities). Three hours lecture per week. Prerequisite: a senior or graduate level course on semiconductors.

252. *Pattern Recognition and Computer Vision*

Modeling of classes of patterns. Algorithms for effective recognition by largely parallel computation. There will be an emphasis on computer vision. Statistical decision and estimation theory in Euclidean n -space as a framework within which to view pattern recognition and pattern structure learning. Linguistic, geometric, and algebraic models for representing complicated pattern data. Prerequisite: a one semester advanced undergraduate level course in probability theory or statistics.

253. *Digital Signal and Image Processing*

The principles and practice of digital signal processing, sampling, DFT, FFT, WFT, FIR filters, multirate filtering, computer filter design, infinite impulse response filters, spectral analysis, LPC analysis, hardware, computer laboratory. Prerequisite: Engineering 157 or written permission.

254. *Introduction to Stochastic Control Theory*

This course deals with fundamental methods and problems in stochastic control theory and its applications: Markov chains in finite and countable state spaces; models of control systems; dynamic programming; state variabilization of typical control problems; fixed and free time control problems; discounted and average cost per period problems; computational methods; optimal stopping; linear filtering and control; stochastic stability; diffusion models of continuous control processes. Prerequisite: An undergraduate course in probability theory (or equivalent).

255. *Linear Systems Theory*

Modeling physical systems by transfer matrices as well as state-space and differential operator equations. Applications of linear algebra and polynomial matrix theory. Equivalence of alternative system representations and state transition matrix determination. Minimal realization theory. Quadratic optimization and asymptotic state estimation. State feedback and dynamic feedforward compensation of linear systems for stability, arbitrary pole placement, decoupling, and exact model matching.

257. *Applied Stochastic Processes*

This course focuses on the study of stochastic processes in a number of applications. Analysis of continuous and discrete time Gaussian random processes. Applications to Kalman filtering, the detection of signals in the presence of noise, and two dimensional filtering. Application of queuing theory to the analysis of communication networks. Prerequisite: Applied Mathematics 263 or equivalent.

258. *Control System Analysis and Synthesis*

Formulation of optimal control problems through the calculus of variations, linear functionals in L_p function spaces, and the Pontryagin maximum principle. Applications to the linear optimal regulator problem, time optimal control problems and minimum fuel problems. Relationships between modern optimal control theory and the classical Hamilton-Jacobi theory in the calculus of variations. Examples of the use of modern control theory in various industrial and aerospace applications.

260. *Electronic Processes In Semiconductors*

The course is directed towards a detailed understanding of electronic processes primarily in semiconductors with tetrahedral bonding (Si, Ge, $Al_{III}B_V$, $Al_{III}B_{VI}$, $Al_{III}B_{IV}C_V$, $Al_{III}B_{III}V_{VI}$ compounds). Topics include phonon spectra, band structure, impurity states, electron and hole distributions, optical properties, electron plasma, scattering processes, excess and hot carriers, semiconductor-metal transitions, one-and two-dimensional electron gas, and amorphous semiconductors. Prerequisite: Physics 241 or equivalent.

261. *Physics of Solid State Devices*

Topics include junction devices such as Schottky barrier and heterojunctions; interface devices such as MOS, JFET and MOSFET's; CCD's, surface acoustic devices, and storage elements in semiconductor memories luminescence and optoelectronic devices including LED's semiconductor lasers and solar cells; high-field effects and devices such as tunneling, Gunn oscillators, Impatt diodes, and switching and memory effects in amorphous semiconductors. Prerequisite: 260 or equivalent.

262. *Solid State Quantum and Optoelectronics*

The course incorporates the study of interaction of radiation with matter with emphasis on lasers, nonlinear optics, and semiconductor quantum electronics. Basic laser theory and common systems. Q-switching and mode-locking, electro- and acousto-optic interactions, harmonic generation and parametric processes, self-focussing and phase modulation, stimulated Raman and Brillouin scattering, ultrashort pulse generation, self-induced transparency, nonlinear processes of conduction electrons in semiconductors, linear and nonlinear aspects of bulk and surface polaritons. Prerequisite: 260 or equivalent.

263. *Electromagnetic Theory, I*

The Maxwell field equations, scalar and vector potentials, boundary conditions, electromagnetic momentum, and the Maxwell stress tensor. Magnetic and dielectric materials and anisotropic media. Power and energy relations, the Poynting theorem, and plane, cylindrical, and spherical waves. Retarded potential solutions, Green's functions, and variational principles.

264. *Electromagnetic Theory, II*

Application of the fundamental laws of electrodynamics to problems in the radiation, scattering, and propagation of electromagnetic waves. Techniques for solving boundary value problems; transmission lines, waveguides, resonant cavities, antennas and microwave circuits.

266. *Advanced Electromagnetic Theory*

A guided wave analysis of propagation and diffraction in cylindrical and other geometries. Ample use is made of Green's functions, eigenfunctions, integral equations, and variational techniques. A rigorous transmission line formulation of field problems is developed and applied to diffraction in wave-guides and free space.

273. *Advanced Thermodynamics I* (Chemistry 201)

Fundamental principles of macroscopic equilibrium thermodynamic stability; Gibbs relations and chemical thermodynamics; applications to various systems, including fluids, solids, magnetic and dielectric materials. Fundamental principles of macroscopic nonequilibrium thermodynamics (irreversible processes). Entropy production; Curie's principle; Onsager-Casimir reciprocal relations; applications to transport and relaxation phenomena in continuous systems. Taught alternately by

the Engineering division and the Chemistry department.

274. *Advanced Thermodynamics II* (Chemistry 202)

Introduction to the statistical mechanics of equilibrium phenomena for classical and quantum-mechanical systems. Ensemble-theory; fluctuations; statistical interpretation of the laws of thermodynamics; applications to ideal gases, chemical equilibrium, simple crystals, magnetic and dielectric materials, radiation, condensation phenomena. Taught alternately by the Engineering division and Chemistry department.

276. *Heat Transfer*

Convection. Laminar flow: boundary layer equations and similarity solutions; solution techniques for arbitrary wall temperature distribution; development of flow in tubes. Turbulent flow: semi-empirical methods of solution for turbulent shear layers. Natural convection. Separated flow. Condensation and evaporation. Fundamentals of heat and mass transfer for chemically reacting flows. Radiation. Basic concepts and properties of solids and gases. Enclosures with non-participating medium; shape factors. Equation of radiative transfer.

281. *Fluid Mechanics I*

Formulation of the basic conservation laws for a viscous, heat conducting, compressible fluid. Molecular basis for thermodynamic and transport properties. Kinematics of vorticity, and its transport and diffusion. Introduction to potential flow theory. Viscous flow theory; the application of dimensional analysis and scaling to obtain low and high Reynolds number limits.

282. *Fluid Mechanics II*

Introduction to concepts basic to current fluid mechanics research: hydrodynamic stability, the concept of average in fluid mechanics, introduction to turbulence and to multi-phase flow, wave motion, topics in inviscid and compressible flow.

289. *Advanced Lecture or Reading Courses*

The following courses are offered whenever a sufficient number of students express interest.

289A. *Hydrodynamic Stability*

Introduction: Tollmein-Schlichting waves, Rayleigh-Taylor instability, Benard-Rayleigh problems, Marangoni effects, Taylor instability. Fundamental equations. Basic flows. Kelvin-Helmholtz instability. Linearized stability theory for parallel flows, the Orr Sommerfeld equation, Squire's theorem, Gaster's transformation, energy relation; the inviscid, Rayleigh problems, Rayleigh-Fjortoft theorems; influence of viscosity.

289B. *Combustion Theory*

Survey of combustion phenomena. Extension of basic equations of fluid mechanics to multicomponent mixtures. Thermochemistry, equilibrium, and reaction rates. Deflagration and detonation waves. Diffusion controlled combustion: Schvab-Zeldovich theory; droplet burning, wall fire, flame propagation. Kinetically controlled combustion: explosion theory, laminar flame propagation. Ignition and extinction phenomena.

289C. *Dynamics of Rotating and Stratified Flow*

Introduction to geophysical fluid dynamics, vorticity production by nonhomogeneity and rotation, potential vorticity, the thermal wind, Taylor-Proudman Theorem, geostrophic motion. Topics in the quasigeostrophic motion of a stratified fluid on a sphere, scaling, the Ekman layer, geostrophic energy equation and available potential energy, Rossby waves, wave-zonal flow interactions, topographic waves, layer models; baroclinic instabilities.

289D. *Physical Gas Dynamics*

Reacting mixtures of perfect gases; relevant quantum statistical mechanics; equilibrium gas properties. Equilibrium and frozen flows. Rate equations for population of internal states and species: statistics and chemical kinetics. Flow with nonequilibrium internal modes and chemical reactions. Nonequilibrium flows in acoustic approximation; flows in ducts; the method of characteristics; shock waves. Flow with nonequilibrium electronic excitation and ionization.

289E. *Mechanics of Nonlinear Fluids*

Kinematics, strain and motion in deforming media. Review of balance principles in continuum mechanics. Connection between stress and motion: constitutive relations. Material indifference principle. The general nonlinear Stokesian fluid. Simple fluids with memory. Viscometric flows

and motions with constant stretch history. Asymptotic forms for simple fluid constitutive relations. Applications of the general theory.

289F. *Transitional and Turbulent Flows*

The theoretical and experimental bases of linear and nonlinear hydrodynamic instabilities and transition are reviewed. Few-mode models of transition to turbulence. Statistical theory of homogeneous, isotropic turbulence. Cascades. Kolmogorov's theory. Analogs for two-dimensional flow. Similarity theory. Free turbulent shear flows and the turbulent boundary layer. Coherent structures.

289G. *Chemical Reaction Engineering*

Elements of chemical rate processes; steady-state and transient behavior of continuous-flow chemical reactors; uniqueness, multiplicity, and stability in chemical reactor systems and individual catalyst particles; heterogeneous chemical reactor analysis focusing on packed beds (continuum and discrete models) and fluidized beds (deterministic and stochastic models).

289H. *Modern Topics in Viscous Flows*

Review of the stress tensor, the Navier Stokes equations, and classical viscous flow problems. Relevant flow regimes. Vorticity diffusion concepts. Low Reynolds number flows. High Reynolds number flows; the interacting boundary layer, unsteady flows, steady and unsteady separation, triple-deck methods. Emphasis is on recent advances in viscous flow theory.

291, 292. *Special Topics in Engineering*

297, 298. *Special Projects: Reading, Research, and Design*

Work with individual students in connection with reading, problems of research, or preparation for work on theses. Offered every year.

As part of the Program of the Center for Fluid Dynamics at Brown University, special attention is called to related courses in the Division of Applied Mathematics, the Physics Department, the Geological Sciences Department, and the Chemistry Department.

English

Professors DAVIS, GOLDBERG, HARPER, HAWKES, HENKLE, HIRSCH, KIRK, KRAUSE,¹ LANDOW, MONTEIRO,¹ NICHOLS, ROSENBERG, SABOL, ST. ARMAND, SCHOLES (Chairman), SHERIDAN, SHROEDER, SPILKA, WALDROP, WILMETH, WOODS; Associate Professors: BECKHAM,² BLASING, CALDWELL, DOANE, EMIGH, ROSENFELD, RUSSOM,¹ SILVERMAN;¹ Assistant Professors ALLEN, FOLEY,³ HARING-SMITH, RABB, ROONEY, STEINBACH, VOGEL, WRIGHT; Adjunct Professors BLOOM, COOVER;² Visiting Faculty CALISHER, LAUGHLIN; Mellon Fellow COOMBS; Adjunct Lecturers ACKER, HARDING, SCOTT, SULLIVAN, WHITLOW.

UNDERGRADUATE PROGRAMS

The English Department offers the following concentration choices for undergraduates. Detailed information about each one is available from the Department.

1. *English and American Literature*. English 16 ("Introduction to Poetry") or an equivalent course in close poetic analysis is prerequisite. In addition to English 16, eight courses must be satisfactorily completed according to one of the six general models provided for regular concentrators — e.g. a historical, a generic (fiction, poetry, or drama), an American literature or English and American literature model. The detailed requirements of each of the models are available from the Department.
2. *Honors in English and American Literature*. English 16 or an equivalent course in poetic analysis is prerequisite. In addition to English 16, nine courses must be satisfactorily completed. Of those nine, four Honors seminar courses are required for the concentration. Up to two of

¹ On Sabbatical Leave or Leave of Absence in Semester I, 1985-86.

² On Sabbatical Leave or Leave of Absence in Semesters I and II, 1985-86.

³ On Sabbatical Leave or Leave of Absence Semester II, 1985-86.

the seminars may be graduate courses or other seminar-type equivalents. A thesis is required.

3. *Special Concentration in English and American Literature*. English 16 or an equivalent course in poetic analysis is prerequisite. Also required are eight other courses in English and American literature, three of which should be in a related subject or field. Proposals for special concentration require Departmental review and approval.
4. *Creative Writing*. The nature and requirements of this concentration are presently under review. Information about a revised set of requirements will be available from the Department in the first semester of 1985-86.

GRADUATE PROGRAMS

The Department accepts candidates for the degrees of Doctor of Philosophy and Master of Arts. A Master's degree in English is ordinarily prerequisite to the Ph.D.; however, after the first semester or first year of graduate study at Brown, some candidates are encouraged by the Department to proceed directly to the doctorate. GRE scores no more than three years old, both Verbal Aptitude and Advanced in Literature, are required for admission to either program.

MASTER OF ARTS. The Department of English offers a Master of Arts degree in English and American literature. This degree is often sought as a terminal degree by students planning careers in secondary education, publishing, etc. Ph.D. students, approved as such by the department, may proceed directly with doctoral work without taking the Masters degree, though many such students choose to take the intermediate degree in course.

The Master of Arts degree may be earned in two ways. The program with thesis calls for eight semester courses, one of which may be a thesis research course (297 or 298). These courses should build upon and extend the student's undergraduate preparation in the field, and should reflect some specialized interest. The program may be entirely in English, or may include one related course in another department, e.g., history, philosophy, a foreign literature. The Master's thesis, which normally grows out of research in an advanced seminar, is to be a lucid and responsible piece of scholarship or criticism, manifesting the student's mastery of the research skills and tools pertaining to his fields; it normally ranges between 50-100 pages. A full-time student in this program can normally complete the work for the A.M. within one calendar year.

The Master of Arts program without thesis calls for ten semester courses (requiring a third semester's residence), one of which may be a reading/research course (297 or 298). One of the two additional courses in the third semester shall be an advanced seminar in the area of the student's special interest and calling for a sustained scholarly product. The other shall be a Teaching Workshop (293A) centering upon the theory of language and composition, which affords the student some experience in teaching and tutoring students. This program is geared especially for students who wish to teach in Junior Colleges and Community Colleges.

Course Requirements for the A.M. in Either Program:

1. One semester course in literary theory or criticism.
2. A three-to-four week non-credit workshop in Methodology of Literary Scholarship, beginning during orientation week.

Recommended Courses:

1. One semester course emphasizing philological or linguistic training.
2. One semester course in English Literature before 1700, in addition to the one-semester philology requirement.

Language Requirement for Either Program:

A candidate for the M.A. should show competence in one modern foreign language. Normally this is demonstrated by passing a departmental examination.

MASTER OF ARTS IN WRITING. The acceptance of candidates for the Master of Arts degree in Writing is determined by three members of the staff of the Writing Program. Candidates take eight courses, four of which are in writing. The other four courses supplement the major objective of completing a substantial manuscript in fiction, poetry, drama, or film writing, which is submitted as a thesis. All students are advised to take one or two courses in studio or performing arts: music, drama, painting, sculpture, or the like. Poets, in particular, are advised to take one or two semester courses in translation. In the last semester of residence the candidate prepares and delivers a public reading from his or her work. Normally, work for the degree is done during a two year period,

though on rare occasions it may be completed in a shorter time.

DOCTOR OF PHILOSOPHY. Specializations in the doctoral program are possible in any period of English or American Literature, in English philology, in literary theory and criticism, and in genre studies. Interdepartmental specialization, e.g., in cooperation with Linguistics or Comparative Literature, is also possible. *Courses.* A full time doctoral candidate will register for eight courses during the first year of residence, for the most part at the 200-level, though a limited number of 100-level courses in areas where basic coverage is needed may be elected. After the first year, the student will take at least six additional courses and advanced seminars.

Course Requirements

1. One semester course in literary theory or criticism, required during the first year of study.
2. One semester course emphasizing philological or linguistic training.
3. One semester course in English Literature before 1700, in addition to the one semester philology requirement.
4. A three-to-four week non-credit workshop in Methodology of Literary Scholarship, beginning during orientation week.

In addition, a seminar in the theory and practice of teaching writing (293A) is expected. The Department requires its Ph.D. students to do three years of supervised teaching in the department. A waiver is granted only in special circumstances; for further information, see departmental statement.

Foreign Languages. The foreign language requirement may be met in two ways. The student may show competence in two languages by passing ETS or departmental examinations. Alternatively, he or she may pass an ETS or department examination in *one* language, and in addition take a one-semester graduate course in a language relating to the area of specialization from the offerings in literature of the University's departments of classical or modern foreign languages or (in some cases) Comparative Literature. The course may be, or may not be, in the same language offered for ETS or departmental examination. The intention is to permit the candidate to determine, with the advice of the department, the language or languages most useful in the proposed area of specialization. Certain areas of specialization within the Department (medieval literature, for one) have specific language requirements; students intending to specialize should ask area faculty about such requirements.

Preliminary Examination. The preliminary examination tests the competence the candidate has attained, through course work and independent study, in two disciplines, central to English studies, literary history and literary criticism. There are two parts.

PART I. An oral examination over a list of works presented by the candidate and approved by his or her committee. The list should display the candidate's familiarity with major authors, periods, and movements of one national literature, either English or American, and a reasonable acquaintance with some of the important figures of the other; some European writers may be included if the candidate wishes. The list, averaging seventy-five to one-hundred titles, should be broadly representative of periods, genres, and kinds of literature, though it should also reflect the candidate's primary concentration and interests. Whole works should be presented, not selections, and wherever possible volumes of lyric poetry rather than individual titles. This examination should normally be taken at the end of the second year, or at the beginning of the fifth semester.

PART II. A three-to-four hour written examination in the candidate's area of specialization. The student may offer specialization in a particular historical field, in a genre, or in a topic or area otherwise defined (e.g., an interdisciplinary field); the definition of the area of specialization to be approved by the candidate's committee. This examination will normally be taken at the end of the fifth semester.

Dissertation. The doctoral dissertation must be a lucid and substantial work of scholarship or criticism.

The program of doctoral study is one which a student working as a Teaching Assistant can complete in five years. The program supposes that the first two years will be devoted to course work, seminars, and fulfilling the requirements in foreign languages, that both parts of the preliminary examination will be taken and passed and a dissertation proposal submitted by the end of the third year, and that the fourth and fifth years will be given over to the writing of the dissertation. Students

who have fully demonstrated their ability in the first year of graduate study are permitted to proceed directly with doctoral work without taking an M.A. degree.

I. PRIMARILY FOR UNDERGRADUATES¹

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|---|--------------------------------------|
| 1. <i>The Process of Writing</i>
Emphasizes strategies for all stages of the writing process: generating ideas, identifying audience and purpose, organizing and revising. | Mr. ALLEN and STAFF. |
| 2. <i>Scholarly and Critical Writing</i>
An introduction to writing from research. | Mr. FOLEY and STAFF. |
| 3. <i>Technical and Scientific Writing</i> | The STAFF. |
| 4. <i>The Personal Voice</i>
The development of a credible personal style in prose. | Ms. BLASING and STAFF. |
| 5. <i>Beginning Fiction Writing</i> | Mr. HAWKES, Ms. SCOTT and STAFF. |
| 6. <i>Beginning Play Writing</i> . (Theatre Arts 6) | |
| 7. <i>Beginning Poetry Writing</i> | The STAFF. |
| 8. <i>Beginning Journalistic Writing</i> | The STAFF. |
| 10. <i>Intermediate Fiction Writing</i> | Mr. HAWKES, Ms. STEINBACH and STAFF. |
| 11. <i>Intermediate Poetry Writing</i> | Ms. WRIGHT and STAFF. |
| 12. <i>Intermediate Play Writing</i> (Theatre Arts 12) | Ms. VOGEL and STAFF. |
| 13. <i>Intermediate Journalistic Writing</i> | The STAFF. |
| 14. <i>Persuasive and Argumentative Writing</i> | Mr. FOLEY and STAFF. |
| 15. <i>Introduction to Fiction</i>
Critical reading and writing. Introduction to the novel and the short story, emphasizing the development of critical skills through reading, discussion, and writing. Frequent writing assignments; close attention to the stages of the writing process. | Mr. SCHOLES and STAFF. |
| 16. <i>Introduction to Poetry</i>
Critical reading and writing. Readings of selected English and American poems from different historical periods suggest a broad range of critical concerns. The course emphasizes the development of critical skills through reading, discussion, and writing. Frequent writing assignments; close attention to the stages of the writing process. | Mr. ST. ARMAND and STAFF. |
| 17. <i>Introduction to Drama</i>
Critical reading and writing. Readings of English and American plays suggest some of the major concerns of dramatic criticism. The course emphasizes the development of critical skills through reading, discussion, and writing. Frequent writing assignments; close attention to the stages of the writing process. | Ms. HARING-SMITH and STAFF. |
| 20. <i>Advanced Fiction Writing</i> | Mr. HAWKES and Ms. STEINBACH. |
| 21. <i>Advanced Poetry Writing</i> | Mr. HARPER and Ms. WRIGHT. |
| 22. <i>Advanced Play Writing</i> | Ms. VOGEL. |
| 23. <i>Advanced Journalistic Writing</i> | Mr. HENKLE. |
| 24. <i>Special Topics in Writing</i>
Section 1. Memories and Memoirs.
Section 2. Ideas and Criticism of Ideas | Mr. ALLEN.
Ms. SHERIDAN. |

¹ Here, and in the following sections, those courses which are listed with an indication of the identity of the Instructor or Instructors are scheduled in 1985-86.

25. *Individual Study in Writing* The STAFF.
Tutorial instruction.
29. *Seminar in the Teaching of Writing* Ms. HARING-SMITH.
An exploration of the theory and practice of teaching writing.
31. *Survey of English Literature, I* Mr. SABOL.
A survey course in English prose and poetry from the beginnings to 1660.
32. *Survey of English Literature, II* Mr. LANDOW.
A survey course in English prose and poetry from 1660 to modern times.
33. *Sixteenth-Century Literature*
34. *Selected Modern Writers, English and American*
35. *Seventeenth-Century English Literature* Mr. DAVIS.
39. *Special Topics in Literature*
(Enrollment limited to freshmen and sophomores.)
- Section A. Science Fiction: between science and the humanities Mr. ROBERTSON.
- Section B. Mad Women in and out of the Attic: women and madness in literature. Ms. SWEENEY.
- Section C. Dramatic Comedy: a study of archetypal comic strategies from Aristophanes to Beckett Mr. KRAUSE.
41. *American Literature* Ms. CALDWELL.
Major American writers of prose and poetry from the Puritans to Whitman.
42. *American Literature*
Major American writers of prose and poetry from Twain to Hemingway.
43. *Black Women in Poetry and Fiction* Ms. WHITLOW.
An exploration of the range of the black female experience as presented imaginatively through the novels of Jamaica Kincaid, Toni Morrison, Zora Neale Hurston and Paule Marshall, the short stories of Alice Walker, and the poetry of Gayl Jones and Sherley Anne Williams.
44. *Black Novelists*
49. *Romantic Literature* Mr. COOMBS.
50. *Romantic Literature, Special Topic*
54. *Comedy and Laughter*
56. *The Nature of Tragedy*
61. *Victorian Poetry*
- S71. *Undergraduate Seminar* Mr. HARPER.
Chant of Saints.
- S72. *Undergraduate Seminar* Mr. NICHOLS.
Peoples of America in Literature.
- S73. *Undergraduate Seminar* Mr. ALLEN.
Arthurian Romance.
- S74. *Undergraduate Seminar* Mr. ST. ARMAND.
Mark Twain.
- S75. *Undergraduate Seminar* Ms. ROONEY.
English in America: introduction to literary theory.
- S76. *Undergraduate Seminar* Mr. SCHROEDER.
Shakespearean Perspectives.
- S90. *Senior Seminar* Mr. GOLDBERG.
Shakespearean Histories: *Richard II*, *Henry IV*, parts I and II, and *Henry V*.
- S92. *Senior Seminar* Ms. CALISHER.
Readings in Contemporary Literature: contemporary non-American writers and their antecedents.

93. *Senior Seminar* Ms. WRIGHT.
The New Long Poem: a selection of long poems published in English in the last decade.
94. *Senior Seminar* Mr. HARPER.
Four Afro-American Voices: Sterling Brown, Robert Hayden, Margaret Walker, Gwendolyn Brooks.
95. *Senior Seminar* Ms. STEINBACH.
Studies in the Novella.

II. FOR UNDERGRADUATES AND GRADUATES

- 101, 102. *Workshop in Creative Writing* (Theatre Arts 128H)
Mss. CALISHER, STEINBACH, WRIGHT and Mr. WALDROP.
Students will be expected to complete extended imaginative works or series of works.
103. *The Structure and History of the English Language.* Mr. RUSSOM.
A survey of the major historical developments affecting English from its Indo-European origins to the present.
104. *The Structure and History of the English Language* Mr. COOMBS.
105. *Chaucer, the Canterbury Tales* Mr. ALLEN.
106. *Chaucer*
- 115, 116. *Principles of Literary Criticism*
- ✓ 117. *Survey of English Poetry, 1200-1660* Ms. WOODS.
118. *Survey of English Poetry, 1660-1940* Ms. WOODS.
122. *Development of the American Theatre*
- 123, 124. *History of the European Theatre* (Theatre Arts 123, 124) Mr. WILMETH.
- 125, 126. *Shakespeare, Selected Plays* Mr. SABOL.
In 1985-86, the plays studied will be *Romeo and Juliet*, *2 Henry IV*, *Twelfth Night*, *Measure for Measure*, *Antony and Cleopatra*, *The Winter's Tale*.
127. *Restoration and Early Eighteenth-Century Literature* Ms. RABB.
128. *The Age of Johnson*
130. *Milton, Poetry and Prose*
133. *English Fiction of the Eighteenth Century* Ms. RABB.
The 18th-century English novel.
134. *Nineteenth-Century British Fiction* Ms. ROSENFELD.
136. *Studies in the Renaissance*
A reading of the major authors.
137. *English and American Non-Fiction* Mr. LANDOW.
140. *Earlier American Literature* Ms. CALDWELL.
- ✓ 141. *American Prose Fiction*
To the Civil War.
142. *American Prose Fiction* Mr. SHROEDER.
Since the Civil War.
143. *American Poetry* Ms. BLASING.
From the time of the Puritans to the Civil War.
- ✓ 144. *American Poetry.* Ms. BLASING.
From the Civil War to the present.
146. *Special Topics* Ms. WOOD.
British and American Women Poets.

148. *Special Topics*
The Dramatic Writings of G.B. Shaw and the 19th-century Theatre. Mr. WILMETH.
149. *Special Topics*
British and American Woman Writers Ms. ROONEY.
150. *Special Topics*
The *Cantos* of Ezra Pound: motifs and methods. Messers. LAUGHLIN, OLDCORN, WALDROP.
171. *Twentieth-Century Poetry, English and American, to World War II*
172. *Twentieth-Century Novel, English and American, to World War II* Mr. NICHOLS.
173. *Shakespeare, Histories and Comedies* Mr. SHROEDER.
174. *Shakespeare, Tragedies and Romances* Mr. SHROEDER.
181. *English Drama from the Beginnings to 1600*
182. *Early Stuart Drama, 1604-1640* Mr. SABOL.
186. *English and American Drama, Seventeenth and Eighteenth Centuries*
187. *Twentieth-Century English and American Drama, to World War II* Ms. HARING-SMITH.
191. *Senior Honors Conference* Ms. WOODS and STAFF.
192. *American and British Poetry since World War II*
193. *American and British Fiction since World War II* Mr. SPLIKA.
194. *American and Continental Drama and Theatre since World War II* Ms. VOGEL.
198. *Reading and Research.* The STAFF.

HONORS COURSES

- H1, H2, *Shakespeare, the Complete Works*
Semester I: Comedies, histories, and poems. Semester II: Tragedies, problem plays, and dramatic romances.
- H3. *The Seventeenth Century*
- H4. *Milton* Mr. GOLDBERG.
- H5, H6. *The Eighteenth Century* Mr. BLOOM.
- H7. *The Romantic Movement, Earlier Years*
- H8. *The Romantic Movement, Later Years*
- H9. *Victorian Literature* Mr. WALDROP.
- H10. *Victorian Literature, Special Topic*
- H11. *American Literature* Mr. BLASING.
- H12. *American Literature* Mr. HIRSCH.
- H13. *Modern British Literature* Ms. ROSENFELD.
- H14. *Modern American Literature* Ms. ROSENFELD.
- H15. *Special Topic*
- H16. *Special Topic* Mr. KRAUSE.
Theatre of absurdity and revolt.
- H29. *The Middle Ages* Ms. KIRK.
- H30. *The Renaissance* Mr. DAVIS.

III. PRIMARILY FOR GRADUATES.

201. *Second-Year Graduate Workshop in Creative Writing*
Messers. HARPER AND HAWKES: Ms. VOGEL.
A writing seminar, limited to second-year graduate students, with emphasis on developing a better

understanding of creative process, strategies, and forms.

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| 210. <i>Seminar in Dramatic Theory</i> (Theatre Arts 210) | Mr. EMIGH. |
| 224. <i>Methods of Literary Criticism</i> | Mr. SPILKA. |
| 225, 226. <i>The History of Literary Criticism</i> | |
| 225A. <i>Studies in Literary Theory</i> | |
| 226A. <i>Studies in Literary Theory</i> | Mr. HIRSCH. |
| 231, 232. <i>History of the English Language</i> | |
| 233. <i>Old English Language and Literature</i> | Mr. ACKER. |
| 234. <i>Old English Language and Literature</i> | Mr. RUSSOM. |
| 235A. <i>Language and Symbolic Structures</i> | |
| 241. <i>Middle English Language and Literature</i> | |
| 242. <i>Middle English Language and Literature</i>
<i>Piers Plowman</i> and the <i>Gawain</i> -poet. | Ms. KIRK. |
| 243. <i>Chaucer's Folktales</i> | Mr. ROSENBERG. |
| 244. <i>The Early Chaucer</i> | Ms. KIRK. |
| 245, 246. <i>Sixteenth-Century Literature</i> | |
| 245A. <i>Studies in the Literature of the Renaissance</i> | |
| 246A. <i>Studies in the Literature of the Renaissance</i>
Approaches to Renaissance literary historiography. | Mr. FOLEY. |
| 249. <i>Shakespeare, Comedies, Histories, and Poems</i> | Mr. GOLDBERG. |
| 249A. <i>Studies in Elizabethan Drama</i> | |
| 250. <i>Shakespeare, Tragedies and Romances</i> | |
| 251. <i>Seventeenth-Century Literature</i>
Seventeenth-century English poetry. | Ms. WOODS. |
| 252. <i>Seventeenth-Century Literature</i> | |
| 252A. <i>Studies in Seventeenth-Century Literature</i>
Non-fictional prose. | Mr. DAVIS. |
| 255, 256. <i>Eighteenth-Century Literature</i> | Ms. RABB. |
| 259. <i>Eighteenth-Century Fiction</i> | |
| 260. <i>Eighteenth-Century Fiction</i>
Jane Austen. | Mr. BLOOM. |
| 261. <i>English Literature of the Romantic Age</i> | |
| 262. <i>English Literature of the Romantic Age</i>
The Romantic imagination. | Ms. HARING-SMITH. |
| 263. <i>English Literature of the Victorian Age</i> | Mr. LANDOW. |
| 264. <i>English Literature of the Victorian Age</i> | |
| 265, 266. <i>Nineteenth-Century English Fiction</i> | Mr. HENKLE. |
| 267. <i>Modern Fiction</i> | |
| 267A. <i>Studies in Modern British Literature</i>
British poets of the 1930's. Auden and others. | Mr. SCHOLES. |
| 268. <i>Modern Fiction</i>
Dickens. | Ms. ROSENFELD. |
| 273. <i>Major American Literary Figures</i>
Poe, Hawthorne, Melville. | Mr. HIRSCH. |

273A. <i>Studies in American Literature</i> Emerson and Thoreau.	Mr. NICHOLS.
274. <i>Major American Literary Figures</i> Whitman.	Mr. NICHOLS.
274A. <i>Studies in American Literature</i> American painting and literature of the nineteenth century.	Mr. ST. ARMAND.
275. <i>Modern American Literary Figures.</i>	Mr. MONTEIRO.
275A. <i>Problems in American Literature</i> Image of the child in American Literature.	Mr. ST. ARMAND.
276A. <i>Problems in American Literature</i> The Puritan legacy in American literature.	Ms. CALDWELL.
286. <i>Special Topics</i> Postmodern American Poetry.	Ms. BLASING.
287. <i>Special Topics</i> Theories of textuality.	Ms. DOANE.
288. <i>Special Topics</i> Contemporary feminist theory.	Ms. ROONEY.
288A. <i>Special Topics</i> Institutions of Renaissance criticism from the late 19th century to the present.	Mr. GOLDBERG.
289. <i>Special Topics</i> Drama in theory and performance.	Ms. HARING-SMITH.
293A. <i>Laboratory in Teaching Writing</i>	Mr. ALLEN.
294A. <i>Teaching Workshop in Literature</i>	
297, 298. <i>Reading, Independent Study, Research.</i>	The STAFF.
297A, 298A. <i>Doctoral Research in English and American Literature</i>	The STAFF.

Environmental Studies

A concern for the issues and problems of the natural and human environment on the part of students and faculty at Brown led to the formation of the Center for Environmental Studies in May 1978. The Center acts as a resource and communication center for members of the Brown and the Rhode Island communities and assists students in securing academic internships and volunteer positions with governmental agencies and public interest groups.

The standard environmental studies concentration provides the guidance necessary to design a program which has depth in a single area of knowledge and exposure to at least two related areas. A student may elect a policy focus or a science focus and all students will take basic courses in environmental studies, course work in values or ethics, and an independent research course(s) leading to the preparation of a thesis. A policy focus requires some course work in the sciences and the science focus involves some policy related study, to insure that all students have a basic understanding of the broad scope of environmental problem-solving.

An environmental studies concentration is a particularly appropriate addition to the liberal arts curriculum. Virtually every substantial environmental problem requires for its solution an understanding of both the natural and human environment as well as some appreciation of societal value structures. Therefore, an environmental studies concentration necessarily encompasses work in the physical, biological and social sciences as well as some exposure to ethics and values, all of which must be related in ways which make the disciplinary skills and information available for problem-solving.

The Executive Committee of the Center for Environmental Studies is composed of faculty members and students from various environmentally related fields. The faculty members are Professor Douglas Anderson (Anthropology), Associate Professor Annette Coleman (Biology), Professor George Seidel (Physics), Assistant Professor Johanna Schmitt (Biology), Associate Professor Jon

Waage (Biology), Professor Harold Ward (Chemistry), Associate Professor Tom Webb (Geology), Associate Professor Dudley Burton (Environmental Studies), Assistant Professor DeWitt Allen (English), and Assistant Professor Jim Marone (Political Science). The 85-86 student members are John Gruber, Sarah McClurg and Mike Siegel.

For information concerning Environmental Studies contact Harold Ward, Director, Center for Environmental Studies, Box 1943, Urban Environmental Laboratory, 135 Angell Street.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

The program requires a minimum of fifteen courses for a concentration, including Environmental Studies 11, 191, 192, 195 or 196. Economics 111 or 113, one course in Biomedical Sciences and one course in values or ethics. The remaining eight courses are selected from the sciences or policy related courses.

Science Focus: Six science courses in addition to a Biomedical Science course and thesis research; two policy related courses, one of which lies outside the field of economics.

Policy Focus: Six policy courses in addition to Economics 111 or 113 and thesis research; two science courses, one of which should be in the physical sciences.

Thesis Requirement: Each student must register for ES 195 and/or 196 and must submit a thesis proposal to the CES concentration committee no later than two weeks prior to the start of the semester in which the thesis preparation is to begin. Students will be urged to begin the development of their thesis topic as part of Environmental Studies 192 and to begin the thesis no later than the seventh semester.

Honors: Honors may be awarded by a vote of faculty members of the Executive Committee of the Center upon recommendation of the thesis advisor to students whose work in Environmental Studies has demonstrated superior quality and culminated in an Honor's Thesis of distinction.

Senior Prize: Each year the Center awards a prize to the graduating senior who has made the most outstanding contribution to environmental studies at Brown.

I. PRIMARILY FOR UNDERGRADUATES

11. *Environmental Issues* (Foundations F16)

Mr. WARD.

Introduction to environmental studies. A number of case studies of environmental issues, ranging from events of local to global concern, will be examined. The natural science necessary to discuss these issues, the institutional framework in which decisions affecting these issues are made and the values which underlie these decisions will be discussed. The manner in which the methods of the various disciplines are used to reach these decisions will be explored. Sections to be arranged.

41-42. *Conscientious Consumption: Efficient Energy Use*

Messrs. BURTON and WARD.

This course will analyze the residential use of energy resources both in theory and practice. Members of the class will reside in a Brown-owned residence for the academic year. In the fall semester, energy use in the building will be modeled, structural and operational improvements will be planned and implemented, and the place of residential use of energy in overall energy strategies will be analyzed. In the second semester, energy use will be measured to illustrate the principles of scientific measurement.

II. FOR UNDERGRADUATES AND GRADUATES

151. *Environmental Theory and Philosophy*

Mr. BURTON.

This course introduces students to the range of analytic and theoretical issues that appear in environmental controversies. The course is highly interdisciplinary and specifically deals with the philosophical and value assumptions (and limitations) associated with particular modes of environmental argument. In short, this is a course in "ways to think" about environmental matters.

191. *Analysis and Resolution of Environmental Problems, I.*

Mr. WARD.

Case study method is used to analyze selected environmental problems. Emphasis on use of scientific and technical data by the legal system in the resolution of environmental disputes. Students will work on group projects concerning current environmental problems in Rhode Island and the

New England regions. Some background in a physical and biological science and in economics is desirable (e.g. Chemistry 3, Biomed 12, Economics 111). Environmental Studies 11 is a prerequisite. Intended for juniors and seniors. Enrollment limited to 25. Written Permission.

192. *Analysis and Resolution of Environmental Problems, II*

Mr. BURTON.

Will begin with an exploration of various research methodologies relevant to environmental studies. The remainder of the semester will be devoted to seminars presented by each class member and critiqued by the entire class. Environmental Studies 11 is a prerequisite and normally Environmental Studies 191 also will be taken before this course. Enrollment limited to 25. Written permission.

195, 196. *Independent Study*

Mr. WARD.

Individual analysis of environmental issues, required for all Environmental Studies concentrators. This course may be taken more than once for credit. Written permission required.

French Studies

Professors AHEARN, BAUER,¹ GOUX, MAJEWSKI, SCHOR,² Associate Professors BOSSY,³ DURAND (Chairperson), HUGOT, WIMMERS,² Assistant Professors GOLOPENTIA-ERETESCU, LESKO; Lecturers, KEINEG, WIART; Visiting Associate Professor BOUVIER.⁴

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAMS FOR THE BACHELOR OF ARTS DEGREE.

The Department of French Studies offers standard and Honors concentration programs, focused on language, literature, and civilization.

Program in French Literature. Prerequisite: French 19B, 75, 76 or Advanced Standing credit on entrance (AP score of 4 or 5). The program consists of a minimum of eight courses. Required courses: two upper language courses (i.e., French 19A, 51, 151) plus either French 190 or 198. Elective courses: at least five chosen from the departmental offerings at the 100 or 200 level.

Program in French Civilization. Prerequisite: French 19B, 75, or 76. Overall requirement: eight courses with a minimum of five courses in French Studies. Required courses: two upper level language courses (French 19A, 51, 151), plus 141 or approved equivalent and either 190 or 198. Elective courses are chosen at the 100 or 200 level in French Studies or other departments such as Anthropology, Art, History, and Political Science.

Program in French Language. A minimum of eight courses, as follows: 1. A sequence of two Departmental French language courses: 51 and 151 and one independent study course (beyond 151 level), or two independent courses in French language (both beyond 151 level). 2. Two 100-level "content" courses offered by the Department, in French literature, civilization, or film. 3. Three 100-level courses offered by other departments, offering specific insight into the functioning of language, or into specific language modes, to be distributed into at least two of the following categories: anthropology, linguistics, philosophy, semiotics, theory of literature; a list of appropriate courses will be provided each year by Department. 4. One independent study course to provide a synthesis of the knowledge acquired in various areas of learning.

Honors. The requirements are the same as for the standard concentration programs, with these differences: the minimum number of courses is ten (rather than eight) and French 198 is required as part of the honors thesis project.

Related Courses or Programs. Students in French are encouraged to take courses related to their interests in other modern languages and literatures, in comparative literature, in linguistics, and in such fields as art, history, music, philosophy, and political science.

¹ On leave 1985-86.

² On leave 1986-87.

³ On leave Sem. II, 1986-87.

⁴ Sem. I, 1985-86.

GRADUATE PROGRAMS

MASTER OF ARTS. Work for the master's degree may be wholly in French Studies or may include one or more courses in such related fields as a second literature, comparative literature, linguistics, history, philosophy or art. A candidate is expected to read, speak, and write French and to have an adequate knowledge of French literature. Demonstration of proficiency in reading either German, or, normally, another Romance language will be required.

DOCTOR OF PHILOSOPHY. The general requirements for the doctorate are outlined below:

1. Command of the French language, spoken and written, and an awareness of its structure and potentialities for expression. Candidates in French must demonstrate proficiency in reading two other languages, including another Romance Language.
2. An understanding of the origins, development, and structure of the French language and its connection with related languages. French 101 is required of all candidates.
3. Knowledge of French literature, consisting of wide acquaintance with its chief movements and writers and a thorough knowledge of selected major authors and works, including their historical and intellectual environment.
4. A limited number of approved graduate courses in a field closely related to the major interest of the candidate may be included in the doctoral program. Such courses will usually be chosen from comparative literature, a second literature, or linguistics, but studies in related fields may be approved on presentation of sufficient evidence of its relevance to the intellectual purposes of the candidate.
5. Teaching experience under supervision. A knowledge of Latin is strongly recommended, and will be required in certain research fields. French 290 (Teaching Methods) is required of *all candidates*.

I. PRIMARILY FOR UNDERGRADUATES

NOTE: French 1, 2, 3, 4, 19A, 19B, 51, 151 constitute the language program. This sequence may be altered in certain cases: with written permission from the placement advisor individual students may skip courses ("acceleration") or repeat them for credit (e.g., after an interruption in the study of French). Courses in the language program offer practice in four skills: listening, speaking, reading, writing. Oral communication receives priority in class. Materials studied cover a wide range of topics and are chosen from a great number of modules (tapes, written texts, slides, films). Starting in French 3, the program is so designed as to enable every student to choose, in close consultation with the instructor, the relative emphasis to be given to each skill and the materials used for individual practice.

1-2. *Basic French*

Ms. WIART and STAFF.

A two-semester course; no credit is given for the first semester alone. Six hours per week: Conversation, grammar, and language laboratory. In the second semester an accelerated track enables selected students to go directly to French 19 in the following semester.

3. *Intermediate French I*

Ms. LESKO and STAFF.

Prerequisite: French 2 or placement.¹ Oral practice in class, grammar review, minimum of three hours of language laboratory. Individualized reading and writing.

4. *Intermediate French II*

Ms. LESKO and STAFF.

Prerequisite: French 2 with written permission, French 3, or placement.¹ For course description, see French 3.

19A. *Writing and Speaking French I*

The STAFF.

Prerequisite: French 2 (accelerated track) with written permission, French 4, or placement. Oral practice in class. Laboratory work, grammar review, reading, and writing are all individualized.

¹ See announcement for Placement Tests, page 64.

19B. *Introduction to the Literary Experience*

Mr. MAJEWSKI and STAFF.

Prerequisite: French 2 (accelerated track) with written permission, French 4, or placement. Laboratory work (listening comprehension), grammar review, and writing skills will be individualized. Classroom discussion devoted entirely to literary texts from the 17th century to the present.

51. *Writing and Speaking French II*

The STAFF.

Prerequisite: French 19A, 19B or placement,¹ or French 17, 18, or 35. For course description, see French 19A.

75. *Literature and Social Thought* (Semiotics 163D)

Mr. GOUX.

Introduction to several approaches to literature relying on methods drawn from other fields: sociology and history, anthropology, psychoanalysis, semiotics. Three perspectives: a) historical and social contexts, b) thematic or structural invariables, and c) language and reality.

76. *Intensive Introduction to Literature and Literary Methods*

Ms. WIMMERS.

Intended for qualified upper classmen and for freshmen who have attained the highest placement in French. Using selected works of three or four major authors in the areas of prose fiction and poetry, this course offers an intensive introduction to the central concepts and modes of literature and literary criticism. (Replaces FR 35)

II. FOR UNDERGRADUATES AND GRADUATES

NOTE: General prerequisite for all 100-level courses (except 131 and 151) is one of the following: French 19, 51, 75, or 76. All 100-level courses, with the exception of 151, offer specific topics which vary from year to year. Detailed descriptions of the yearly course topics can be obtained from the departmental office. Any course may be repeated for credit, provided that the topic is different. Several 100-level courses are offered in alternate years.

101. *Early French Language and Literature*

Mr. BOSSY.

Readings of texts dating from the eleventh to the sixteenth century and illustrating the development of the French language and literature.

103. *Studies in French Literature of the Renaissance*

Ms. DURAND and Ms. LESKO.

Analysis of the works of writers such as Rabelais, Ronsard, and Montaigne. The course may examine several important writers or focus on some aspect such as a theme, a genre, or the work of a single author.

104. *Studies in French Literature of the Seventeenth Century*

Ms. LESKO.

Topic for 1985-86: Héros et Héroïnes du 17^e siècle. Close readings of texts by Corneille, Molière, Racine, La Fontaine, and Madame de Lafayette, emphasizing the figure of the comic or tragic hero/heroine, and the types of rhetoric through which each communicates his or her vision of the world and justification of self.

105. *Studies in French Literature of the Eighteenth Century*

The STAFF.

History of ideas and the development of form and content in the literary genres of the Enlightenment.

106. *Studies in French Literature of the Nineteenth Century*

Mr. MAJEWSKI and Ms. SCHOR.

The expansion of artistic consciousness and self-consciousness through the discovery of new poetic, novelistic and dramatic forms, and new means to express and describe reality. Topics will be chosen from such areas as: themes and myths of the romantic imagination, symbolist poetry, and the realist and naturalist novel.

107. *Studies in French Literature of the Twentieth Century*

Mr. GOUX and Ms. WIMMERS.

Different tendencies and movements in literature and thought, ranging from the Naturalist and Symbolist legacy to Structuralism. The scope of the course may be either general (consideration of several major writers) or specific (study of some significant aspect, such as a theme or a genre or the work of a single author). Topics 1985-86: Lire l'avant-garde (Sem. I) and Le Surréalisme (Sem. II).

111. *Studies in the French Novel*

The STAFF.

A series of inquiries into the nature of the novel in all periods.

112. *Studies in the French Theatre* Ms. GOLOPENTIA-ERETESCU.
A comparison of selected types of French drama from the *Mystère d'Adam* to the Theatre of the Absurd. The course will focus on one or more aspects of the drama, such as the aims, forms, themes, stagecraft, and concepts of the dramatic art.
113. *Studies in French Poetry* Ms. DURAND and Ms. LESKO.
Exploration of different perspectives on French poetry from the earliest periods to the 20th century.
114. *Studies in French Criticism* The STAFF.
Manifestations of literary criticism from the Renaissance to the present: relationships between the artist and the critic, individual works as seen by different critics, schools of criticism.
115. *Studies in French Cinema* Mr. BOUVIER.
A study and analysis of the great works of French Cinema. Sem. I, 1985-86.
121. *Studies in Major French Writers* Mr. MAJEWSKI.
An intensive analysis of the works of a single important literary figure. Topic for 1985-86: Balzac.
- 131A. *Special Topics in French Studies* (Semiotics 163M) Ms. GOLOPENTIA-ERETESCU and Ms. SCHOR.
Topic for 1985-86: Le français dans le monde (Sem. I), Représentations de la femme au 19^e siècle (Sem. I).
- 132A. *Special Topics in French Studies* Mr. BOUVIER.
Topic for 1985-86: Le libertinage au XVIII^e siècle et l'avènement du particulier.
- 132B. *Special Topics in French Studies* Mr. HUGOT.
Topic for 1985-86: La France et l'Occupation, 1940-44.
133. *Studies in French Literature in English Translation (I)*. Ms. DURAND.
Topic for 1985-86: The Novel in France from Rabelais to Tournier. Readings of French novels in translation, from the Renaissance to the twentieth century. Designed to acquaint students who do not read French with the changes in form, style, and technique that have marked French fiction over the centuries. Authors read will include Rabelais, Mme de LaFayette, Laclos, Maupassant, Zola, Gide, Colette, Camus, and Tournier.
- NOTE: The following two courses, 141 and 142, are specifically designed for students interested in French civilization: in these courses, literary texts will be studied along with other documents in light of the cultural, social and anthropological forces that are essential components of any given historical period.
141. *French Culture and Civilization* Mr. BAUER.
Provides a general introduction to the civilization of France, and a cross-cultural perspective which will foster more tolerance for an alien way of life and make us at the same time better appreciate our own culture.
142. *French Society Today* Mr. BAUER.
The semiotics of daily life will be discussed including the food and the clothing codes, marks of social distinction in everyday life, rules of etiquette, as well as more complex systems which integrate image and text, like newspapers and magazines, and advertising. (Not offered 1985-86.)
151. *Advanced Written and Oral French* Messrs. BAUER and HUGOT.
Follows French 51 in the sequence of language courses. Prerequisite: French 51 or placement by interview. Students in this course choose specific areas of language performance in which to develop advanced proficiency.
190. *Senior Seminar* Mr. GOUX.
Studies in the development, comparison and synthesis of representative themes, problems, aims and styles of French literature from the Middle Ages to the present. Either this course or 198 is required of all concentrators. Open to others with permission of the instructor. Offered every year. Topic for 1985-86: Les Utopistes français.
198. *Senior Thesis*
Independent study in preparation of a senior thesis under the direction of a member of the staff. Either this course or 190 is required of all concentrators in French.

III. PRIMARILY FOR GRADUATES

NOTE: 200-level courses are offered every second or third year.

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| 204. <i>Studies in Medieval French Literature</i> | Mr. BOSSY. |
| 211. <i>Studies in French Literature of the Renaissance</i> | Ms. DURAND and Ms. LESKO. |
| 213. <i>Studies in French Literature of the Seventeenth Century</i> | Ms. WIMMERS and Ms. LESKO. |
| 215. <i>Studies in French Literature of the Eighteenth Century</i> | The STAFF. |
| 217. <i>Studies in French Literature of the Nineteenth Century</i> | Mr. MAJEWSKI and Ms. SCHOR. |
| Topic for 1985-86: Flaubert. | |
| 219. <i>Studies in French Literature of the Twentieth Century</i> | Mr. GOUX, Ms. SCHOR, and Ms. WIMMERS. |
| Topic for 1985-86: Roman moderne et narratologie. | |
| 260. <i>Studies in French Critical Theory</i> | Mr. GOUX. |
| Topic for 1985-86: Le Structuralisme. | |
| 261. <i>Seminar in French Literature</i> | Ms. GOLOPENTIA-ERETESCU and Ms. SCHOR. |
| Topic for 1985-86: La Théatralité. | |
| 290. <i>Teaching Methods</i> | Mr. HUGOT. |
| 291, 292. <i>Reading and Research</i> | The STAFF. |
| Offered every year. | |

Geological Sciences

Professors GILETTI, HEAD, HERMANCE, HESS, IMBRIE, MATTHEWS, RUTHERFORD (Chairman), WEBB, YUND; Associate Professors FORSYTH, GROMET¹ PARMENTIER, PIETERS, PRELL, SCHULTZ, J. TULLIS,² T. TULLIS; Assistant Professors BYRNE, GROMET; Adjunct Professor Berggren.

The Department aims to develop in its students a comprehensive grasp of the principles of the geological sciences as well as the ability to think critically and creatively. Formal instruction places an emphasis on fundamental principles and recent developments. The courses of study are conducted by means of lectures, seminars, laboratories, colloquia, and field trips. Undergraduates as well as graduate students have opportunities to carry out research in current fields of interest.

The principal research fields of the Department are geochemistry, mineralogy, igneous and metamorphic petrology, tectonophysics including geophysics and structural geology, climate dynamics-oceanography-sedimentation, and planetary geology. Emphasis in these different areas varies but includes experimental, theoretical, and observational approaches as well as applications to field problems. Field studies of specific problems are encouraged rather than field mapping for its own sake. A wide variety of rock types and structures is available in the nearby area. Interdisciplinary study with other departments and divisions is encouraged.

The Department is presently located in the new Geo/Chem Building and in Lincoln Field Building. Excellent laboratory facilities are available for a wide range of geological, geochemical, and geophysical research.

The Geological Sciences section of the Sciences Library includes complete sets of the principal American and foreign periodicals, publications of the U. S. Geological Survey, state and foreign geological surveys, and general reference books. A complete set of published topographic and geologic maps for the United States is available.

The Brown Regional Planetary Data Center is located in the Lincoln Field Building. This center, one of seven such facilities in the country, is operated as a cooperative effort by the National Aero-

¹ On sabbatical Semesters I and II, 1984-85.

² On sabbatical Semesters I and II, 1985-86

nautics and Space Administration (NASA) and Brown University. It contains an extensive variety of photographic prints and rapid access images of planetary bodies. These data include recent images obtained by the U.S. space program of Mercury, the Moon, Mars, Jupiter, Saturn, and the satellites and rings of Jupiter and Saturn.

UNDERGRADUATE PROGRAMS

The Department offers four standard degree programs, each of which leads to a Bachelor of Arts or Bachelor of Science degree. The basic concentration in Geological Sciences is complemented by three other programs which take cognizance of the increasingly interdisciplinary nature of the Geological Sciences: Geology-Biology, Geology-Chemistry, and Geology-Physics/Math. The Geology-Biology option places more specific emphasis on the evolution and history of life, and is recommended for students who wish an understanding of the origin and development of life as interpreted from the geologic record. The Geology-Chemistry and Geology-Physics/Math options provide increased emphasis upon chemical and physical processes and phenomena occurring on and within the earth. These options are recommended for students who wish an application of chemical and physical principles toward an understanding of the earth. The suitability of each of these options with respect to career objectives should be discussed with the undergraduate advisor. For each of these programs specific courses are required which are listed below. To suit individual backgrounds and goals, students may enroll in one or more Independent Research courses to pursue topics of special interest not covered in depth by normal course offerings.

Students planning to continue with study in the Geological Sciences are advised to take the course sequence leading to the Bachelor of Science degree. They are advised to have a reading knowledge of French, German, or Russian, and are urged to take at least two semesters each of Chemistry, Physics, and Mathematics. Students planning to specialize in Paleontology should take at least one year of Biology.

General Prerequisite. Geological Sciences 2, 3 is prerequisite to all other courses in the Department except those courses for which other provision is made in the course statement.

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

Geological Sciences. Courses: Geological Sciences 2, 3, 11, 24, 41, 45, 102, 109; Chemistry 21, 22, or 31, and three of the following: Mathematics 9, 10, Physics 5, and Biomed 11 or 12.

Geology-Biology. Courses: Geological Sciences 2, 3, 11, 24, and two of 41, 45, 102, 109; Biomed 11, 12 plus three additional courses to be approved by the concentration advisor; Chemistry 21, 22, or 31; two of the following: Mathematics 9, 10, Physics 5, 6.

Geology-Chemistry. Courses: Geological Sciences 2, 3, 24, 41, 45, 102; Chemistry 21, 22 or 31, 114, plus two of the following: 11, 15, 106, 115; Mathematics 9, 10; Physics 5, 6.

Geology-Physics-Mathematics. Courses: Geological Sciences 2, 3, 45, 63, and 41 or 161 or 109; Physics 5, 6 or 7, 8 and 47, 50 or Engineering 52, 37; four mathematics courses including either Mathematics 29, 52 or Applied Mathematics 33, 34; Chemistry 21, 22, or 31.

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF SCIENCE DEGREE

Geological Sciences. Courses: Geological Sciences 2, 3, 11, 24, 41, 45, 102, 109; Mathematics 9, 10; Physics 5, 6; Chemistry 21, 22, or 31; four courses from mathematics and supporting sciences and upper level Geological Sciences which must have the approval of the concentration advisor; one semester of Independent Study, Geological Sciences 191 or 192.

Geology-Biology. Courses: Geological Sciences 2, 3, 11, 24, and two of 41, 45, 102, 109; Biomed 11, 12 and three additional courses having the approval of the concentration advisor; Mathematics 9, 10; Chemistry 21, 22 or 31; four courses from mathematics and supporting sciences and upper level Geological Sciences which must have the approval of the concentration advisor; one semester of Independent Study, Geological Sciences 191, or 192.

Geology-Chemistry. Courses: Geological Sciences 2, 3, 24, 41, 45, 102, 109; Chemistry 21, 22, 31, 50, 114, 115; Mathematics 9, 10; Physics 5, 6; four courses from mathematics and supporting sciences or upper level Geological Sciences which must have the approval of the concentration advisor; one semester of Independent Study, Geological Sciences 191 or 192.

Geology-Physics-Mathematics. Courses: Geological Sciences (option 1) 2, 3, 45, 63, 161, 162, plus one from 41, 109, 116; or (option 2) 2, 3, 41, 45, 63, 109, plus one from 116, 161, 162; Phys-

ics 5, 6, or 7, 8 and 47, 50 or Engineering 52, 37; four courses in mathematics including Applied Mathematics 33, 34; Chemistry 21, 22 or 31; 3 additional upper level courses from mathematics and supporting sciences which must have the approval of the departmental concentration advisor; one semester of Independent Study, Geological Sciences 191 or 192.

Honors. Honors work in the geological sciences involves completion of a written senior thesis evaluated by three members of the staff, an oral presentation of the results, and a superior record in the concentration.

GRADUATE PROGRAMS

The graduate program in Geological Sciences is intended for students of exceptional ability and interest. Admission to graduate study is usually limited to candidates for the doctoral degree, and is normally accompanied by the award of a teaching or research assistantship or a University Fellowship. Assistants are expected to devote approximately 20 hours per week to their teaching or research duties. Summer research fellowships are available to graduate students in good standing. The graduate enrollment is limited to approximately fifty students to ensure proper research facilities, and close contact between the students and the faculty. Because of the interdisciplinary nature of the Geological Sciences, candidates are encouraged to apply from a variety of undergraduate backgrounds including biology, chemistry, mathematics, physics, and engineering, as well as geology.

The degrees awarded by the Department include Master of Arts, Master of Science, and Doctor of Philosophy.

MASTER OF ARTS. The requirements include 8 courses of which no more than 2 can be Independent Research courses (Geological Sciences 211, 212).

MASTER OF SCIENCE. The requirements include 8 courses of which no more than 2 can be Independent Research courses (Geological Sciences 211, 212), and demonstrated ability to pursue independent research. This may be demonstrated by the submission of a written Master's Thesis, a scientific publication, or a formal written summary of activities and accomplishments in the research courses. There is no formal language requirement.

DOCTOR OF PHILOSOPHY. There are not formal course requirements for the Ph.D. degree. Students with the approval of their advisor will devise an appropriate program of study in their major and minor areas. For a student entering with a Bachelor's degree this will normally result in a program of 10 to 14 courses, not including thesis research. Students are encouraged to take courses in other departments where appropriate.

A student is required to pass the Preliminary Examination to establish his or her candidacy for the Ph.D. degree. This examination is generally taken at the end of the fifth semester for those entering with a Bachelor's degree and at the end of the third semester for those entering with a Master's degree. For the purposes of this examination, it is presumed that the candidate will be able to display a broad knowledge of scientific disciplines related to his or her research area. In order to accomplish this, it is recommended that students attain breadth by taking courses in most of the major areas. Students entering with a minimal earth science background will normally remedy this deficiency during the first two years of graduate work.

The Department tries to be flexible in its graduate program, attempting to place the responsibility for the graduate students' education on the students themselves. Course work is supplemented by seminars and colloquia given by visitors and members of the Department, and by field trips. Certain departmental requirements can be waived, if the individual can justify the educational value of the suggested changes in a petition to the Graduate Program Committee.

Research programs within the Department are divided into four main areas: (1) geochemistry-mineralogy-petrology, (2) geophysics-structural geology-tectonophysics, (3) paleo-oceanography-micropaleontology-sedimentology, (4) Planetary sciences. Cooperative research and integrated teaching programs exist within these groups; a student's research and course program may lie mainly within one of these groups or it may overlap two or three groups.

Research being carried on in geochemistry-mineralogy-petrology includes the following areas: isotope geochemistry and geochronology; trace element geochemistry; thermodynamics and kinetics of element and isotope exchange and diffusion in minerals; dynamics of geothermal regions; stable isotope fractionation; mechanisms and kinetics of solid state processes; experimental determination

of mineral equilibria; stability and compositional equilibration of co-existing minerals in medium to high grade metamorphic terrains; and solution theory of silicate melts.

Research in geophysics is currently being carried out in the following areas: physical characteristics of the crust and upper mantle with emphasis on lateral variations in structure of the lithosphere and asthenosphere; model studies of convection within the earth; earthquake prediction, focal mechanisms and source properties; tectonics of oceanic fracture zones; experimental studies of friction and brittle fracture; analysis of tectonic processes through regional electromagnetic field experiments; coupling of geothermal energy reserves to deep-seated processes in the mantle; the nature and cause of deep-seated volcanic phenomena.

Current research in structural geology and tectonophysics encompasses a broad range of studies from the submicroscopic to the global, including investigations into the driving forces of plate tectonics, the structure and origin of mountain belts, the mechanics of formation of folds and of schistosity, and the determination of the deformation mechanisms and rheological properties of rocks and minerals at crustal and upper mantle conditions. Strong ties exist with the Solid Mechanics group in the Engineering Division, and students are encouraged to take advantage of opportunities for course work and research in that area.

Current studies in paleo-oceanography-micropaleontology-sedimentology cover a wide range of areas including but not limited to: (1) mathematical paleoecology, (2) paleoecological, biogeographical and evolutionary studies of deep-sea Cenozoic deposits bearing fossil plankton, (3) Pleistocene climatic history as recorded by carbonate shorelines, deep sea cores, and Quaternary pollen, (4) petrographic and geochemical studies of diagenetic processes in carbonate sediments, (5) isotopic studies of deep sea sediments.

Through a cooperative program with Woods Hole Oceanographic Institute (1-1/2 hours drive away) students in paleontology, stratigraphy, geophysics, and sedimentary petrology can broaden the scope of their research and have contact with a distinguished staff of scientists engaged in a study of the ocean and its history.

Studies in planetary geology include photographic interpretations of the Moon, Mercury, Mars, and other Planetary Surfaces. Emphasis is placed on understanding the structure and composition of a planetary surface and the processes involved during its evolution. Comprehensive collections of Lunar Orbiter, Apollo, Mariner 9, Mariner 10, and Viking and Voyager pictures are available. Computer techniques have been developed to store, retrieve, and analyze much of the photographic and remote sensing information. Opportunities exist for a wide range of research programs including photographic mapping, statistical analysis of landforms, remote sensing of surface composition, and theoretical modelling of surface-modifying processes. Field analog studies are being pursued chiefly in volcanic terrains. Natural and synthesized lunar samples are studied both petrographically and experimentally to determine crystallization histories of the outermost portions of the moon.

I. PRIMARILY FOR UNDERGRADUATES

1. *Face of the Earth* (Foundations I) Ms. TULLIS and Mr. YUND. (Mr. Yund 1985-86)

The nature of the earth's surface and the processes which have created and continue to change it. Topics include rivers, deserts, and shorelines; volcanism; glaciation; plate tectonics; and earthquakes, with an emphasis on understanding problems of the environment, natural resources, land use, and geologic hazards. Intended for non-science majors. Several practical sessions during the semester, plus a field trip. Cannot be taken in addition to Geological Sciences 2.

2. *Physical Processes in Geology* Mr. TULLIS.

An introduction to the configuration and the origin of the interior and the surface of the earth. Topics include physical processes that occur in the interior of the earth driven by internal heat sources and those that occur at the surface driven by solar radiation. Interior processes include volcanism, earthquakes, magnetism, plate tectonics, and mountain building. Surface processes include atmospheric and oceanic circulation; flow of rivers, groundwater, and glaciers; erosion and deposition of sediments. Four labs and two field trips. Primarily for science majors. Cannot be taken in addition to Geological Sciences 1.

3. Chemical Geology.

Messrs. GROMET and RUTHERFORD.

An introduction to the chemical and mineralogical nature of the earth, moon and meteorites, and the role of chemical processes in their evolution. Topics covered include: composition and atomic structure of rock-forming minerals; major features and origin of common igneous, sedimentary, and metamorphic rocks; chemical aspects of weathering and sedimentation. Weekly laboratory and two field trips. Prerequisites: high school chemistry or equivalent and Geological Sciences 1 or 2. Primarily intended for science majors.

5. Mars, the Moon, and the Earth

Mr. HEAD.

Space exploration in the last two decades has revealed an astonishing array of surface features on the Moon and planets. How do these features form? Why are they different from those on Earth? Lunar and planetary landscapes will be examined to try to understand the processes shaping these surfaces. A primary objective is to gain perspective on planet Earth by expanding awareness to the processes and history of other planets.

7. Introduction to the Ocean

Mr. IMBRIE.

Intended primarily for non-science students, the course offers a non-quantitative introduction to the major facts and principles of physical, chemical, biological, and geological oceanography. Topics include: composition and history of seawater; surface and deep circulation systems; waves and beaches; the sea floor; marine sediments and organisms; marine ecology; continental drift; and sea level fluctuations.

8. Resources and Man: A Geologic Perspective

Mr. MATTHEWS.

The standard of living of developed nations is based on earth resources which are finite. Major topics include geologic and atmospheric processes, petroleum, metals, climate and agriculture, man in geologic perspective, and alternative world future scenarios. Lectures, discussions, occasional labs. Open to freshman and sophomores. No prerequisites. Should not be taken after Geological Sciences 2.

11. Fossil Record

Mr. WEBB and STAFF.

Evolutionary history of the major groups of fossil animals and plants. Attention is given to the use of fossils as guides to stratigraphic correlation and as indicators of past environments. Two Saturday field trips, one in Rhode Island, and one in New York. Prerequisite: Geological Sciences 3, Biomed 12, or written permission.

24. Stratigraphy and Sedimentation

Mr. MATTHEWS.

Introduction to depositional environments and processes responsible for formation of sedimentary rocks. Major sedimentary environments in the Recent are discussed, general models are proposed, and stratigraphic sequences in older sediments are examined in the light of these models. Laboratory and independent study projects. Prerequisites: Geological Sciences 2 and 3, or written permission.

28. Pollution and the Environment

Mr. GILETTI.

The definitions of pollutants and the ways (legal, scientific, medical, etc.) in which the definitions are established will be examined. Times for reservoirs to recover to particular "acceptable" pollution levels will be treated. A paper, which may include independent field work, will be required. Occasional field trips. Science or Engineering concentrators or written permission.

41. Mineralogy

Mr. YUND.

Topics for the first half of the semester include crystallography, principles of mineral optics, crystal chemistry, and X-ray diffraction/crystallography. The second half is devoted to a discussion of the major rock-forming minerals with emphasis on crystal structure, compositional relations, and how mineralogical relations reflect their physical-chemical history. Laboratory includes optical and X-ray diffraction techniques. Prerequisites: Chemistry 3; Geological Sciences 2, 3, or written permission.

45. Structural Geology

Messrs. BYRNE and TULLIS (and Ms. TULLIS, 1986-87).

An introduction to the geometry, classification, and mechanics of deformed rocks. Topics include: stress and strain, mechanical behavior of real and ideal materials, faulting, folding, minor structures, global tectonics. Laboratory work in geologic map reading, three dimensional visualization of structures, study of deformed rocks, and model experiments. Two field trips. Prerequisite: Geological Sciences 2 and 3 or written permission.

63. *Geophysical Exploration for Earth Resources*

Mr. FORSYTH.

An examination of the geophysical methods used in the search for petroleum, geothermal energy, minerals and water, including seismic reflection and refraction, gravity and magnetic potential field anomalies, and electromagnetic techniques. Emphasis on interpretation of field data and computer modelling of the structures in the earth's crust associated with these resources. Occasional labs. Prerequisites: Mathematics 9, 10; Physics 5, 6, or the equivalent.

81. *Planetary Geology*

Mr. SCHULTZ.

The geology of the solid planets (i.e., Mercury, Venus, Earth, Moon, Mars, asteroids, outer-planet satellites). Physical processes that shape planetary surfaces, such as impact cratering, volcanism, tectonism, and atmosphere-surface interactions. Contrasting approaches and hypotheses will be examined, thereby providing a perspective for the evolution of not only each planet but also scientific thought. Prerequisite: Geological Sciences 3 or 5, or permission of instructor.

II. FOR UNDERGRADUATES AND GRADUATES**102. *Petrology***

Mr. HESS.

Origin of igneous and metamorphic rocks with petrographic microscope laboratory to study main types of rocks. Prerequisites: Geological Sciences 41.

109. *Field Geology*

Mr. BYRNE.

An introduction to the interpretation of geologic features in the field, and to the fundamental principles and techniques of geologic mapping. Approximately ten days prior to the beginning of classes in the Fall plus two or three weekends early in the Fall semester are devoted to several detailed geologic field mapping problems. Prerequisite: Geological Sciences 24 and 45 or written permission.

110. *Oceanography*

Mr. PRELL.

The oceans will be studied primarily from a physical, chemical and biological viewpoint. Topics will include: material and heat budgets; definition and behavior of water masses; chemistry of sea water; nutrient cycles; productivity patterns; submarine topography; nature of the sea floor; circulation and sedimentation rates; and origin of the ocean basins. Prerequisite: written permission. Offered in alternate years.

114. *Submarine Geology*

Mr. PRELL.

The physiography, structure, and sediments of the ocean basins. Emphasizes the morphology of the sea floor, active and passive margins, and major deep sea depositional systems. The stratigraphy of the ocean floor, including lithic, seismic, magnetic, and isotopic stratigraphy, will be developed as a means to the study of the history of ocean basins. Prerequisites: Geological Sciences 24, 110, or written permission. Offered in alternate years.

116. *Regional Geology and Global Tectonics*

Mr. BYRNE.

Development of structural and stratigraphic styles in orogenic belts and their relationship to plate tectonic processes. Rules of plate tectonic theory and their application to understanding mountain building processes. Focuses on the development of the western Cordillera in the context of plate tectonic concepts. Specific aspects of other tectonically important regions will be incorporated. Prerequisites: Geological Sciences 45 or written permission; 24 is recommended.

135. *Meteorological Aspects of Climatic Change*

Mr. WEBB.

An introduction to meteorology and climatology with attention paid to physical principles and mapping techniques useful in studying climatic change. Students are expected to keep notes on the daily weather during the course. Prerequisites: Physics 5, 6, or equivalent; Mathematics 9, 10, or equivalent. Offered in alternate years.

150. *Economic Geology*

Messrs. RUTHERFORD and GROMET.

The geological associations, characteristics, and origins of economic mineral deposits, with emphasis on base and precious metals and uranium. Petrologic and geochemical processes relevant to the formation of economic mineral deposits; geographic distributions of mineral deposits; brief treatment of exploration and extraction methods. Offered alternate years. Prerequisite: Geological Sciences 41 or written permission.

161. *Solid Earth Geophysics*

Mr. HERMANCE.

The physics of the Earth with emphasis on the fundamental mathematical and physical principles involved. Topics: mass, moment of inertia, and internal structure of the Earth; global seismology; the magnetic field and global induction; crustal structure from gravity and seismology; paleomagnetism, marine magnetism, and plate rotation; heat flow and the thermal structure of the Earth. Prerequisites: Geological Sciences 2 or written permission; Physics 47 or Engineering 52; Applied Mathematics 34.

162. *Solid Earth Geophysics*

Mr. PARMENTIER.

The physics of the Earth with emphasis on the fundamental mathematical and physical principles involved. Topics: cooling of dikes and lava lakes; rheological structure of the Earth; mechanisms and forces causing plate motions; thermal and mechanical models of the lithosphere deduced from studies of gravity and topography; viscous flow in the mantle. Prerequisites: Geological Sciences 161, Physics 50 or Engineering 137, or written permission.

163. *Interpretation Theory in Geophysics*

Mr. FORSYTH.

Basic statistical theory and its matrix algebra representation. Descriptions of random processes. Modern approaches to the optimum design of experiments, constructing model solutions to measurements, and describing non-uniqueness in models with particular emphasis on generalized-linear-inverse techniques. Prerequisites: Geological Sciences 63 or 161; Mathematics 29, 52, or Applied Mathematics 33, 34, and Physics 47 or Engineering 52, and computer programming skills.

165. *Earthquake Seismology*

Mr. FORSYTH.

The location and distribution of earthquakes in space and time; measures of size and intensity of shaking; nature of seismic waves; the study of structure of the interior of the earth using wave propagation; the nature of faulting in earthquakes and relationship to tectonic processes. Prerequisites: Geological Sciences 2; Physics 5, 6, or Engineering 3, 4; Applied Mathematics 33, 34, or written permission.

167. *Electromagnetic Fields and the Earth's Interior*

Mr. HERMANCE.

The application of classical electromagnetic field theory to describe a variety of geophysical techniques for probing the earth's interior. Beginning with a review of Maxwell's equations, we will study a wide range of theoretical problems and practical techniques relevant to delineating subsurface structures of importance to resource exploration and to understanding regional geophysical processes associated with mountain building and geodynamics. A background in geology is not expected; open to students in a variety of scientific disciplines. Prerequisites: Physics 47, Engineering 52, or equivalent.

171. *Remote Sensing of Earth and Planetary Surfaces*

Ms. PIETERS.

Applications of remote sensing techniques to understanding the geology and chemistry of surfaces. Topics include: interaction of the electromagnetic spectrum with surface material; Fresnel equations of transmission and reflection; spectroscopy of common rock forming minerals; reflectance properties of rocks, powders, and soils; alteration and weathering processes; applications of current remote sensing data of the Earth and planets to geological and environmental problems. Prerequisites: Physics 5, 6, and Geological Sciences 3 or written permission.

181. *Physics of Planetary Evolution*

Mr. PARMENTIER.

The evolution of planetary bodies will be discussed on the basis of geological and geophysical evidence derived from planetary exploration of the solar system. This will involve the study of physical processes that may be responsible for volcanism and tectonism on the surface of planetary bodies, including the accretion of planets, the thermal and chemical evolution of planetary interiors, and the deformation of planetary lithospheres. Prerequisites: Geological Sciences 161 or written permission.

191, 192. *Individual Study of Geologic Problems*

The STAFF.

Library, laboratory, or field study; includes preparation of thesis. Required of seniors in Sc.B. and Honors Program; open to others by written permission of the Chairman of the Department.

III. PRIMARILY FOR GRADUATES

211, 212. *Research in the Geological Sciences*

The STAFF.

May be repeated for credit.

219, 220. *Seminar in Micropaleontology*

Mr. BERGGREN.

Study of selected groups of microfossils, with emphasis on planktonic forms significant in the interpretation of pelagic deposits. The stratigraphic framework as well as the evolutionary development and biogeographic distribution of various groups will be stressed.

226. *Sedimentary Environment in the Stratigraphic Record*

Mr. MATTHEWS.

A substantially deductive approach to the stratigraphic record. Closely follows *Dynamic Stratigraphy*, Second Edition. Lectures, text and journal literature, student originated regional stratigraphy independent project, field trip. Offered every other year.

227. *Sedimentary Petrology Seminar*

Mr. MATTHEWS.

Discussion of selected problems of recent interest in the fields of sedimentation and sedimentary petrology. Offered every other year.

230. *Mathematical Models in the Geological Sciences*

Mr. WEBB.

Review of matrix algebra and basic univariate statistical concepts. Theory and practical applications of multivariate statistical models applicable to large arrays of empirical data in ecology, stratigraphy, paleontology, sedimentary petrology, igneous petrology and geochemistry. Emphasis on multivariate regression and correlation procedures; factor, covariance, and discriminant-function analysis; and the use of cluster algorithms. Extensive use of computers. Prerequisite: Mathematics 9 and 10 or the equivalent. Mathematics 52 and a course in statistics are recommended. Offered in alternate years.

235. *Quaternary Climatology Seminar*

Mr. WEBB

Discussion of current problems in paleoclimatology. Students will analyze the literature on these problems, and when possible, do original analysis of their own on previously published data. Topics will include time-series analysis, theory of ice age climates, air-sea-ice interactions, and recent climatic patterns as analogues for past climatic data. Prerequisites: Geological Sciences 135 and 112, or written permission.

239. *Quaternary and Human Paleoecology*

Messrs. WEBB and ANDERSON.

Current topics concerning human interactions with the physical environment during the past million years. Students will critique journal articles in this inter-disciplinary field. Topics: 1) effects of human migration in North America, 2) large mammal extinctions, 3) technological change in response to environmental change, and 4) human records of environmental change. Prerequisite: written permission. Offered in alternate years.

241. *Solid State Mineralogy*

Mr. YUND.

Solid state principles and their application to mineralogy will be emphasized. Topics will include structural relations, kinetics and mechanisms of solid state transformations and reactions, diffusion, and application of transmission electron microscopy to these problems. Applications will emphasize selected silicates. Prerequisite: written permission. Offered in alternate years.

242. *Mineralogy Seminar*

Mr. YUND.

Discussion and evaluation of selected topics of current mineralogical interest. Offered in alternate years.

243. *Igneous Petrology*

Mr. RUTHERFORD.

Study of mineral equilibria in igneous rocks in relation to theoretical and experimental studies in silicate systems. Principles of the origin and evolution of magmas rocks in space and time. Prerequisite: Geological Sciences 246 or written permission. Offered in alternate years.

244. *Metamorphic Petrology*

Mr. HESS.

Study of mineral equilibria, metamorphic facies, and metamorphic facies series of metamorphic rocks. Topics covered include metasomatism, mobile components, partial anatexis, and petrogenetic grids. Prerequisite: Geological Sciences 246 or written permission. Offered in alternate years.

246. *Phase Equilibria*

Mr. HESS.

Principles of thermodynamics and phase equilibria in unary, binary, ternary and multicomponent systems using analytical and graphical methods. Other topics include solution theory, equations of state and thermodynamics of surfaces. Prerequisite: written permission. Offered in alternate years.

251. *Advanced Structural Geology*

Messrs. TULLIS and BYRNE (and Ms. Tullis, 1986-87).

A survey course emphasizing basic physical principles applied to problems in structural geology. Begins with fundamentals of stress and infinitesimal strain tensors, finite strain, and deformation processes in rocks and minerals. Applications include the mechanics of folding, faulting, igneous intrusion, and regional-scale structures. Occasional laboratories and field trips. Prerequisites: Geological Sciences 45 and Mathematics 10 or equivalents.

252. *Theoretical Structural Geology*

Mr. PARMENTIER.

Application of continuum mechanics to problems in structural geology and global tectonics. Includes: the formulation and solution of the equations of motion for elastic, viscous, and plastic materials; finite strain tensors; strain energy and variational methods; and conservation laws for heat and mass transfer in a deforming medium and for flow in a permeable medium. Prerequisites: Geological Sciences 251 and Engineering 175 or equivalents.

253. *Deformation Mechanisms, Microstructures, and Constitutive Behavior*

Messrs. TULLIS and BYRNE and Ms. TULLIS.

Deformation mechanisms and recovery processes operating in minerals and rocks over the range of conditions in the crust and upper mantle and the microstructures and constitutive relations characteristic of each mechanism. Topics include crystal elasticity, fracture, friction, pressure solution, dislocation glide and climb, diffusion creep, recovery, and recrystallization. Emphasis on processes characteristic of metamorphic rocks, and on advances derived from high temperature and pressure laboratory deformation experiments. Prerequisite: Geological Sciences 251 or written permission. Offered in alternate years.

255. *Topics in Structural Geology*

Messrs. TULLIS, PARMENTIER, BYRNE and Ms. TULLIS.

Consideration of current problems in the field of tectonophysics. Prerequisite: Geological Sciences 251.

273, 274. *Geochemistry*

Messrs. GILETTI and GROMET.

The distribution of the elements and particular nuclides in the earth, with reference to geochronology, stable isotope geochemistry, and the principles governing the distribution of the elements during the major geological processes. The origin of the elements, development of the solar system, and earth history based on data from earth, lunar, and meteorite materials; rigorous treatment of radioactive and stable isotope geochemistry and its application to significant earth problems.

275, 276. *Geochemistry Seminar*

Messrs. GILETTI and GROMET.

Discussion of current problems in geochemistry including study of recent publications on cosmic and terrestrial isotopic and element distribution. Theoretical implications will be stressed.

278. *Radiochemistry*

Mr. GILETTI.

The nature, types, energetics, statistics, and mathematical treatment of radioactive decay will be treated, followed by discussion of the interaction of radiation with matter, and detection, counting, and safety aspects of radiation. Applications will be discussed largely with geological examples. Prerequisite: permission of the instructor. Offered in alternate years.

281. *Planetary Geology Seminar*

Messrs. HEAD, PIETERS, and SCHULTZ.

Consideration of the surface geologic processes of the terrestrial planets, implications for the characteristics of planetary interiors, and comparison of the geologic histories of the solid-body planets. Emphasis will be placed on current problems in these areas.

283. *Advanced Geoelectricity and Geomagnetism*

Mr. HERMANCE.

Detailed theoretical considerations will focus on a critical review of the current literature. Topics may be selected from the following areas: magnetotelluric and geomagnetic deep-sounding of the earth's crust, electromagnetic potential separation, the impedance tensor over laterally inhomogeneous and anisotropic media, applications of signal processing, the generation of natural electromagnetic phenomena, and wave propagation in the earth-ionosphere cavity. Prerequisite: Geological Sciences 167 or permission of the instructor.

285. Geophysics Seminar

Mr. HERMANCE.

Discussion of current problems in geophysics. Prerequisite: permission of the instructors.

291, 292. Special Topics in the Geological Sciences

The STAFF.

Prerequisite: written permission.

German

Professors BARNOUW,¹ CROSSGROVE, LOVE, WARNOCK (Chairman); Associate Professor D. SMITH; Assistant Professors FRASER, K. GOODMAN, POORE.²

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAMS FOR THE BACHELOR OF ARTS DEGREE

German Literature. Prerequisite: German 4 or equivalent placement. Required: nine courses normally including two of the following: 31, 33, or 34. Seven of the nine courses must be at the 100-level (or higher), including either 109 or 170; and at least six of the nine courses must be selected from among those taught in German. In addition, at least one course must be chosen from each of three of the four major groupings: 130's, 140's, 160's, or 180's. At the beginning of the senior year, each concentrator is expected to submit a statement to the concentration advisor outlining his or her understanding of how the various courses taken as part of the concentration program are related to each other.

Senior Colloquium. The Senior Colloquium is an integral part of the concentration program and serves an important function in bringing coherence to the student's program. It consists of an oral presentation before the German Department near the end of the senior year on a topic worked out in consultation with a faculty member. This topic should be chosen during the junior year, but at the latest at the beginning of the senior year, and it should serve to integrate work done in two or more courses and to give coherence to the entire concentration program.

Independent Concentration. A student may work out an independent concentration program with a member of the German Department as sponsor and advisor. Such a program may involve a particular period or aspect of German Civilization or of German and other literatures.

Honors. Candidacy for honors in German assumes a better than average academic record, particularly in the major field. Requirements are the same as those for the standard concentration with the addition of one 100-level course from the German offerings and presentation of an acceptable honors thesis, for which one course credit may be granted (198, Senior Conference).

Study Abroad Programs. Interested students are urged to consult with the German Department about opportunities for participation in Brown University programs for study at Bamberg (Federal Republic of Germany) and Rostock (German Democratic Republic). We also maintain at the graduate level an exchange program with the University of Kiel (Federal Republic of Germany).

GRADUATE PROGRAMS

MASTER OF ARTS. Work for the master's degree includes eight courses, of which up to two may be in related fields. Candidates are expected to read, speak, and write German, and to have a broad knowledge of German literature. A reading knowledge of another foreign language is also required. For details, write to the Chairman of the Department.

DOCTOR OF PHILOSOPHY. The general requirements for the doctorate are:

1. Command of the language, spoken and written, and an awareness of its structure and potentialities for expression. Candidates must demonstrate proficiency in reading two additional foreign languages, approved by the Department. An alternate option is to establish competency in one language (generally French) and to demonstrate intensified study of the literature

¹ On leave, 1985-86

² On leave, Semester I, 1985-86

by successfully completing one pertinent course at the 100 or 200-level.

2. An understanding of the origins and developments of the German language and its connection with related languages.
3. Knowledge of German literature, consisting of wide acquaintance with its chief movements and writers and a through knowledge of selected major authors and works, including their historical and intellectual environment.
4. Students are encouraged to take courses in fields related to their major interest. Such courses may be chosen from a second literature, linguistics, or another related field such as art, history, philosophy, or political science.

For further details, write to the Chairman of the Department.

PRIMARILY FOR UNDERGRADUATES

1-2. *Beginning German*

Ms. FRASER and STAFF.

Introductory course for beginners; acquisition of all four basic skills: listening, speaking, reading, and writing. Five hours per week.

11-21. *Intensive Beginning German* (double course)

The STAFF.

Covers material similar to that of German 1-2 in one semester, with somewhat more emphasis on developing speaking skills. Nine hours per week.

3. *Intermediate German I*

The STAFF.

Emphasis on developing vocabulary, grammatical and reading competence, while maintaining speaking and listening abilities. Four hours per week. Prerequisite: German 2 or placement.

4. *Intermediate German II*

The STAFF.

Intensive intermediate German. Readings in contemporary texts. Stress on active use of German and vocabulary development. Four hours per week. Prerequisite: German 3 or placement.

25. *German Literature in English Translation*

Ms. POORE.

Major trends and writers in modern German literature, focusing on authors such as Thomas and Heinrich Mann, Kafka, Brecht, Hesse, Boll, Grass, Weiss, Christa Wolf and others.

26. *German Civilization in English Translation*

Ms. POORE.

Designed for students interested in learning about major issues of cultural and historical development during the Third Reich and in West and East Germany. Texts will be drawn from literature as well as historical analyses of this period, and discussion of several films will be included.

31. *Introduction to German Civilization*

Ms. FRASER.

Designed for students interested in a variety of readings, drawn from literature and public life, concentrating on major issues of German cultural and historical development. Emphasis will also be placed on strengthening writing, speaking, and reading skills, with selective review of grammatical topics as needed. Prerequisite: German 4 or placement.

33. *Introduction to German Literature: Literary Forms*

Mr. LOVE.

Introductory readings in German Literature with special attention to formal aspects of genres, including narrative prose, drama and poetry. Emphasis will also be placed on strengthening writing, speaking and reading skills, with selective review of grammatical topics as needed. Prerequisite: German 4 or placement.

34. *Introduction to German Literature: Aspects of Literary History*

Ms. GOODMAN.

Introductory readings in German literature with special attention to literary history and the relation between history and literature. Emphasis will also be placed on strengthening writing, speaking and reading skills, with selective review of grammatical topics as needed. Prerequisite: German 4 or placement.

II. FOR UNDERGRADUATES AND GRADUATES

NOTE: Most 100-level courses are offered in alternate years. The prerequisite for 100-level courses (except as designated in the course descriptions) is two of the following: 31, 33, 34; or one of these and permission of the instructor. Courses at the 100 level are conducted in German unless the course

description states otherwise.

109. *Composition*

Ms. GOODMAN and Ms. POORE.

Designed to increase the range, fluency and accuracy of idiomatic expression through concentration on written practice; based on the discussion and analysis of texts from media and/or literary sources relevant to current life and attitudes in the German speaking parts of Europe. *This course is a minimum prerequisite for Brown exchange programs with German universities.*

132. *The Evolution of a Classical German Literature (1700-1815)*

The STAFF.

Presentation and analysis of major ideas and works of the Enlightenment, *Sturm und Drang*, Classicism and Romanticism. Discussion of major authors, such as Gottsched and his critics, Lessing, Wieland, Herder, Lenz, Wagner, Goethe, Schiller, the Schlegel Brothers, Novalis, Tieck, Brentano, Arnim, H.V. Kleist, Jean Paul, Hölderlin and Eichendorff, and their position within contemporary literary, cultural, philosophical and political movements.

133. *German Literature between Tradition and Innovation (1800-1918)*

Ms. GOODMAN.

Major works and themes from this stormy and contradictory period of German literature. From the end of one empire through the creation and demise of the next. Movements such as late Romanticism, young Germany, Vormärz, Realism, Naturalism and authors such as Varnhagen, Heine, Gottschalk, Grabbe, Hebbel, Stifter, Storm, Keller, Fontane, Hauptmann will be treated in their literary, cultural, philosophical, and political context.

134. *The Modern Period (1900-the present)*

The STAFF.

Selected texts (novel, drama, lyric) indicative of cultural change and conflict in the poetic (de-)construction of reality in literature of the twentieth century.

143. *Literature of the German Democratic Republic*

The STAFF.

(Topic varies).

144. *Studies in Literary Genres.*

The STAFF.

Topic varies. In 1985-86 Mr. Love will offer *The German Novella*. Representative readings in the narrative form of moderate dimension cultivated by major German writers from Goethe and the Romantics to Mann and Kafka.

145. *Seminar in German Literature*

The STAFF.

Topic varies. In 1985-86 Mr. Love will offer *Nietzsche: Critic, Essayist, Aphorist*. Through study and discussion of representative selections from his published works, his literary estate (Nachlass) and his correspondence, students will be introduced to the problems of Nietzsche's spiritual biography: his intellectual origins, his intense love-hate involvement with contemporary culture, the contributory role of illness in his development. Conducted in English. German knowledge will be helpful.

163. *Studies in Northern European Civilization*

Mr. CROSSGROVE.

Topic varies. In 1985-86 Mr. Crossgrove will offer: *Land Use, Culture, and Civilization in Northern Europe and the New World*. This course is the same as the ST/0121 in content (see the description under Extradepartmental Courses), but there is an additional hour each week that will focus on specifically German aspects of the topics. This extra hour will be conducted in German. Writing assignments in German.

164. *German Film*

The STAFF.

Topic varies. In 1985-86 Ms. Goodman will examine West German Cinema since the 1960s for its expression of the concern of young Germans with issues of violence and peace. In particular these films will focus on topics such as the German Nazi past, terrorism and feminism. Films by Straub/Huillet, Fassbinder, Kluge, Schlöndorff, von Trotte, Sander, Brückner, Sanders-Brahms will be included. Conducted in English.

166. *Interdisciplinary Seminar*

The STAFF.

170. *Stylistics*

The STAFF.

Designed to develop accuracy and fluency of expression, and to sharpen awareness of idiomatic and stylistic nuances. Discussion of current cultural and political events. Prerequisite: German 109 or permission.

181. *Introduction to German Philology*

Mr. CROSSGROVE.

The language, literature, and culture of the Germanic peoples from the beginnings to the high Middle Ages. Examination of sample texts in the various attested dialects, and survey of the different types of evidence for details of Germanic linguistic structure and social life, such as archaeology, inscriptions, loan words, onomastics, comparative linguistics, etc. Prerequisite: reading knowledge of a Germanic language other than English, or some knowledge of old English.

183. *Introduction to Middle High German*

Mr. WARNOCK

The structure of the Middle High German language and its literature will be studied through the reading of shorter texts in a variety of genres and dialects.

198, 199. *Senior Conference*

III. PRIMARILY FOR GRADUATES

NOTE: Many of the 200-level courses are currently being offered only on demand.

201. *Introduction to Germanic Philology*

Mr. CROSSGROVE.

203, 204. *Old Icelandic*

Messrs. CROSSGROVE and RUSSOM.

209. *The Teaching of German*

The STAFF.

Practical and theoretical issues in language pedagogy. Contrastive analysis of English and German.

211, 212. *Studies in Germanic Linguistics and Pedagogy.*

Mr. CROSSGROVE.

Independent reading and research or, in response to specific needs or desires of students, seminars on older Germanic languages or related special topics.

215-216, 217-218. *Basic Course for Graduate Students*

The STAFF.

A two-semester double-credit course required for all first-year Ph.D. candidates and optional for M.A. candidates. Jointly taught by faculty members in the German Department.

222. *Middle High German Literature*

Messrs. CROSSGROVE or WARNOCK.

227. *Baroque Literature*

Mr. WARNOCK.

232. *Literature of the Eighteenth Century*

The STAFF.

234. *Romanticism*

The STAFF.

243. *Literature of the Nineteenth Century*

The STAFF.

246. *Modern Literature*

The STAFF.

261. *Studies in German Literature*

The STAFF.

284. *Poetry*

The STAFF.

285. *Narrative Prose*

The STAFF.

286. *Drama*

The STAFF.

288. *Studies in Literary Theory*

The STAFF.

291, 292. *Reading and Research*

The STAFF.

Swedish

1-2. *Beginning Swedish*

Messrs. CROSSGROVE, WEINSTEIN and STAFF.

Introduction to Swedish and Sweden. Four hours per week.

Hispanic and Italian Studies

Professors AMOR Y VÁZQUEZ, CARREÑO, DURAND,¹ FIDO, Oldcorn,² RIBBANS, TRUEBLOOD³
Associate Professor MERRIM; Assistant Professors BEANE, GUNZBERG, SCHAFFER, and SMITH.

¹ Chairman.

² Director of the Bologna Program, 1985-86.

³ Emeritus, Adjunct Professor.

The Department of Hispanic and Italian Studies offers regular courses and opportunities for group and individually directed study in the language, literature, civilization and culture of Spain and the Spanish-speaking New World and of Italy. There are degree programs leading to the B.A., M.A., and Ph.D.

The University Library contains ample materials for study and research in these fields, including new and standard books, reference works and literary and professional journals. The Chambers Dante Collection and the Church Collection on Latin America provide good background material in these subjects, while the Italian field is kept up to date by the acquisition of all current publications having research value to the student of Italian language and literature. The John Carter Brown library is rich in printed-source material on the Spanish colonial period.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAMS FOR THE BACHELOR OF ARTS DEGREE

Hispanic Literature and Culture. Prerequisite: Hispanic Studies 33; or two of the following: Hispanic Studies 11, 12. Program: Two of the following: 19, 51, 170; at least three of the following: 121, 122, 124, 126, 129, 133, 137; at least three of the following: 142, 145, 148, 149, 150, 160. With the approval of the concentration advisor, one or more of these courses may be replaced by a course in another Romance literature, in comparative literature, in history, philosophy, art, or another appropriate field.

Hispanic Language and Linguistics. Prerequisite: Hispanic Studies 33; or two of the following: Hispanic Studies 11, 12, 13. Program: Hispanic Studies 19, 51, 170, plus at least one of the following: Hispanic Studies 121, 124, 195, and 133 or 137; or Linguistics 11 or, with the permission of the instructor, Linguistics 32; two additional courses to be chosen from among the following: an approved 100-level course in Linguistics, Comparative Literature 171, Portuguese 19, 150, 160, a course included in the concentration program in Italian Studies.

Italian Studies. It is possible for students who begin the study of Italian at Brown to concentrate. Those interested should discuss their plans with the concentration advisor. Requirements: eight relevant courses beyond the second-year level, including Italian Studies 19 and 51, 161 or 162, and at least three courses of the sequence 131, 132, 133, 134, 135, the remainder to be chosen from the department's offerings above the 100-level. Qualified undergraduate students are strongly encouraged to register for 200-level courses. With the approval of the concentration advisor, a student's program may include one or more courses in another Romance literature, or from other closely related fields, such as comparative literature, history, art, political science or philosophy.

Up to four of the required courses, or their equivalents, may be taken during the Brown Junior year in Bologna (ask concentration advisor for brochure and more information).

Latin American Studies. Prerequisite: Language proficiency in Spanish and Hispanic Studies 19 or 51. Program: Hispanic Studies 13 or 137; also one of the following senior courses in directed reading and research leading to the completion of a senior project: Anthropology 193 or 194, Economics 199, Hispanic Studies 198, History 197H or 197I, Political Science 142, Sociology 190 or 191; plus five additional courses to be chosen from among the following: Afro-American Studies 121, 122, Anthropology 112, 142, 152, 242 (with permission); Economics 151, 152; History 121, 122, 127, 153; Hispanic Studies 133, 137, 150 (if suitable subject); Portuguese 11, 12, 19, 150; Sociology 15 or 60.

Honors in Hispanic Studies. The usual number of courses is ten, to be distributed in the manner recommended for the regular concentration program. Hispanic Studies 198 will be taken as part of the honors thesis project.

Related Courses or Programs. Students in Hispanic or Italian Studies should consider the election of one or more courses in such related fields as a second literature, linguistics, history, philosophy, or art. A candidate is expected to read, speak and write Spanish or Italian and have an adequate knowledge of the corresponding literature. In addition, the candidate must demonstrate a reading knowledge of one other foreign language, ordinarily French or German.

GRADUATE PROGRAMS

MASTER OF ARTS. Work for the master's degree may be wholly in Hispanic or in Italian literature or may include one or more courses in such related fields as a second literature, linguistics, history,

philosophy, or art. A candidate is expected to read, speak and write Spanish or Italian and have an adequate knowledge of the corresponding literature. In addition, the candidate must demonstrate a reading knowledge of one other foreign language, ordinarily French or German. Requirements: 8 courses beyond the A.B. degree. A thesis or, alternatively, in special circumstances, a special examination.

DOCTOR OF PHILOSOPHY.

The requirements for the doctorate are outlined below:

1. Command of the Spanish or the Italian language, spoken and written. In addition a knowledge of two other languages, usually French and German, will be required. In certain fields of specialization a knowledge of Latin or another language may be substituted.
2. An understanding of the development and/or the linguistic basis of the Spanish or the Italian language.
3. Knowledge of Hispanic or Italian literature, consisting of wide acquaintance with the chief movements and writers and a thorough knowledge of selected major authors and works, including their historical and intellectual environment.
4. The program may include a number of individually directed reading and research courses. A limited number of approved graduate courses in a field closely related to the major interest of the candidate may also be included. Such courses will usually be chosen from a second literature or linguistics, but studies in another related field may be approved on presentation of sufficient evidence of its relevance to the intellectual purposes of the candidate.
5. Nine semester courses beyond those offered for the M.A. are required.
6. Preliminary examination and defense of dissertation.
7. It is expected that every graduate student will serve 2 years as a teaching assistant and will have attended a course of instruction in teaching methods.

Hispanic Studies

I. PRIMARILY FOR UNDERGRADUATES

1-2. *Basic Spanish*

The STAFF.

A course for beginners: fundamentals of grammar and basic vocabulary. Six hours of classes distributed among grammar presentation, reading, conversation, drill and training in the language laboratory. Elective for students who have not presented Spanish for admission. No credit is given for the first semester alone, but with written permission a qualified student may elect the latter half of the sequence.

3. *Intermediate Spanish I*

The STAFF.

Intensive three-week oral practice and full review of Spanish grammar followed by readings in Spanish and Spanish American literature: short stories, poetry, drama. Discussion and analysis of reading, conducted in Spanish, with accompanying compositions in Spanish. Three class hours and one laboratory hour per week. Prerequisite: placement.¹

4. *Intermediate Spanish II*

The STAFF.

The course aims to broaden the students' understanding of the Hispanic world, with special emphasis on Hispanic America, and to improve their ability to communicate orally and express themselves in written Spanish. Readings will include, in accordance with student interest, contemporary fiction and nonfictional works dealing with political, social, historical and literary aspects of Hispanic America. Prerequisite: work of high quality in 2, 3 or placement.

11, 12. *Expression and Values in Spanish Literature*

MR. DURAND and STAFF.

A study of literature as an interplay between artistic expression and underlying schemes of values. Each work is examined to reveal essential aspects of a value system (reason, passion, intuition, society, art, etc.) and their effect on literary expression. The readings exemplify various forms (novel, drama, essay, poetry) and are representative of major periods from the medieval to the present. The problems and topics are approached primarily through class discussion. For the relation of these courses to concentration in Hispanic Studies, see concentration statement above. Prerequisite: 4, or

¹ See statement on Placement Tests, page 64.

placement by examination,² or permission of the course chairman.

13. *Modern and Contemporary Writers of Spanish America* Ms. MERRIM and STAFF.
An introduction to Spanish American literature. Intensive and extensive reading and discussion of major literary works by Spanish American authors of the modern and contemporary periods. For the relation of this course to concentration in Hispanic Studies, see concentration statement above.

19. *Spanish Composition and Conversation* Ms. BEANE.
Practice in writing and speaking Spanish. Four hours per week: two hours of discussion and analysis, one hour of language laboratory, one hour of oral practice. Weekly compositions. Prerequisite: Hispanic Studies 4 or placement.²

33. *Intensive Survey of Spanish Literature* Mr. AMOR and STAFF.
An intensive introduction of the major authors and literary movements in Spanish literature, from medieval to modern times. Special attention to the definition of genre and the building up of critical vocabulary and techniques. Intended as an advanced preparatory course for 100-level courses for students who achieve the highest placement in Spanish. Prerequisite: 4 or placement, or written permission. May not be combined with 11 or 12. For its relation to concentration in Hispanic Studies see Appendix A.

51. *Advanced Composition and Conversation* The STAFF.
Intensive practice in writing and speaking Spanish. Oral reports, weekly compositions. Four hours per week: three hours of discussion and analysis, one hour of language laboratory. Prerequisite: Hispanic Studies 19 or placement.² Open also, with written permission of the instructor, to students who have completed two of the following: Hispanic Studies 11, 12, 13, 33.

II. FOR UNDERGRADUATES AND GRADUATES

Prerequisite for all courses except 102 and 103: 33; or two of the following: 11, 12, 13 or, upon consultation with the instructor, a single semester of either of these sequences plus an appropriate course in another literature.

102. *Twentieth Century Hispanic Literature in English Translation* Mr. DURAND.
Selected works in various genres by the most important Spanish writers of the twentieth century, beginning with the Generation of 1898. Authors studied will include: Unamuno, Machado, Ortega y Gasset, Lorca, and others. Not offered every year.

103. *Contemporary Latin American Fiction in Translation* Ms. MERRIM.
The ideological and aesthetic orientations of some of the most significant literary developments of recent decades. Novels and short stories by Spanish American and Brazilian writers that mirror the changing realities of the continent — regionalism, societal factors, conflict and upheaval — and become a vehicle for the affirmation of cultural identity. Topic for 1985-86: Contemporary South American Narrative: Fantastic and existential literature.

121. *Studies in the Language and Literature of the Middle Ages* Ms. SCHAFFER.
An examination, with its historical and cultural background, of a substantial area of Medieval Spanish literature. Topic for I, 1985-86: Christians, Muslims and Jews.

122. *Studies in the Theatre of the Golden Age* Mr. CARREÑO.
An examination of an important aspect of the Spanish drama of the Golden Age, from Juan del Encina to Calderón, with appropriate historical and cultural background. Not offered every year.

124. *Studies in the Literature of the Golden Age* Mr. CARREÑO.
Topic for 1985-86: Don Quijote and the Formation of the Modern Novel.
A detailed close analysis of Cervantes' masterpiece *Don Quijote* designed to convey an appreciation of the cultural significance of the XVIIth century as the end of the Renaissance period and the beginning of modern fiction. Relations to the modern novel will be drawn (structure, points of view, characters) with special emphasis on Peninsular and Latin American fiction writers.

126. *Studies in the Nineteenth Century* Messrs. DURAND and RIBBANS.
A thorough examination of an important aspect of nineteenth-century Hispanic literature in Spain against the appropriate historical and cultural background. Normally offered every second year.

² See statement on Placement Tests, page 64.

129. *Studies in the Twentieth Century*

Messrs. AMOR and RIBBANS.

A critical examination of an important area of twentieth-century Hispanic literature against the appropriate historical and cultural background. Not offered every year.

133. *Studies in Contemporary Spanish American Literature*

Ms. SMITH.

Topic for 1985-86: Cultural perspectives of the New World: The intermingling of Spaniards and Indians.

It might be said that the Spaniards' arrival in the New World was tantamount to an encounter with life on another planet. Focusing on western South America, in this course we shall study historical and literary texts (Pedro Cieza de León's *Cronica del Perú*, Pedro de Oña's *Arauco domado* and Inca Garcilaso's *Comentarios reales*, among others) in order to examine perceptions of the radical differences between Spanish and indigenous cultures.

137. *Studies in Contemporary Spanish American Literature*

Ms. MERRIM and BEANE.

Will examine closely one of the important aspects of contemporary Spanish-American literature in relation to the political and cultural development of the continent. Topic for I, 1985-86: "Civilización y barbarie" in 19th and 20th Century Hispanic America. Topic for II, 1985-86: Masterworks of Post-Modernist Latin American Poetry.

142. *Studies in Narrative Fiction*

Messrs. DURAND and AMOR.

An examination of literary texts bent on reconstructing historical events. This course will cover representative prose fiction of the Nineteenth and Twentieth centuries, both of Spain and Latin America.

145. *Studies in Poetry*

Messrs. AMOR and RIBBANS.

Essential aspects of poetry in Spain and/or Spanish America without limitation of period or country. Offered in alternate years.

148. *Studies in the Theatre*

The STAFF.

Important aspects of the theatre in Spanish which do not fall within the area of the other courses. Offered in alternative years.

149. *Studies in the Literature of Ideas*

Mr. RIBBANS and STAFF.

Topic for 1985-86: Intellectual thought from the 18th to the 20th centuries. The development of the literature of ideas in Spain, mainly in the form of essays or short treatises, following the decline of Spanish imperial power. The relationship of Spain with its colonial past and with other European countries will be explored through a series of writers from the 18th Century (Feijoo, Cadalso, Jovellanos) through the Romantic period (Larra) and the reformers of the later 19th Century (Giner, Ortega).

150. *Special Topics in Hispanic Literature*

The STAFF.

A topic that transcends usual course boundaries and is of special concern to a member of the department will form the basis of a seminar in which undergraduates under his or her direction will explore its ramifications. Not offered every year. Topic for II, 1985-86: The Spanish Civil War: Antecedents, Significance and Cultural Impact. Mr. Ribbans.

160. *Studies in Catalan Language and Literature*

Mr. RIBBANS.

A rapid study of the rudiments of the language will provide sufficient reading knowledge for the study of selected texts in Catalan; these will be studied against the historical and cultural background of Catalonia. The emphasis of the course will be placed alternately on medieval and modern literature. Instruction will be in English. Course normally offered in alternate years.

170. *Studies in Stylistics and Linguistics*

Mr. CARREÑO.

A stylistic analysis of literary texts that can serve as "models" in advanced expository and creative writing. Examples of idiomatic and stylistic nuances will be taken from current newspaper editorials to study in depth the mechanics of the language. Prerequisite: Spanish 51 or permission.

198. *Senior Conference*

The STAFF.

Special work or preparation of Honors thesis under the direction of a member of the staff. Open to Honors students and others with written permission.

III. PRIMARILY FOR GRADUATES

201. *History of the Spanish Language* Ms. SCHAFFER.
Study of the phonological and morphological development of the language (with reference to the dialects and to Portuguese and Catalan). Syntax, semantics, and word-formation will also be discussed. Knowledge of Latin recommended.
202. *Hispanic Linguistics* Ms. SCHAFFER.
Phonetics and phonology of the Spanish language, including discussion of articulatory and acoustic features, emphasizing transcription and production. Application of principles of general linguistics.
203. *Studies in Spanish Literature of the Middle Ages* Ms. SCHAFFER.
Topic: Studies in medieval themes and genres.
210. *The Study of Literature: Methods and Approaches* Ms. MERRIM.
Introduction to problems, instruments, and techniques of literary scholarship with consideration of the more significant critical methods, particularly as applicable to Hispanic literature.
211. *Cervantes' Work, I* Messrs. CARREÑO and TRUEBLOOD.
212. *Cervantes' Work, II* Messrs. CARREÑO and TRUEBLOOD.
215. *Studies in Spanish Literature of the Golden Age* Messrs. CARREÑO and TRUEBLOOD.
Topic for 1985-86: Teatro del Siglo de Oro: *de Lope a Calerón*.
216. *Seminar in Spanish Literature of the Golden Age* Mr. TRUEBLOOD.
Topic for 1985-86: Dialogued Prose of the 16th and 17th centuries; fictional and non-fictional.
225. *Studies in Spanish Literature of the Eighteenth and Nineteenth Centuries* Messrs. DURAND and RIBBANS.
Topic for 1985-86: Realism and the novel of the nineteenth century.
An introduction to Spanish realism as represented by major novelists of the nineteenth century: Alarcón, Valera, Pereda, Pardo Bazán, Galdós, Clarín.
227. *Studies in Spanish Literature of the Twentieth Century* Messrs. AMOR and RIBBANS.
Topic for 1985-86: Poesía española del siglo XX.
235. *Studies in Spanish American Studies* Mr. AMOR and Ms. MERRIM.
Topic for 1985-86: Poesía hispanoamericana del siglo XX.
252. *Seminar in Spanish American Literature* Mr. AMOR and Ms. MERRIM.
262. *Seminar in Spanish Literature* Mr. RIBBANS and STAFF.
Topic for 1985-86: Eighteenth century prose: Feijóo, Jovellanos, Cadalso.
291. *Independent Research*
- 291A. *Research in Spanish Literature of the Middle Ages* Ms. SCHAFFER.
- 291B. *Research in Spanish Literature of the Golden Age* Messrs. CARREÑO and TRUEBLOOD.
- 291C. *Research in Spanish Literature of the Eighteenth and Nineteenth Centuries* Messrs. AMOR, DURAND and RIBBANS.
- 291D. *Research in Spanish Literature of the Twentieth Century* Messrs. AMOR and RIBBANS.
- 291E. *Research in Spanish American Literature* Messrs. AMOR, DURAND and Ms. MERRIM.
- 291F. *Research in Intellectual History* Mr. RIBBANS.
- 291G. *Research in Spanish Regional Literature* Mr. RIBBANS.
292. *Thesis Preparation* The STAFF.

ITALIAN STUDIES

I. PRIMARILY FOR UNDERGRADUATES

1-2. *Elementary Italian*

Ms. GUNZBERG and STAFF.

A year course. Elective for students without previous training in Italian. No credit for first semester alone. Fundamentals of Italian grammar and development of skills in speaking, comprehension, and writing. Language Laboratory training.

1X. *Intensive Elementary Italian*

Ms. GUNZBERG and STAFF.

Course will cover the same material presented in Italian 1-2. One semester equivalent to the standard two-semester sequence. Two semester course credits. Eight class hours weekly plus two laboratory hours.

3. *Intermediate Italian I*

Ms. GUNZBERG and STAFF.

Review of the fundamentals of grammar, with emphasis upon skills in speaking and writing. Short readings from modern literature and articles on current events. Prerequisite: 1-2, or placement by examination,¹ or written permission.

4. *Intermediate Italian II*

Ms. GUNZBERG and STAFF.

Specific problems in Italian grammar. Reading of one or more short novels, composition and conversation. Prerequisite: 3, or placement by examination,¹ or written permission.

2X. *Intensive Intermediate Italian.*

The STAFF.

Course will cover the material included in Brown's present Italian 3-4 sequence. The duration of the course — to be given each year in Bologna as a requirement for our program there — will be three months, and weekly instruction 10 hours. Two semester course credits. Prerequisite: Italian 2 or 1X.

19. *Italian Composition and Conversation*

Ms. GUNZBERG.

A third-year course with intensive practice in speaking and writing. Selected works illustrative of modern Italian culture will provide a basis for reading and discussion. Prerequisite: 4, or placement by examination, or written permission.

51. *Advanced Composition and Conversation*

Ms. GUNZBERG.

Continuation of 19. Discussion of representative works by influential Italian authors will provide a basis for analysis and oral practice. Prerequisite: 19, or placement by examination, or written permission.

90A., 90B. *Introduction to Italian Civilization.*

The STAFF.

90A: to be taught at Brown and in Bologna. An introduction to the characteristic features and principal phases of post-medieval vernacular Italian culture. The course will discuss the evolution of the culture of modern Italy since the 13th century, situating historically the various intellectual, cultural, and sociological trends of the last 8 centuries. Prerequisite: Italian 2 or 1X.

90B: to be taught in Bologna. A continuation of Italian Studies 90A, structured in connection with the University of Bologna courses taken by participants in the Program. Prerequisite: Italian 4 or 2X and 90A.

II. FOR UNDERGRADUATES AND GRADUATES

Prerequisite for all 100 courses: Italian Studies 4 or placement by examination,² or written permission

101. *Dante in English Translation*

Messrs. FIDO and OLDCORN.

The course, primarily for students with no knowledge of Italian, will be devoted to the study of Dante's works, with the emphasis on the *Vita Nuova* and the *Divine Comedy*. Concentrators in Italian will be expected to read the material in the original.

102A. *Boccaccio's "Decameron" in English Translation*

Mr. FIDO.

102B. *Boccaccio's "Decameron"*

Mr. FIDO.

For concentrators who will do their work in Italian.

¹ See statement on Placement Tests, page 64

² See statement on Placement Tests, page 64

103. *Realism in the Italian Cinema* Ms. GUNZBERG.
The realistic tradition in Italy since World War II. Given in English.
131. *Literature of the Middle Ages from St. Francis to Savonarola* Mr. Oldcorn.
Readings in early Italian literature, including religious writers and love poets of the 13th century, Petrarch, Boccaccio, the Humanists of 15th century Florence, Ferrara, etc. Prerequisite: Italian 19 or 51.
132. *Great Authors and Works of Italian Renaissance.* Mr. Fido.
Readings from Machiavelli, Castiglione, Ariosto, Tasso, Galilei, with special attention to the theory and practice of modern genres: "canzonieri," narrative poems, treatises in dialogue form, comedies, etc. Prerequisite: Italian 19 or 51.
133. *Literature of the Enlightenment* Mr. Fido.
Major cultural trends and authors of the Eighteenth century. Offered in alternate years.
134. *Literature of the Risorgimento and of United Italy* Messrs. Fido and Oldcorn.
From romanticism to decadentism through Foscolo, Manzoni, Leopardi, Verga, Carducci, Pascoli, D'Annunzio. Offered in alternate years.
135. *Contemporary Italian Literature* Mr. Oldcorn and Ms. Gunzberg.
From Svevo and Pirandello to "Hermetic" poetry and neorealism. Offered in alternate years.
140. *Special Topics in Italian Literature* Messrs. Fido and Oldcorn.
A topic that transcends usual course boundaries and is of special concern to a member of the department will form the basis of a seminar in which undergraduates under his or her direction will explore its ramifications. Not offered every year.
- 161, 162. *The Divina Commedia* Messrs. Fido and Oldcorn.
A close reading of Dante's poem in the light of contemporary European and American critical interpretations.
198. *Senior Conference*
Special work or preparation of an honors thesis under the direction of a member of the staff.

III. PRIMARILY FOR GRADUATES

200. *Teaching Methodology for Italian Instructors* Ms. Gunzberg.
Classroom performance, phonetic and morphological structure, techniques for oral drill, testing, critiquing.
201. *History of the Italian Language* The Staff.
Study of the phonological and morphological development of the language, with reference to dialects. Reading and analysis of medieval texts. Knowledge of Latin recommended. Not offered every year.
202. *Italian Linguistics* The Staff.
Phonetics and phonology of literary Italian and regional dialects, including discussion of articulatory and acoustic features. Application of principles of general linguistics, plus linguistic geography. Not offered every year.
210. *The Study of Literature: Methods and Approaches* The Staff.
Introduction to problems, instruments, and techniques of literary scholarship with consideration of the more significant critical methods, particularly as applicable to Italian literature.
213. *Studies in the Duecento and Trecento* Messrs. Fido and Oldcorn.
Monographic studies in the "Scuola Siciliana," the "Dolce stil nuovo," Dante, Petrarch, Boccaccio.
215. *Studies in the Renaissance and Baroque* Messrs. Fido and Oldcorn.
Monographic studies in major sixteenth and seventeenth century authors.
217. *Studies in the Enlightenment and Romanticism* Mr. Fido.
Writers and cultural movements from 1750 to 1860.
219. *Studies in Modern Literature and Theatre* Mr. Oldcorn.
Problems and figures from 1860 to the present.

230. *Seminar in Italian Literature and Criticism*

Mr. FIDO.

Analytical study of specific authors, works, or subjects. Not offered every year.

291, 292. *Reading and Research*

The STAFF.

Courses on special subjects individually planned and supervised.

History

Professors H. P. CHUDACOFF, L. P. CURTIS, C. FORNARA, A. GLEASON,¹ S. R. GRAUBARD,¹ J. B. GRIEDER, B. LYON,² W. McLoughlin, A. MOLHO, C. E. NEU, R. C. PADDEN, J. T. PATTERSON,¹ K. RAAFLAUB, N. RICH, D. G. ROHR, J. L. THOMAS, D. UNDERDOWN, L. E. WILLIAMS, G. S. WOOD; Adjunct Professor N. ROELKER; Associate Professors: P. BENEDICT,¹ M. J. BUHLE, M. GLUCK, R. S. JONES, R. B. LITCHFIELD, J. MCCLAIN;¹ Assistant Professors: N. LAMOREAUX, J. RICHARDS; Lecturers: D. SCOTT,¹ E. WIDMER.

The History Department offers a wide variety of courses all concerned with changes in human experience through time. These courses range from the histories of Classical Greek and Roman civilizations to the histories of Europe, the Americas, and Asia. The Department has no single approach or pedagogic method. Some courses deal with the history of a particular country (e.g. Russia or France); others concentrate on a certain period of time (e.g. the Middle Ages or the Renaissance); and still others deal with a special topic (e.g. 20th Century Science or Multi-Racial Societies in the Americas). All use methods of instruction appropriate to the particular subject and to students' level of knowledge. Introductory and intermediate courses combine lectures and discussions, while a sizeable number of small seminars give students an opportunity to delve deeply into an area of special interest. By taking advantage of the variety of offerings, students will be able to develop broad perspectives on both the past and the present.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

In the broadest sense history entails the comparative study of chronologically and culturally diverse societies. The aim of the concentration is to give students an appreciation of different approaches to the study of the past and to encourage them to develop an understanding of the way in which societies and cultures change through time.

At the time of entering the concentration all students must decide, in consultation with their Concentration Advisor and other members of the Department, what particular combination of courses will best fulfill these objectives in accordance with the following requirements:

1. Concentration in History consists of a minimum of eight semester-long courses in the Department of History.
2. At least two of the eight concentration courses must deal with an area or areas outside the concentrator's primary area of interest. Currently areas include the following: Classical Antiquity, Medieval and Renaissance Europe, Early Modern and Modern Western Europe, Eastern Europe and Russia, Latin America and the Caribbean, North America, and East Asia.
3. Students whose primary area of interest lies in modern history must take at least three semester courses in a period prior to 1800, while those emphasizing the pre-modern past must take at least three semester courses in the period after 1800.

The following courses satisfy the requirement concerning courses prior to 1800: Classics 1-2, History 1, 41, 42, 90, 95, 101, 102, 103, 104, 106, 107, 108, 109, 111, 112, 117, 118, 121, 122, 131, 132, 135, 136, 137, 140, 145, 146, 147, 151, 152, 154, 155, 161, 185 and seminars in related fields. These courses satisfy the requirement concerning courses post 1800: History 2, 41, 42, 51, 52, 90, 114, 118, 119, 120, 123, 124, 125, 126, 127, 128, 129, 130, 133, 134, 138, 139, 141, 143, 144, 148, 149, 153, 159, 160, 162, 163, 164, 166, 167, 168, 169, 170, 173, 174, 175, 176, 177,

¹ On leave 1985-86.

² On leave, Semester I, 1985-86.

181, 186, 187 and seminars in related fields.

4. Students must take an undergraduate seminar, preferably in their primary area of interest, in their junior or senior year. These seminars provide students with an opportunity to delve deeply into a historical problem and, in most cases, to write a major historical paper.

In addition, concentrators are strongly encouraged to enroll in courses in other departments and/or programs concerned with the focus of their study.

All concentrators are urged to consult regularly with their Concentration Advisor or a Department advisor about their program. During the seventh semester all students must consult their Concentration Advisor for review and approval of their program.

A maximum of two courses in the 0-89 group may be counted toward concentration. Students are urged to take a sequence (History 1 and 2, History 51 and 52, History 41 and 42, or Classics 1 and 2) prior to enrolling in the concentration. It is advisable for students planning to emphasize modern or early European history to take both History 1 and 2. Students emphasizing Asian history must normally complete History 41 and 42. Students who wish to emphasize ancient (Greco-Roman) history must take either Classics 1 and 2 or the more advanced Greek and Roman history courses. Freshmen and sophomores should note that (with the exception of History 121, 122, and 127) History 1 and 2 (or equivalent) are prerequisites for freshmen and sophomores who take courses numbered 100-139. For freshmen and sophomores, History 41 and 42 are prerequisites for courses numbered 140-148. Advance Placement credit does not count for concentration. One or two semester courses taught in other universities may be accepted for concentration with the advice and approval of a Concentration Advisor.

The History Department encourages students to study history abroad. Students taking history courses at foreign institutions should build on work initiated at Brown. Their performance in these courses and the content of these courses must meet the Department's standards. Prior consultation with appropriate members of the History faculty and/or Concentration Advisors is required. It is normally expected that students will have declared their intention to concentrate in history and have their concentration programs approved before they undertake study abroad. Ordinarily, a maximum of two course credits for work satisfactorily completed at foreign institutions (or at other institutions in the United States) may be counted toward fulfillment of the concentration requirements in history at Brown. Those history courses taken at a foreign university or at a domestic university other than Brown which students wish to offer for concentration credit must first be approved by the Department Advisor for Transfer Credits and then by one of the Concentration Advisors. Before granting concentration credit for history courses taken elsewhere, Concentration Advisors may seek advice from members of the Department who are specialists in the areas of the courses.

NOTE: Students who contemplate enrolling in the Honors Program in History should consult with the Departmental Honors Advisor at the time they register for concentration. In addition to the 8 required courses all Honors candidates are required to take History 93 and 94 in their senior year. They are strongly advised to take History 92 in the Spring Semester of their junior year. Other requirements for the Honors Program will be indicated by the Honors Advisor.

COMBINED A.B.-M.A. PROGRAM. This program is open only to very exceptional and outstanding students. The requirements of the program may be met by either of two options: (1) sixteen history courses, two of which must be 200-level seminars (including at least one research seminar) taken with two different instructors with a grade of B or better in both, or (2) sixteen history courses, one of which must be a graduate seminar, another of which would involve the writing of a master's thesis. Students may petition for acceptance of a limited number of courses from other departments to satisfy part of the sixteen-course requirement. Not only the Department but also the Committee on Academic Standing and the Graduate Council must approve requests for admission to the program.

GRADUATE PROGRAMS

MASTER OF ARTS. Each candidate shall follow an integrated program of advanced study approved by the Department. Normally the student should be able to complete the M.A. program in one year. There are three possible routes to the M.A.: (1) eight courses, including the colloquium required of all first-year graduate students (for double credit) and at least one research seminar, plus the writing of an M.A. thesis; (2) eight courses, including the colloquium required of all first-year graduate students (for double credit) and two other 200-level seminars (including at least one research seminar) taken with two different instructors with a grade of B or better in each; (3) satisfactory completion of

the first year of study for the Ph.D. program with a grade of B or better in two seminars. Normally all courses are chosen from those offered by the History Department, but a maximum of four courses, not including the seminars, may be taken outside the Department, provided the student presents a coherent program. There is no foreign language requirement for the M.A. degree.

DOCTOR OF PHILOSOPHY. Ordinarily the student should be able to complete the Ph.D. program in five years. The program is essentially divided into three stages: (1) first year courses and seminars; (2) preparation for the Preliminary Examination; (3) writing of the dissertation.

Each candidate for the Ph.D. in the first year will be expected to enroll in the Colloquium required of all first-year students (for double credit); three other 200-level seminars (of which two must be research seminars); and three other courses (which may be either seminars taken for S/NC credit, 100-level courses, extra-departmental courses, reading courses, or, in the case of students in Asian History, language courses).

Students who have already earned an M.A. degree in another University may waive one ABC-credit seminar during the second semester of their study. But they must still satisfactorily complete two research seminars during their first year.

At the beginning of their first term, candidates for the Ph.D. should discuss their program of study with the Graduate Advisor and choose the four fields which they will present in the Preliminary Examination. These four fields constitute a student's basic program and should form a coherent whole. In special cases, one of the fields may be in a discipline other than history, provided approval is obtained from the Department. During the second year students will devote their time to preparation for the Preliminary Examination. Before the end of the second year of graduate study, students should indicate the field in which they intend to write the dissertation. This will be the major field; the others will be minor fields.

Normally during the fifth semester of full-time graduate study, candidates will present themselves for the Preliminary Examination. The examination will consist of two parts, written and oral. The written portion will consist of four three-hour examinations, one for each field. Within one month of the written examination, the candidate will take the oral examination. In this examination one half-hour will be devoted to each minor field and a somewhat longer period will be allowed for the major field.

The final stage of the program involves the writing of a dissertation. After the thesis has been approved by three readers, the Final Examination (oral) will focus on its problems and potentialities.

The foreign language requirement for the Ph.D. consists of written and oral translations from the foreign language into English. A dictionary may be used in the written portion of the examination. The oral translation consists of sight translation from the foreign language into English, not oral use of the language. Failure to meet these requirements will be sufficient grounds to bar a student from continuing in the Ph.D. program. The requirement will vary according to the student's major area of interest.

1. American History: The language requirement will be set by each director of the student's major field.
2. English and British History: A reading knowledge of either French or German. With the consent of the major field advisor another language may be substituted. The director of the student's major field may require additional languages as well. The language exam will be taken during the student's registration week in September. In case of failure the exam may be retaken and must in any case be passed prior to the Preliminary Examination.
3. Continental European History: A reading knowledge of at least two languages, including either French or German. The director of the student's major field may require additional languages as well. Proficiency in at least one of the languages must be satisfactorily demonstrated (in September) before the student enrolls in the Ph.D. program. The second language examination must be passed before the student is allowed to take the Preliminary Examination.
4. Asian History: Proficiency in Japanese language; or in Chinese, equivalent to the completion of Chinese 7-8, plus Chinese 104 and/or Chinese 119 or their equivalents. Proficiency in a second foreign language: before taking the preliminary examination the student must have passed the examination in the second language, and have demonstrated satisfactory progress toward completing the Japanese or Chinese requirements.

TEACHING REQUIREMENTS: Candidates for the Ph.D. must demonstrate satisfactory performance as a Teaching Assistant in undergraduate courses at Brown, or in teaching at another institution

approved by the Department.

List of Fields

The History of Greece or Rome, or an approved portion thereof

Medieval England

Medieval Continental Europe

The History of Italy, 1200-1600

The History of Europe, 1492-1715

The History of Europe, 1715-1870

The History of Europe, 1870 to the present

Early Modern England, 1500-1783

Modern Britain, 1760 to the present

France under the Ancient Regime

Modern France, 1750 to the present

The History of Germany since 1648

The History of Russia since 1689

The History of Central Europe since 1648

The History of Italy, 1600-1870

Spain and her American Empires, 1400-1800

The History of European Science

The Intellectual and Cultural History of Modern Europe

European Social and Demographic History, 1700-1900

European Women's History, 1750 to the present

American History (The student may offer no more than two of these fields, each with a different examiner):

Early American History

Modern American History

American Economic and Business History

American Diplomatic History

American Urban and Social History

The History of American Science and/or Technology

American Intellectual History

American Social and Cultural History

American Women's History

History of Religion in America

The English Speaking Caribbean before 1838

Asian History. (The student may present not more than three of the following fields):

Chinese Intellectual History

Modern Chinese Social and Political History

Chinese Diplomatic History

Southeast Asian History

Inner Asian History

Early Modern Japanese History

Modern Japanese History

Notations to List of Fields

Students may petition the Department for fields that are not listed.

I. PRIMARILY FOR UNDERGRADUATES

Prerequisites: History 1, 2 is not prerequisite for concentration but is strongly recommended. With the exception of History 121, 122, and 127, History 1, 2 or equivalent is prerequisite for freshmen and sophomores for all courses numbered 101 through 138. History 41, 42 is prerequisite for all courses numbered 141 through 148. These requirements may be waived by written consent of the instructor.

1, 2. *European History Since the Middle Ages*

Mr. ROHR.

A primary purpose of History 1, 2 is to introduce students to the period of European history which began with the Renaissance, the period of modernization which transformed European society from one which was deeply religious, traditional, highly stratified and land-based into one which is secular, urban, innovative and revolutionary. History 1 deals with the period 1500 to 1815; History 2 deals with the period since 1815. A second purpose is to instruct students in historical thinking: how to formulate significant questions, how to test evidence for credibility; how to resolve conflicting interpretations of events; how to understand those events as products of multiple and indeterminate causation; how to draw tentative conclusions from imperfect data.

41, 42. *Introduction to East Asian Civilization*

Messrs. McCLAIN and WILLIAMS.

A survey of selected institutions and developments in the Far East and of their emergence and evolution since antiquity. The first half of the sequence is focused on China; the second is on Japan. Either semester may be taken separately.

51, 52. *American History since 1763*

The STAFF.

A general study of American society, politics, and institutions, and of the relations of the United States with other countries.

90. *Development and Modernization in a Colonial Society: Origins of the Third World in Brazil*
(Foundations 90)

Mr. PADDEN.

92. *Selected Topics in the Writing and Interpretation of History*

The STAFF.

Honors seminar for juniors. Topics will vary from year to year.

93, 94. *Honors Courses. Research and Writing of Honors Thesis*
(See description above of Honors Program.)

The STAFF.

95. *Shogun: Fact and Fantasy in Early Modern Japan*

Mr. McCLAIN.

II. FOR UNDERGRADUATES AND GRADUATES

101. *Medieval Personalities and Mentalities*

Mr. LYON.

This course investigates whether influential individuals or whether long-term economic, social, and institutional development have a more fundamental impact upon history. Typical of the individuals studied are Constantine, St. Benedict, St. Augustine, Clovis, Charlemagne, Alfred the Great, Pope Gregory VII, Abelard and Heloise, Thomas Becket, Henry II of England, St. Francis, and Joan of Arc.

102. *The Intellectual and Cultural Ambience of Medieval Europe*

Mr. LYON.

Emphasis upon the rise of Christian thought and scholasticism, the intellectual revival of the 11th and 12th centuries, the evolution of Roman and Canon law, and the development of the cathedral school and medieval university. These developments are related to contemporary, medieval, social, and economic history.

103. *Social and Economic Problems and Institutions of the Middle Ages*

Mr. LYONS.

A study of the collapse of the Roman Empire, and the development and function of seignorialism, feudalism, the town, the bourgeoisie, the guild, trade and finance, and capitalism.

104. *The Concept of Political Freedom in Greek and Roman Antiquity* (Classics 136)

Mr. RAAFLAUB.

107. *Renaissance Italy*

Mr. MOLHO.

A detailed study of Italian society and culture from the late thirteenth to the early sixteenth centuries. An attempt will be made to provide an economic, social, and political framework for the rise of humanism and the development of the arts.

108. *Europe in the Age of Charles V*

Mr. BENEDICT.

Analysis of the changes affecting European society during the period traditionally considered the watershed between medieval and modern times (ca. 1475-1559). Major themes to be explored include: demographic growth and economic change; the rise of the "New Monarchies"; the diffusion of the Renaissance to Northern Europe; and the transforming religious crises of the Reformation and Counter-Reformation.

109. *English Constitutional and Legal History in the Middle Ages*

Mr. LYON.

A detailed examination of the medieval development of English institutions and the common law. Emphasis will be placed on the development of a strong monarchy, on the growth of local institutions of self-government, and representation in a central parliament.

111. *Europe, 1559-1715: From Religious War to Absolutism*

Mr. BENEDICT.

Survey of the leading developments in European history over a century and a half in which political stability and a new intellectual order gradually emerged out of the chaos of religious conflict.

112. *Old Regime France*

Mr. BENEDICT.

Examination of the historical experience of Frenchmen of all levels of society between roughly 1500 and 1770.

117. *European History, 1748-1815: The Enlightenment, the French Revolution and Napoleon*

Mr. LITCHFIELD.

The culture and politics of late 18th century France, the Revolution and the Napoleonic period. Emphasis on the development of political consciousness among different groups; and on the interaction between events in France and international Jacobinism in England, Germany, and Italy.

118. *The Industrial Revolution in 18th — 19th Century Europe*

Mr. LITCHFIELD.

A detailed analysis of the beginnings of industrial modernization in Western Europe, ca. 1730-1880. Attention is given to agriculture and peasants, the demographic transition, the economic process of industrialization, and the accompanying transformation of middle and working class social life, the family, popular culture, and protest in this period.

119. *Europe 1870-1918*

Mr. GRAUBARD.

A political and cultural history of Europe, 1870-1918, with emphasis on the pre-war decade.

120. *Europe, 1914 to the Present*

Mr. GRAUBARD.

An intensive examination of two World Wars and their consequences for European Society.

121. *The Ethnohistory of European Expansion to The Americas:*

Europeans and Africans in the Americas, 500-1700

Mr. PADDEN.

The comparative study of major European and African transits to the Western Hemisphere. Emphasis on Portugal's early exploitation of Africa and the development of colonial Brazil, Spain's invasion and exploitation of the greater Caribbean islands and subsequent creation of the mainland kingdoms of New Spain (Mexico) and Peru, and England's penetration of the Caribbean and counter-colonization of the North American mainland.

122. *The Ethnohistory of European Expansion to The Americas:**Comparative American Societies, 1670-1850*

Mr. PADDEN.

Comparative study of the origins and perception of American identities, as manifested in the Era of Greater American Revolution (1776-1826) and the emergence of Spanish, Brazilian, Anglo, and Black American nationalisms. Emphasis is placed on the eighteenth-century Enlightenment as the intellectual foil against which American identities tended to be formed, and on Haitian revolution, the Empire of Brazil, Mexican and Argentine federalism, and the federal republicanism of the United States.

123, 124. *The Foreign Relations of the Great Powers, 1815 to the Present*

Mr. RICH.

An analysis of the foreign relations of the great powers, with emphasis on the social, economic, and ideological forces involved in the formulation of foreign policy. The chronological break is in 1914.

125. *Twentieth-Century Intellectual History*

Mr. GRAUBARD.

The course will deal with a selected number of major texts that have significantly affected thought in the twentieth century.

127. *The National History of Mexico* Mr. PADDEN.
The political, economic, and social development of the Mexican nation from onset of the Independence movement in 1810 to the present. Major components include the Juárez era, the Porfiriato, the Revolution of 1910, and the Institutionalized Revolution, culminating in the contemporary scene. Relations with the United States and European powers, especially in the areas of foreign investment, industrialization, and programs of modernization and development, are of particular significance.
128. *Modern Italy* Mr. MOLHO.
The history of Italy from the Risorgimento to the present, with emphasis on the impact of modernization on Italian society and culture.
- 129, 130. *European Intellectual History 1790 to the Present* Ms. GLUCK.
The course will examine in some detail the major cultural and intellectual tendencies that emerged in Europe during the nineteenth and twentieth centuries. The first semester will cover the period between 1790 and 1870 and will focus on such seminal thinkers as Burke, Rousseau, Schiller, Hegel, Bentham, Darwin and Marx. The second semester will continue from 1870 to the present and will include the works of Nietzsche, Bergson, Freud, Weber and others.
- 131, 132. *English History, 1500-1783* Mr. UNDERDOWN.
The political, social, economic, and cultural development of Early Modern England; the origins and growth of British imperialism.
- 133, 134. *Modern Britain, 1760 to the Present* Mr. CURTIS.
An introduction to British history since 1760 with emphasis on social structure, industrialization, reform movements, the rise of labour, and the warfare-welfare state of the twentieth century. (See University course 138.)
- 135, 136. *Greek History* (Classics 121, 122) Mr. FORNARA.
- 137, 138. *Russian History* Mr. GLEASON.
The development of Russia from the Kievan period to 1917.
139. *The Soviet Union* Mr. GLEASON.
140. *History of Imperial China: From the Sung Dynasty to the Mid-Ch'ing* Mr. WIDMER.
141. *History of Sino-Russian Relations* Messrs. WIDMER.
This course will begin in the Mongol period; move to an examination of the meeting of the Chinese and Russian empires in the 17th century; and to the bases of their coexistence up through the 19th century. The second half of the course will deal with the interaction of the two revolutionary regimes in the 20th century. Open to students who can attest some familiarity with Chinese or Russian history, or by the consent of the instructors.
- 143, 144. *China in Revolution, 1800 to the Present* Mr. GRIEDER.
A survey of modern Chinese history, emphasizing social, political, and intellectual developments from the early 19th century to the People's Republic. The course will deal with the background of China's confrontation with the West, the decay of imperial institutions, various aspects of the impact of alien economic, social and intellectual influences, the rise of radicalism, and the establishment of successive revolutionary regimes.
145. *Modern History of Inner Asia* Mr. WIDMER.
Beginning with the life of Chinggis Khan, the course covers the rise of nomadic empires and the expansion into the steppe of the sedentary societies of Russian and China. The concluding analysis is focused on modern Sino-Russian relations.
146. *Chinese Diplomatic History, 1800 to the Present* Mr. WILLIAMS.
Analyzes the processes that have characterized China's foreign relations as the traditional order in East Asia was challenged and ultimately broken, as China attempted to contain Western and Japanese attack and as the People's Republic has sought great power status.
- 147, 148. *History of Japan* Mr. MCCLAIN.
The first half of the course treats the history of Japan to 1800. Specific topics include the development of the imperial institution and traditional forms of political authority, the emergence of warrior elites and a feudal society, the evolution of Japan's unique cultural heritage, and the social and polit-

ical changes that resulted from Japan's "sixteenth century revolution." The second half, Japan from 1800 to the present, will focus on the Meiji Restoration, modernization, Japan's emergence as an industrial and military power, the road to Pearl Harbor, and the post-World War II "economic miracle." Each semester, particular attention will be paid to the relationship between social and economic change and political developments. Either semester may be taken independently.

149. *Modern Southeast Asia*

Mr. WILLIAMS.

An investigation of both the indigenous and more recently imported elements in the transformation of Southeast Asia. Emphasis is placed on the relationship among traditionalism, imperialism, colonialism, and nationalism.

151. *The History of the American Colonies, 1580-1760*

Mr. WOOD.

The origins and development of American society out of the interaction of European elements and the environment of the New World.

152. *The Era of the American Revolution*

Mr. WOOD.

The political, intellectual, and social sources and consequences of the American Revolution. History 151 is recommended but not required as a prerequisite.

153. *History of the Early Republic*

Mr. WOOD.

A survey of social, political, and cultural developments from the formation of the Constitution to the Age of Jackson. History 152 is recommended but not required.

154. *Multi-Racial Societies in the Americas before 1800* (Afro-American Studies 154)

Mr. JONES.

Social scientific conceptual schema are utilized in the study of the social and cultural significance of race in the new world before the 19th century. At least one course in History, Afro-American studies, the Social Sciences, or written permission.

155. *Slave Societies in the English Speaking Caribbean* (Afro-American Studies 155)

Mr. JONES.

The course will be concerned with such slave societies in the English speaking Caribbean as Old Providence, the Barbados, Belize, Jamaica, Trinidad, St. Kitts and St. Vincent. Among the topics to be examined are Afro-Caribbean institutions, the sugar economy, slavery, maroon societies, mulatto populations, and Afro-Indian communities. At least one course in History, Afro-American Studies, the social sciences, or written permission.

159, 160. *History of American Foreign Policy since 1890*

Mr. NEU.

Traces major themes in American foreign policy from 1890 to the present, as the nation moves from isolationism to the globalism of the decade after World War II. The course divides in 1941.

161. *The Changing Economic Order: American Economic History, 1607 to 1860*

Ms. LAMOREAUX.

The first half of the economic history survey will focus on questions of economic growth its rate, pattern, and spread; factors which retarded or promoted it; its relationship to political and social change.

162. *The Changing Economic Order: American Economic History 1860 to the Present*

Ms. LAMOREAUX.

The second half of the economic history survey will pursue the themes developed in the first half of the course, but the primary emphasis will shift from growth to institutional change.

163, 164. *History of American Women* (American Civilization 163, 164)

Ms. BUHLE.

166. *Problems in Afro-American History* (Afro-American Studies 166)

Mr. JONES.

Social scientific paradigms are employed in this overview of Afro-American history. Particular emphasis is placed on the relationship between the changing American social structure and the thought patterns, attitudes, values, and beliefs of whites and blacks.

167. *The Era of the Civil War*

Mr. THOMAS.

A survey of the political, economic, and cultural forces which disrupted and reunited the American nation. Primary readings include Stowe, Grant, Lincoln, Davis, Stephens, Chestnut, Whitman, Tourgee, DeForest, Kyd, Douglass.

169, 170. *The United States in the Modern Era.*

Mr. PATTERSON.

Political, social, economic, cultural, and intellectual trends in the United States since 1885. Little coverage of foreign policy. Chronological break is 1930.

173, 174. *The Social and Intellectual History of the United States Since 1789*

Mr. McLOUGHLIN.

An examination of American cultural development with emphasis on the interaction between major movements or forces affecting social change, and the prevailing (or novel) ideas, myths, values, and beliefs of the American people.

175, 176. *American Urban History*

Mr. CHUDACOFF.

This course will examine the urban dimension of American history. It is both a survey, covering a period from colonial times to the present, and a specialized focus, placing the city in its historical context and exploring American history from an urban frame of reference. It will divide around 1850 or 1860, the watershed between the old "walking" city and the modern, mechanized city.

177. *History of Religion in America* (Religious Studies 177)

Mr. McLOUGHLIN.

An evaluation of the major religious ideas, leaders, and movements which have influenced American society from 1607 to the present with special attention to revivalism, millennialism, the Protestant ethic, separation of church and state, perfectionist reform, anti-Catholicism, and the conflicts between religion and science.

185. *The Rise of Scientific Worldview*

Ms. RICHARDS.

An examination of the rise of Western Science and its intellectual and social context in the period from 1500 to 1800.

186. *Science and Society in the Nineteenth Century*

Ms. RICHARDS.

An examination of the development of science in the nineteenth century.

187. *Science and Society in the Twentieth Century*

Ms. RICHARDS.

An examination of selected aspects of the development of science and technology in relation to twentieth-century Western society.

197. *Undergraduate Seminar in Interpretations of History — Semester I*

The topics that are considered in individual sections of the course will vary from year to year.

198. *Undergraduate Seminar on Interpretations of History — Semester II*

The topics that are considered in individual sections of the course will vary from year to year.

199. *Undergraduate Reading Course*

The STAFF.

Guided reading on selected topics.

III. PRIMARILY FOR GRADUATES

201. *Proseminar in Medieval History*

Mr. LYON.

Reading knowledge of French or German required.

202. *Seminar in Medieval History*

Mr. LYON.

Reading knowledge of Latin and French or German required.

207. *Seminar in Renaissance History*

Mr. MOLHO.

Concentrated reading on selected topics in the Renaissance. Reading knowledge of either French, German, or Italian required.

208. *Seminar in Ancient History* (Classics 208)

Mr. RAAFLAUB.

211. *Proseminar in the History of France, 1500-1750*

Mr. BENEDICT.

Reading on selected topics in French history and historiography, 16th-18th centuries. Reading knowledge of French required.

212. *Seminar in the History of Early Modern Europe*

Mr. Benedict.

216. *Seminar in European Social, Demographic, and Economic History: 18th-19th Centuries*

Mr. LITCHFIELD.

218, 219. *Seminar in Modern European History*

Mr. RICH.

Domestic and international politics of 19th and 20th century Europe.

221. *Advanced Studies in the Sources and General Literature of the Expansion of Europe.*

Mr. PADDEN.

Intensive examination of the history of Ibero-American colonial historiography. Extensive exercise in comparative and critical analysis of historical works and sources, with emphasis upon problems involved with the expansion of Europe and American colonization.

222. *Graduate Research Seminar in the Expansion of Europe*

Mr. PADDEN.

Original research on problems within the broad area of the expansion of Europe into the western hemisphere.

231. *Proseminar in Early Modern English History*

Mr. UNDERDOWN.

Interpretations of English history with emphasis on topics from the period 1529-1783.

232. *Seminar in Early Modern English History*

Mr. UNDERDOWN.

Research seminar with emphasis on topics from the period 1529-1714.

233. *Proseminar in Modern British History*

Mr. CURTIS.

Interpretations of British history from the reign of George III to the era of World War I.

234. *Research Seminar in Modern British History*

Mr. CURTIS.

Problems in British society, politics, and culture since 1800.

237. *Problems in Nineteenth-Century Russian Intellectual and Social History*

Mr. GLEASON.

A reading knowledge of Russian is desirable, but French or German may be substituted.

241. *Problems in Modern Chinese Intellectual History*

Mr. GRIEDER.

Offered in alternate years. A reading knowledge of Chinese is ordinarily expected.

242. *Problems in Sino-Southeast Asian Relations*

Mr. WILLIAMS.

Topics in the history of Chinese involvement with Southeast Asia will be selected annually. A reading knowledge of Chinese or a Southeast Asian research language is expected.

244, 245. *Readings in Malay and Indonesian History*

Mr. WILLIAMS.

A reading knowledge of Malay/Indonesian is required.

248. *Problems in Japanese Modernization*

Mr. McCLAIN.

249. *Approaches to Modern China*

The STAFF.

A conference course designed to familiarize students with techniques in the interpretation of modern China. This seminar is considered to complement Chinese 104. Materials and Methods of Sinology. A reading knowledge of Chinese is normally expected.

251. *Introduction to Advanced Study in Early American History: Historiography, Approaches, and New Interpretations*

Mr. WOOD.

252. *Seminar in Early American History*

Mr. WOOD.

260. *Seminar in Twentieth Century American Foreign Policy*

Mr. NEU.

261. *Graduate Seminar in Economic History*

Ms. LAMOREAUX.

This course will be tailored to the needs and backgrounds of the students taking it but the primary aim will be to develop the skills necessary to conduct cliometric research.

263. *Proseminar in American Labor History (American Civilization 263)*

Ms. BUHLE.

268. *Seminar on Nineteenth-and Twentieth-Century American History*

Mr. THOMAS.

274. *Problems in American Social and Intellectual History*

Mr. McLOUGHLIN.

276. *Seminar in American Urban and Social History*

Mr. CHUDACOFF.

An advanced examination of the issues and methodology of American urban and social history plus primary research on specific topics.

277. *Seminar in the History of Religions in America*

Mr. McLOUGHLIN.

285. *Proseminar in the History of Science and Technology*

Ms. RICHARDS.

An introduction to the study of the history of science and technology by means of selected topics. Emphasis will be on readings in secondary literature and the writing of interpretive essays.

286. *Seminar in the History of Science and Technology* Ms. RICHARDS.
Research and writing, including the use of primary sources, in the history of science and technology in Europe and America, and the history of science policy.
290. *Seminar in Modern United States History* Mr. PATTERSON.
- 291, 292. *Reading and Research* The STAFF.
Work with individual students in connection with special reading, problems of research, or preparation of thesis. Offered every year.
293. *Colloquium* The STAFF.
Themes and topics in history and historiography. Required of first year graduate students and open to other graduate students.
295. *Workshop* The STAFF.
Required of second year graduate students and open to other graduate students.

History of Mathematics

Professors PINGREE and TOOMER (Chairman).

The program of the Department is concerned with the history and transmission of mathematics, astronomy and related disciplines in Antiquity, the Middle Ages and the Renaissance. The great variety and complex character of the problems connected with this field permit different approaches; consequently students either with primarily mathematical and astronomical training or with a background in classical and historical studies may take part. For graduate students knowledge of the relevant ancient languages and ability to read at least French and German among modern languages is required. Emphasis is laid on the study of original source material. The facilities of the University Libraries are adequate for the printed literature, and the Department has a large and growing collection of photographs and microfilms of original documents.

Programs leading to the M.A. and Ph.D. degrees are worked out with regard to the training, abilities and interests of the individual student.

I. FOR UNDERGRADUATES AND GRADUATES

- 152, 153. *History of Ancient Astronomy* Mr. TOOMER.

II. PRIMARILY FOR GRADUATES

- 211A, 212A. *Apollonius' Conics V to VIII* Mr. TOOMER.
- 211B. *Greek Astrological Texts* Mr. PINGREE.
- 212B. *Byzantine Scientific Texts* Mr. PINGREE.
- 291, 292. *Kepler's "Astronomia Nova"* Mr. TOOMER.
- 291A, 292A. *History of Indian Astronomy* Mr. PINGREE.

Courses in Sanskrit taught by Mr. PINGREE are listed under the Classics Department. Courses in Classics taught by Mr. TOOMER are listed under the Classics Department. Members of the Department participate in the Ancient Studies Program and teach in the Foundations Courses F13, F14 (Ancient World).

Judaic Studies

Professors NEUSNER (Co-director), DIETRICH, FRERICHS, (Co-director), GOLDSCHIEDER, HIRSCH, ZUCKERMAN: Assistant Professors FRADKIN¹ SORKIN;¹ Visiting Professor, JAMES BARR² Fellows of the Program: Professors BARNOUW, GOLDSTEIN, and WARNOCK.

The Program serves as an interdisciplinary focus for studies of Jews and Judaism, including, but not limited to, historical, linguistic and philosophical perspectives and approaches. The Program faculty offers courses at the undergraduate and graduate level, and the Program supervises undergraduate concentrations and graduate programs. The chronological scope of the program's area of interest includes ancient Israel as well as modern Jews and the modern State of Israel. Represented within the faculty associated with the Program in Judaic Studies are three principal humanistic disciplines: history, literature, and religion. Work in the social sciences is carried on as well. Focus is upon sociology and political science. The undergraduate curriculum of the Program's *courses* is organized along *disciplinary* lines. The undergraduate *concentration* of the Program, for its part, is developed along *interdisciplinary* lines. Graduate programs are in the disciplines of the academic study of religion and in sociology. It follows that the Program in Judaic Studies is not a non-disciplinary exercise in Jewish studies, but at every point a carefully crafted effort to show how diverse academic disciplines deal with a single subject, the Jews. The educational goal of the concentration, spelled out below, is to provide students with a clear idea of how different approaches to the framing and answering of questions of systematic learning deal with the same social entity over a long period of history. Studying the Jews' history, the history of their religion, their languages, their diverse literatures, as well as the sociology, politics and philosophy characteristic of their community, the student learns three important things: first, some of the facts of the matter, that is, some Hebrew, knowledge of history, mastery of the description, analysis and interpretation of the religion of the Jews; second, clear knowledge of how a historian, a sociologist, a political scientist, a philosopher, or a scholar of the history of religions frames questions and answers them; third, a preliminary notion of what it means to look at the same thing from different angles.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

Ten courses in all, two courses of the ten will be in the Hebrew Language. All concentrators will have one full year of Hebrew. The remaining eight courses will be chosen in at least three learning modules (thus: three sets of two matched courses, with two further courses chosen among the Programs's offerings).

A learning module (a set of two courses) will be defined in one of two ways.

1. A learning module of two courses may provide an introduction to the method of a discipline and the application of that method to Judaic Studies, for example, the disciplines of history, literature, religion, philosophy, political science, archaeology, sociology, and the like, presented as a theory of systematic learning in one course, and applied to a Judaic topic in a second course.
2. A learning module may provide a comparison of a Judaic topic with some other topic and so introduce the student to comparative studies as an approach to learning, for example, the study of religion in America and American Judaism, or a topic in Christianity and a comparable topic in Judaism.

Modules involve work in a variety of departments. One module, for instance, consists of R.S. 11, Theory of Religion, with any one of the Program's courses in the discipline of Religious Studies. We expect that further modules will draw upon other Religious Studies courses for purposes of comparison. Thus both disciplinary and substantive courses of other departments will serve the Program in Judaic Studies. An example of (1) a disciplinary module in the present Course Catalogue would be Political Science 50, Foundations in Political Analysis, and Special Themes and Topics

¹ Beginning 1985-86.

² 1985-86. Semester I.

21, Modern Jewish Society and Politics (both: Mr. Zuckerman). An example of (2) a module of comparison would be Judaic Studies 1 and Religious Studies 2, thus, how one would view as a whole both Judaism and Christianity. Further examples would be these: one course in modern European intellectual history and one in modern Jewish intellectual history; a course in the literature of ancient Israel (Old Testament) and in the literature of earliest Christianity (New Testament); or R.S. 72 and J.S. 74, Christianity and Judaism in Late Antiquity, respectively. All concentrators will enroll in the senior seminar, R.S. 199, in Semester II of the senior year. In that seminar, concentrators write a senior essay meant to draw together the threads of the concentration, both substance and disciplines. A comprehensive examination will be required of all concentrators. Questions will be framed to encompass a wide range of course selections in the students' patterns of concentration. Recognition of excellent work in R.S. 199 and in the comprehensive examination will take the form of a degree with honors. The Program in Judaic Studies will provide counsel to concentrators on courses outside of the concentration to be recommended in particular. It will further take full responsibility to provide faculty advisers for all concentrators. Potential concentrators who request advisers will be accommodated as well.

GRADUATE PROGRAMS

MASTER OF ARTS. The Master of Arts in Judaic Studies will be conferred upon completion of an approved program of eight semester courses and a thesis. Interdisciplinary approaches will be expected in the construction of the program of courses and in the thesis. The candidate is expected to develop competence in the theory of religion, or other disciplinary option, through formal course work. M.A. candidates must pass an ETS examination at the designated level in either French or German.

DOCTOR OF PHILOSOPHY IN HISTORY OF JUDAISM. The doctoral program presupposes that degree candidates will acquire a broad base of knowledge across the total chronology of Judaism, but will complete the degree with research-level competence in Judaism in late antiquity. Degree Requirements:

- a. *Theory of Religion:* The candidate is expected to develop competence in the theory of religion through formal course work. Other disciplinary options may be introduced.
- b. *Language Requirement:* The student must demonstrate by ETS examination a reading knowledge of at least two foreign languages (ordinarily French and German). The student must possess upon entrance the ability to read classical post-biblical Hebrew and Aramaic texts, particularly of the talmudic period, and modern scholarly Hebrew.
- c. *Preliminary Examination:* The preliminary examination must be completed by the end of the first semester of the year in which the student expects to receive the degree. Examination Areas: 1. Religion and literature of ancient Israel with particular emphasis on twentieth century scholarship on ancient Israel; 2. Judaism in late antiquity; 3. Judaism in medieval and modern times; 4. Analytic questions on the history of Judaism, utilizing several approaches to the study of Judaism within the academic study of religions.
- d. *Candidacy:* The candidacy of the student for the degree of Doctor of Philosophy shall be certified no later than the end of the seventh semester in the student's program.
- e. *Preparation for Teaching:* All doctoral students serve as teaching assistants and fellows, under senior faculty supervision. This part of their education is meant to train them as future teachers, colleagues, and members of departments.

The doctoral program in the History of Judaism stresses scholarly study of Judaism in late antiquity. Dissertations and other research projects investigate problems in that period. Doctoral students also take courses and graduate seminars in the biblical, mediaeval and modern period. The Program annually offers graduate seminar work in the biblical and modern periods in particular. While the principal methodological emphases of graduate studies derive from the study of religion, other disciplinary courses, for example, in sociology and anthropology, are regularly taken by doctoral students. Accordingly, the aim of the Program is to turn out young scholars able (1) to teach in a broad spectrum of courses in the study of religion, with emphasis upon Judaism, and in the history of Judaism, and also (2) to pursue research in the limited area of Judaism in the first six centuries of the Common Era. Extensive study in modern Judaic thought and modern Jewish history and sociology qualifies students to teach in the modern period as well. Alumni of the Program now teach in depart-

ments of Religious Studies, Near Eastern Studies, and History. The greater part of doctoral studies takes place in seminars, such as those listed above. Graduate students participate also in upper-level courses in other departments and programs of the University, including anthropology, philosophy, classics, religious studies, women's studies, and the like. Work on the dissertation begins upon entry and is conducted in J.S. 203, 204, which meets on a twelve-month a year cycle. Presentation of a publishable dissertation is required for the degree; all dissertations to date have been published and are listed in the catalogue of series under the Program faculty's editorship. Doctoral studies generally extend for three full years for students with substantial prior education, and for four or even five years for others. All students who have sought academic positions, from the beginning of the Program (and its predecessor) in 1968 to the present date, currently hold such positions, most of them now are tenured and five are chairmen of their departments. Candidates for admission to the Program should write for applications and further information to the following: Graduate Advisor, Program in Judaic Studies, P.O. Box 1826, Brown University, Providence, RI 02912. The Program normally admits one or two students a year and awards, on the average, one doctoral degree annually.

I. PRIMARILY FOR UNDERGRADUATES

Interdisciplinary and Comparative Studies

1. *Judaism as a Religion*

Mr. NEUSNER.

For most of their history, until the beginning of the twentieth century, the Jews have been regarded as a religious group. This course takes up the problem of defining the religion of that group by considering several systems of Judaism — world view, way of life — created by groups of Jews from biblical to modern times. These several systems are treated one by one and also in comparison with one another.

2. *Biblical Israel and the Judaic Tradition: An Interdisciplinary Approach.*

Mr. FRERICHES.

Examines a series of views which inform the world of Biblical Israel and find expression in later forms of Judaism. In each major instance a different disciplinary approach is used: historical, literary, theological, sociological, anthropological. Major attention is given to the Hebrew Bible and its effect on the Judaic tradition in terms of such areas as religion, law, art, philosophy, music, literature.

3. *Contemporary Religious Thought: Judaic and Christian* (see Religious Studies 19)

Mr. DIETRICH.

5. *The Idea of History of Judaism*

Mr. NEUSNER.

The conception that events constitute history and bear meaning comprises a principal definition of Judaism. The role of history and reflection upon its significance, the transformation of events into destiny and catastrophe into prophecy — these form the focus of the course. Readings include samples of the historical literature of the Jews from the beginnings of history-writing to the present day.

6. *Judaism and the Human Experience*

7. *The Literature of the Judaic Experience*

The STAFF.

7A. *The Literature of the Judaic Experience: Holocaust Literature*

Mr. HIRSCH.

Against a background of historical, theological, and cultural studies, we will read poems, novels, short stories, and narratives that either grew out of, or were a response to the historical phenomenon that has come to be known as the Holocaust. Among the issues raised will be such questions as what constitutes "a work of art?" and, can so totally destructive and seemingly meaningless an experience be converted in to "works of art?"

7B. *The Literature of the Judaic Experience: The American Jewish Novel*

Mr. HIRSCH.

American novels and short stories by Jewish authors that deal with the Jewish experience in the United States. The immigrant experience, acculturation and assimilation, the range of feelings toward lost cultural ties and the struggle for a *modus vivendi* between American and Jewish preoccupations are among the themes students will consider in works by Malamud, Bellow, Roth, Singer, Ozick, and others.

7C. *The Literature of Judaic Experience*
The Shtetl in Yiddish Literature (Special Themes 53)

Mr. WARNOCK.

8. *Judaic Thought in the Encounter with Modernity*

Mr. DIETRICH.

Intensive analysis of representative works by major Judaic thinkers expressing in modern concepts classic themes of the Judaic religious tradition (God, Torah, the people Israel). From the European Enlightenment to World War I. Focus on the Jewish appropriation of these aspects of the modern mentality: the claim of moral autonomy and the demand for universally valid ethical standards; the rise of historical consciousness; the conception of religion as association of like-minded individuals; the emergence of the nation as focus of identity and bearer of universal values.

9. *The Social Scientific Study of the Jews* (Sociology 9)

Mr. GOLDSCHIEDER.

How the methods of the social sciences, particularly of sociology are used to analyze the social life of the Jews past and present. Major themes include: population growth and urbanization; migration and residential concentration; family, marriage, and intermarriage; economic activity, industrialization and occupational mobility; secular and Jewish education; ethnic language and Jewish cultural activities; political organizations and movements; anti-Semitism and the Holocaust; Judaism and secularization.

10. *History of the Jews in Modern Times*

Mr. SORKIN.

The last three centuries of Jewish history. The impact of a changing world on the Jews' social, political and cultural history as part of the overall process of modernization. Comparison of the various forms modernization took in the different centers of Jewish life in Europe, America and the Middle East.

Language Studies

11-12. *First Year Hebrew*

Mr. FRADKIN.

Elements of modern Hebrew grammar and syntax.

13-14. *Second Year Hebrew*

Mr. FRADKIN.

Reading and conversation in Modern Hebrew.

15-16. *Third Year Hebrew*

Mr. FRADKIN.

Introduction to Hebrew literature beginning with the modern classics of prose and poetry, especially of the late Haskalah period. The goal is to strengthen skills in reading texts of different styles and in oral and written expression.

Literary Studies

31. *Biblical Interpretation in Judaism and Christianity* (Religious Studies 170)

Mr. FRERICHS.

32. *How To Read a Jewish Book*

Mr. NEUSNER.

Judaism is a religious tradition that came to expression through the writing of holy books. The relationship of book-writing to religious experience and thought forms the problem of this course, which seeks to define what can be holy about a book, and how a book can capture the life of a community. The books at hand range from biblical books to the Bible as a whole, then to books that succeeded and those that did not, in the later history of Judaism.

33. *The Bible as Literature*

Mr. FRERICHS.

An analysis of the literary traditions represented in the Hebrew Bible, (in English translation) with attention to questions of genre, language and form. Approaches and perspectives on the Bible as literature will be derived from ancient and modern sources. The drive of the course is to examine those aspects of the literary aspects of the Hebrew Bible which inform subsequent expressions of the Jewish consciousness through explicit Jewish literature.

49. *Modern Hebrew Literature in Translation: Between Word and World:*
The Flowering of Modern Hebrew Literature

Reading and analysis of masterworks of modern Hebrew fiction from the later 19th century up to the establishment of the State of Israel.

50. *Modern Hebrew Literature in Translation: The Contemporary Israeli Novel*

Historical Studies

52. *The History of Ancient Israel, to Alexander the Great* Mr. FRERICHs.
The history of Ancient Israel from the Mosaic Age to the end of the Persian Period and the rise of Alexander the Great. Emphasis on the interrelationship of political and religious history with particular attention to the roles of particular offices and institutions: kingship, prophecy, the wise man, the Temple. The course will use literary sources from Israel (Bible) and the Ancient Near East as well as artifactual evidence. No prerequisites.
54. *History of the Jews from 70 to 640* Mr. NEUSNER.
61. *The Jews in America* Mr. SORKIN.
Survey of the history of the Jews in this country from 1654 to the present. Political, social and cultural trends among the Jews in twentieth-century American society form the center of interest. The course uses and illustrates historical methods of description and interpretation.
62. *History of the Jews in Europe, 1700-1870* Mr. SORKIN.
The impact of bourgeois society and the nation-state on the lives and beliefs of European Jewry from 1700 to 1870. Social, political and intellectual history including such topics as Emancipation, Reform Judaism, Socialism, Zionism, Science of Judaism, Haskalah.
63. *History of the Jews in Europe, 1870-1980* Mr. SORKIN.
Power and Powerlessness in Mass Society: to what extent did the Jews shape their own history as a minority group in the emerging mass societies of Europe? The course will focus on the transformation of the political, social and cultural life of the Jews as they adjusted to mass society. We will study the Holocaust and the establishment of the State of Israel within this context.
64. *History of the Holocaust* Mr. SORKIN.
The place of anti-Semitism in the economic, social, political and intellectual life of Europe from the eighteenth century, with a particular focus on the historical circumstances in which anti-Semitism became a potent social and political force. Equal attention to theories of anti-Semitism and analysis of specific historical manifestations.
65. *History of Zionism* Mr. SORKIN.
The development of a Zionist ideology and movement in Western and Eastern Europe within the context of European nationalism and politics, as well as the institutionalization of Zionism in Palestine studied through successive waves of immigration. Emphasis on intellectual and political history.

Religious Studies

71. *Introduction to the Bible: Ancient Israel* (Religious Studies 15) Mr. FRERICHs
72. *The Religion of Ancient Israel and the Formation of Judaism* Mr. FRERICHs.
Aspects of the religion of ancient Israel which inform subsequent developments in Judaism. Of particular interest are the interactions of the Israelite priesthood with the rabbinate; the role of covenant(s) in defining the relationship between the people of Israel and its deity; the role of the Promised Land; attitudes toward political authority and the forms of that authority; forms of revelation: law, teaching, oracular revelation, wisdom: sacrificial and non-sacrificial worship, the Temple and the synagogue.
73. *Judaism Before A.D. 70* Mr. NEUSNER.
74. *Judaism in Late Antiquity* Mr. NEUSNER.
Judaism in the first six centuries A.D., the historical setting of the Jews, the principal emphases of the religious-legal literature produced by their intellectual leaders, the structure and system of Judaism as it emerged in its formative age.
75. *Judaism in Medieval Times.*
Survey of the main currents in the intellectual life of Judaism in both the Christian and the Muslim worlds, from the rise of Islam to the eighteenth century, with emphasis upon the development of Jewish mysticism and Jewish philosophy.

76. *Judaism in Modern Times*

Mr. SORKIN.

77. *Modern Judaic Thought*80. *The Mystical Tradition in Judaism*89. *American Judaism*

Mr. NEUSNER.

The ancient Judaic religious tradition moved to America in several forms and stages. It was mediated by immigrants; hence, the history of Judaism in America is described, analyzed, and interpreted against the social world of successive generations of the American Jews. Emphasis upon the religious developments of the mid- and later twentieth century.

90. *Problems in Contemporary Judaism*

The STAFF.

91. *Sociology of American Jews* (Sociology 91)

Mr. GOLDSCHIEDER.

Theories of ethnic survival in modern pluralist societies and analysis of the rich body of empirical research on the American Jewish community. The main themes include: (1) immigration; (2) occupational, educational and social class transformations; (3) Jewish family patterns; (4) intermarriage and assimilation; (5) Jewish residential concentration; (6) religion, ethnic, and communal forms of Jewish identification; (7) Jews and others — blacks and whites as anti-Jewish; (8) American Jews and other Jews, Israel and other diasporas.

99. *Topics in Judaic Studies*99A. *The Bible in Modern Times*

Mr. BARR.

This course will discuss over a broad front the major currents of ideas and traditions that concern the place of the Bible in the modern world. Both religious use of the Bible, and the academic study of it, will come into consideration. Among the topics to be studied are: nature and organization of the canon: the original text and modern translations; popular knowledge and expert knowledge of the Bible and envioning civilizations; exegetical traditions; literal sense and allegorical sense; ideas of authority; the Bible as literature and as a religious text; the impact of the Bible upon our view of the world.

II. FOR UNDERGRADUATES AND GRADUATES

Language Studies

111-112. *Aramaic Talmud Studies*

Mr. NEUSNER.

This course provides students with the tools for reading and understanding in the original language the formative documents of Judaism: the Mishnah, Tosefta, Talmud of the Land of Israel and Talmud of Babylonia. Students will study the technical terms, grammar, rhetoric and style of discourse that characterize each of these documents. We shall consider how the framers make their points and the techniques of interpretation they employ.

191. *Modern Jewish Society and Politics*

Mr. ZUCKERMAN.

The course uses the tools of social science to analyze how Jewish communities in Europe, the United States, and Israel have been affected by modernization: migrations, population growth, industrialization, nation-building. It examines the Holocaust, the Jewish society in Israel, and the future of American Jewry as the primary contemporary issues. Prerequisite: One social science course.

198. *How Social Scientists Study Jews: Methods, Materials, Analysis*

Mr. GOLDSCHIEDER.

This course examines and evaluates the variety of ways to study Jews, the nature of the sources of evidence, and how the evidence can be organized to provide the basis for a sustained argument about social, economic, cultural, or political dimensions of Jewish life. The first part will use published materials to illustrate and evaluate the wide range of data sources and analysis available for the study of Jews of the modern period. The second part will involve the design of research hypotheses and a methodology to analyze a limited issue in the study of Jews and the Jewish community.

199. *Senior Seminar in Judaic Studies*

The STAFF.

The senior seminar, required of all concentrators, focuses upon a single problem in Judaic Studies, analyzed and presented from several different disciplinary perspectives. Each student is required to present a significant, substantial essay, exposing the diverse methodological possibilities inherent in

the study of the history, literature, and religious expressions of the Jewish people from the beginnings to the present.

III. PRIMARILY FOR GRADUATES

- 201-202. *Seminar in Biblical Studies* Mr. FRERICHS.
- 203-204. *Seminar in Talmudic Studies* Mr. NEUSNER.
Focuses on the history of the formation of the principal ideas of talmudic Judaism, as these are expressed in the classical writings of late antiquity. Topics include slavery, women, the role of intention and attitude, and other issues in the larger world view of the nascent rabbinic system. Work in this seminar results in the doctoral dissertations of all graduate students.
- 205-206. *Seminar in Medieval Judaism*
- 207-208. *Seminar in Modern Judaism* (Religious Studies 211) Mr. DIETRICH.
Major movements, thinkers and documents in 19th and early 20th century Judaic religious thought, e.g., Mendelssohn, the Judaic Hegelians, Hermann Cohen, Rosenzweig, against the backdrop of major shifts and changes in the life of the Jewish people in the 19th and 20th century. Topic to be announced each year. For 1985-1986: Franz Rosenzweig and Emmanuel Levinas: On Confrontation with the Personal and the Collective Religious "Other".
- 209-210. *Seminar in the History of the Jews in Modern Times* Mr. SORKIN.
- 211-212. *Seminar in the Literature of the Jews in Modern Times* Mr. HIRSCH.
- 213-214. *Seminar in the Social Sciences and Judaic Studies*
Messrs. ZUCKERMAN, GOLDSTEIN, GOLDSCHIEDER.
- 215-216. *Topics in Judaic Studies* The VISITING PROFESSOR.

Law and Liberal Education

Professor ROBERT H. STANLEY, Director; Visiting Assistant Professor ELISABETH A. CAWTHON.

The Center for Law and Liberal Education is administered by an Executive Committee consisting of Professors BEISER (Political Science), BROCK (Philosophy), CAWTHON (Law and Liberal Education), LAMOREAUX (History), REEDER (Religious Studies), ROSENBLUM (Political Science), RUESCHEMEYER (Sociology), STANLEY (Law and Liberal Education), WARD (Chemistry), and WOOD (History).

The Center seeks to utilize legal materials in a manner appropriate to the goals of undergraduate liberal arts education. It is in no sense a professional or preprofessional enterprise. Rather, it subjects legal institutions, processes and concepts to rigorous and systematic exploration from a variety of points of view. Legal topics provide the occasion for the disciplined examination of fundamental normative and empirical questions.

UNDERGRADUATE PROGRAM

LAW AND SOCIETY

The Center sponsor an honors concentration entitled Law and Society. The following courses must be completed not later than the end of the junior year: Economics 111; History 109 or 152, or Law and Society 151 or 155; Philosophy 50 or Political Science 101; Sociology 142. Political Science 116 must be completed during the sophomore year.

A seminar for concentrators (Law and Society 185) is taken during the junior year. A senior tutorial (Law and Society 191) and either a senior thesis (Law and Society 193-194) or a senior project (Law and Society 192) are required.

Each concentrator will design a cognate field of at least three courses at the 100 level or above, in one or more departments, to be completed by the end of the 8th semester.

Enrollment in this concentration is limited to 15 members of the junior class.

I. PRIMARILY FOR UNDERGRADUATES

11. *Hard Choices* (Foundations 11)

Mr. BEISER.

An analysis of central issues in political and ethical theory, as reflected in contemporary American law. The central empirical and normative assumptions of the liberal state will be analyzed. Particular attention will be paid to the relationship of the individual to the community, and to the prerogatives and obligations of the professions. Limited to 120 freshmen.

24. *A British View of American Law: the Case of Civil Liberties*

Ms. CAWTHON.

A comparative study of American and British law regarding individual freedoms, with emphasis both on historical perspectives and recent developments. Topics to be considered include the powers of the police, freedom of expression, definitions of privacy, the right to assemble, religious liberty, and official secrets. Limited to freshmen and sophomores; written permission required for others.

151. *Topics in Early American Legal History*

Mr. STANLEY.

The social context of the law in American history through 1877, with emphasis on analysis of the factors which have shaped legal change over time. General topics include the growth of law in the prenational period, law and the economy, civil liberties, and the problem of slavery. Prerequisites: Political Science 116, or Law and Society 24 or 155, or any Brown course in American history, or written permission. Not open to freshmen.

155. *Topics in Modern American Legal History*

Mr. STANLEY.

The social context of the law in American history since 1860, with emphasis on analysis of the factors which have shaped legal change over time. General topics include law and the economy, civil liberties, and civil rights. Prerequisites: Political Science 116, or Law and Society 24 or 151, or any Brown course in American history, or written permission. Not open to freshmen.

II. FOR CONCENTRATORS

185. *Junior Seminar*

Mr. STANLEY.

Required for concentrators; written permission.

191. *Senior Tutorial*

Ms. CAWTHON.

Required for concentrators; written permission.

192. *Senior Project*

The STAFF.

193-194. *Senior Thesis*

The STAFF.

Linguistics

Professors BLUMSTEIN, KUCERA, LATTIMORE, LIEBERMAN (Chairman), WRENN; Associate Professors JACOBSON, MESKILL; Assistant Professors CHIERCHIA, RABSON; Adjunct Professor FRANCIS; Lecturers LEE, YAMASHITA; and members of associated departments.

The Department of Linguistics offers an undergraduate concentration in Linguistics and cooperates with Psychology and Computer Science in an interdepartmental standard concentration program in Cognitive Science. Additional interdepartmental concentrations are available with Anthropology, Applied Mathematics, Computer Science, and the language departments. The graduate program offers courses leading to the degree of Master of Arts and Doctor of Philosophy in Linguistics. Specializations include (but are not limited to) psycholinguistics (including neurolinguistics, speech physiology and phonetics); child language; theoretical linguistics (including phonological, syntactic and semantic theory); and computational and mathematical linguistics.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

Linguistics is at the crossroads of many fields of inquiry. The concentration in linguistics is designed both for students interested in the discipline itself and also for those wishing to use their understanding of language to pursue other disciplines. Linguists are concerned with such issues as

what all human languages have in common, why and how languages change, and how our linguistic abilities interact with our cognitive abilities. Fields as diverse as anthropology, literary criticism, semiotics, and language pathology rely heavily upon methods and models developed in linguistics. The analytic and communicative skills necessary in the fields of law, medicine, journalism, social services, and advertising are fostered by understanding the structures and meanings of which human language is composed.

The concentration in Linguistics consists of a minimum of eight courses, including:

(A) Core Component (five courses)

- (1) Linguistics 22 (which may be waived in special instances)
- (2) an introductory course in phonology (Linguistics 121 or 122)
- (3) an introductory course in syntax (Linguistics 131)
- (4) two more courses in Linguistics above the 100 level

(B) Individual Component

A minimum of three more courses in linguistics or appropriately related disciplines, of which no more than two may be courses below the 100 level. Students may focus on theoretical linguistics, language and speech, language and society, psycholinguistics, language and philosophy, individual languages (modern or classical), or language and literature, to list just some of the possibilities.

Concentration components are worked out in consultation with the concentration advisor.

Honors: Candidates for Honors in Linguistics will take a minimum of ten courses for the concentration, which will consist of all requirements for the standard degree plus an additional two courses in Linguistics or appropriately related disciplines above the 100 level. One of these courses may be an independent study project upon which the thesis is based. Honors candidates should formalize their projects in consultation with their advisor by the end of the second semester of the junior year.

See also concentrations in Cognitive Science-Psycholinguistics and in Anthropology-Linguistics.

STANDARD COGNITIVE SCIENCE PROGRAM FOR THE BACHELOR OF ARTS OR BACHELOR OF SCIENCE DEGREE.

The undergraduate programs in Cognitive Science are designed to provide an interdisciplinary approach to the study of thinking and the nature of intelligent systems by combining coursework from anthropology, computer science, linguistics, psychology, and other related disciplines. The A.B. program is designed primarily for students interested in language and human cognition, who have only secondary interest in computer science and artificial intelligence. Any A.B. program focussing mainly on language and human behavior along the lines of the current Psycholinguistics program will receive, with the mutual agreement of the student and the Cognitive Science Center Executive Committee, the concentration designation, Cognitive Science-Psycholinguistics. The Sc.B. program is intended for students who have a strong interest in artificial intelligence and the experimental science aspects of Cognitive Science.

Requirements for the A.B. Degree

Prerequisites: Psychology 1, Linguistics 22, a computer science course (CS4, CS11, LI170, or an approved alternative), a statistics course (PY9, AM165, MA161-162).

Requirements: A total of ten courses including:

- 1) Linguistics 141, Psychology 152, and Cognitive Science 100.
- 2) A Laboratory course (PY153, or an approved substitute).
- 3) Four courses from among those designated cognitive science courses below.
- 4) Two courses from among those designated related courses below.

Requirements for the Sc.B. Degree

Prerequisites: Computer Science 11 (or 4), CS21 (or CS12), and CS52 (or a course in logic, e.g., PH55, or an approved substitute). Psychology 1, Linguistics 22, and a statistics course (PY9, AM165, MA161-162).

Requirements: A total of twelve courses including:

- 1) Computer Science 141, Linguistics 141, Psychology 152, and Cognitive Science 100.
- 2) A laboratory course (PY153, or an approved substitute).
- 3) Four courses from among those designated Cognitive Science Courses below.
- 4) Two courses from among those designated Related Courses below.

5) Independent study. Cognitive Science 198.

Cognitive Sciences courses:

Anthropology	20, 22, 80, 131, 180, and 225;
Computer Science	(if not used as an Sc.B. Prerequisite) 12, 21, 52, 141, 159, 224, 227, 242;
Linguistics	111, 112, 113, 114, 121, 122, 123, 124, 126, 131, 141, 142, 143, 144, 145, 146, 148, 165, 166, 172;
Psychology	21, 27, 74, 75, 81, 100, 103, 104, 119, 153, 175, 177, 181, 182, 183, 185, 187, 192;

Related Courses:

Engineering	122, 157, 158, 163, 164, 252, 253, 255;
Neural Sciences	1, 2, and related physiological courses;
Philosophy	14, 159, 175, 177, 188.

Other related courses may be included if they fit into an integrated program, but such substitutions must be approved by the Concentration Advisor.

GRADUATE PROGRAMS

MASTER OF ARTS. The requirements for the degree of Master of Arts include a minimum of eight courses at the graduate (100 or 200) level, a thesis, and a reading knowledge of one foreign language. Students are required to take or have taken the equivalent of Linguistics 121, 122, 131, and 165. The remaining courses may be made up from further offerings in Linguistics or in other departments, in consultation with the graduate advisor.

The thesis is usually undertaken during the second semester and completed during the summer or the third semester; only in exceptional cases is it possible to complete all work for the degree in one academic year. The thesis requirement may be waived for those students completing two minor papers or the major paper in partial fulfillment of the Ph.D. requirements.

The usual foreign languages are French, German, and Russian, although others may be offered at the discretion of the graduate advisor. A student who is not a native speaker of English may, with the approval of the Department, offer English to fulfill the language requirement, but may not offer his/her native language. A score of at least 550 on TOEFL is required to certify proficiency.

DOCTOR OF PHILOSOPHY. The doctoral program in linguistics has two components: (1) Work in general linguistics including phonology, syntax and at least one other field (such as those described in Linguistics Undergraduate Programs). (2) Concentration in one of these fields. The candidate is required to demonstrate competence in phonology, syntax and one other field by submitting an acceptable paper in each of these areas (two of which are designated as minor areas, the other as the major area) and giving an oral defense of the major paper. The candidate is further required to give an open colloquium talk to the department and to write a dissertation.

Course work normally takes three years including the basic courses required for the M.A. (see above) and such other courses as seem to meet the needs and wishes of the individual student. Those with considerable previous graduate work in linguistics may be able to finish the course work in two years. Near the end of the third semester of study, there will be a formal review of the student's performance by the staff of the department, including, where appropriate, the staff of other departments, to determine whether the student should be (1) admitted to the Ph.D. program immediately, (2) required to write an M.A. thesis before proceeding in the Ph.D. program, (3) advised to complete a terminal M.A. program, or (4) advised to pursue his/her goals elsewhere. Minor papers will be normally completed in the student's second year and the Major paper during the third year.

Proficiency in two foreign languages must be demonstrated. One of these languages should be French, German, or Russian. Options for the second foreign language are available with regard to the specific program of the student. A native speaker of a language other than English may offer English as one of the two languages required, but a native language may not be offered. Proficiency in at least one of these languages must be established before the Minor papers are completed.

After the student has passed the examinations in general linguistics, he/she should select a field in which the dissertation is to be written and is encouraged to begin to define a specific topic within that field. The dissertation is usually in the area of the major field, but this is not expressly required.

The student will choose an advisor for his/her dissertation, and, in consultation with the advisor, will submit to the Department a dissertation proposal and a proposed committee consisting of at least two other members; both the proposal and the committee must be approved by the Department. When the final draft of the dissertation has been accepted by the committee, an open colloquium on the subject area of the dissertation will be scheduled.

Linguistics

I. PRIMARILY FOR UNDERGRADUATES

11. *Language and Man*

Ms. BLUMSTEIN.

The nature of language and its role and function in human life. Topics include: language and communication, theory of language, its biological foundations, language universals, language change and history, dialect studies, and language in social context.

22. *Introduction to Linguistic Theory*

Mr. MESKILL.

An introduction to the basic principles governing the structure of language, and to theoretical issues concerning these principles. Will cover three main areas: Phonology (the study of sound systems); Syntax and Semantics; and Historical Linguistics (the study of how languages change over time). Will develop skills in analyzing linguistic data, and in understanding the theoretical implications of the data.

32. *The Biology and Evolution of Language*

Mr. LIEBERMAN.

Data from anatomy, neurophysiology, physiology, and behavioral biology will be integrated using a Darwinian model of evolution. The properties of human speech, the acquisition of language by children, models of the brain, the fossil record, and the anatomy and behavior of living primates and other animals will be examined with respect to the evolution of human speech, syntax and cognitive behavior.

45. *Modes of Representation*

The STAFF.

Three basic modes of linguistic representation are explored: speech, writing, and sign language. Each language type will be distinguished from non-linguistic communication (e.g. kinesics, art, and pantomime). Several exemplary representation systems will be analyzed, including American Indian pictographs and American sign language.

53. *Language, Thought and Reality* (University Course 53)

The STAFF.

Languages obviously differ in many respects. How deep these differences go is a controversial question and one which is at the heart of a tangled web of disputes about the relationship between language and thought. This question is important to linguistics, philosophy, anthropology, sociology, and the study of literature and languages. The course compares different approaches and evaluates the assumptions underlying them.

II. FOR UNDERGRADUATES AND GRADUATES

104. *The Written Word* (University Course 104)

The STAFF.

This course examines historical, cross-cultural, and psycholinguistic evidence which bears upon the purported decline in our nation's ability to write. The goal is to bring intellectual coherence to this current pedagogical debate, distinguishing between real linguistic issues and those which are ideological in character. Of particular interest to students of linguistics, anthropology, psychology, semiotics, and education. Written permission required for freshmen.

111. *Semantics*

Mr. CHIERCHIA.

Introductory survey of semantics in relation to linguistic theory. Topics include: problems of meaning and reference; the semantic theory of truth; quantification and scope; the relation between syntax and semantics; semantics and pragmatics.

112. *Methods and Problems in Semantics*

Mr. CHIERCHIA.

Detailed examination and selected methods and/or problems of semantic theory, e.g., the semantic role of 'deep structure,' the relation between semantics and formal logic, the nature of semantic representations, the interaction of semantics and pragmatics. Prerequisite: 111 or written permission.

113. *Formal Semantics I*

Mr. CHIERCHIA.

An introduction to logic as it relates to linguistic semantics. The basic concepts of model-theoretic semantics will be developed through detailed discussion of sentential logic and first-order predicate logic followed by an introduction to model logic. The primary focus will be the relevance of these concepts to the study of natural languages. Prerequisite: 22 or 111, or written permission.

114. *Formal Semantics II*

Mr. CHIERCHIA.

Model-theoretic approaches to the study of the semantics of natural languages. Detailed examination of specific proposals, with special attention to those developed within the framework of 'Montague semantics.' Prerequisite: 113 or Philosophy 55 or written permission.

121. *Phonology I*

Mr. MESKILL.

Introduction to articulatory phonetics, with laboratory practice in phonetic transcription; phonological distinctiveness and redundancy, including the nature of the phonemic principle and problems in phonemic analysis; brief attention to acoustic phonetics and distinctive feature theory. Prerequisite: 22 or written permission.

122. *Introduction to Phonological Theory*

Mr. MESKILL.

Critical analysis of approaches to phonological theory, including Prague school, American structuralism, generative theory, and natural phonology. Application of the various theories to natural language data and evaluation of the results from a theoretical and practical standpoint. Prerequisite: 22 or written permission.

123. *Physiologic and Acoustic Phonetics*

Mr. LIEBERMAN.

Quantitative study of speech production and perception in relation to phonetic and phonological theories. The course will examine vocal tract anatomy and physiology in relation to the source-filter theory of speech production, the myoelastic-aerodynamic theory of phonation, and the encoding and perceptual decoding of human speech, with critical evaluation of phonetic feature theories. Lectures, discussions, and laboratory demonstrations.

124. *Research Methods in Physiologic and Acoustic Phonetics*

Mr. LIEBERMAN.

Introduction to laboratory techniques and the analysis of data relevant to physiologic and acoustic phonetics. Emphasis on the use and interpretation of wave-form and spectrum analysis, electromyography, cineradiography, high-speed motion pictures, computer modeling of oral tract output, and experimental techniques involving the preception of synthetic and natural speech. Prerequisite: 123.

126. *Generative Phonology*

Messrs. MESKILL and CHIERCHIA.

The theory and practice of generative phonology. Topics include the goals of phonological theory, distinctive features, the nature of underlying representations, phonological rules and rule ordering, the cycle, and theories of naturalness and markedness. Prerequisite: Linguistics 122 or written premission.

131. *Introduction to Syntax*

Ms. JACOBSON.

The basic principles of syntactic theory and argumentation. Prerequisite: 22, or written permission.

136. *Topics in Syntax*

Ms. JACOBSON.

Will focus on current issues in syntactic theory. Topics will include: constraints on transformational rules; the role of phrase structure rules and lexical rules; the status of grammatical relations. Prerequisite: 131.

141. *Psycholinguistics: Introduction*

Ms. BLUMSTEIN.

Survey of approaches to psycholinguistics. Topics include biological and neurological prerequisites for language, speech perception, syntactic and semantic processing, aphasia, and child language. Psychological evidence for theoretical linguistic assumptions is considered. Prerequisite: 11, 22, or Psychology 1 or written permission.

142. *Syntactic Theory and Syntactic Processing*

Ms. BLUMSTEIN and Ms. JACOBSON

The interface between work in theoretical syntax and psycholinguistic research on syntactic processing. Consideration of how results in psycholinguistics give evidence as to competing theories in syntax, and how controversies in syntax can be used to guide experimental research. Prerequisites: 131 and 141.

143. *Child Language Acquisition*

The STAFF.

Analysis of the process by which children acquire a first language. Traditional and current models of language acquisition; biological, psychological, and sociolinguistic factors influencing linguistic development. Students will get practical experience in collecting and analyzing data. Prerequisite: 22, or previous background in Linguistics.

144. *Topics in Child Language Acquisition*

The STAFF.

In-depth study of specific issues in first language acquisition. A different topic will be selected each year. Topics may include language disability, early semantic development, the role of socialization in language acquisition. Students will conduct primary research projects. The course may be repeated for credit. Prerequisite: Linguistics 143.

148. *Language and the Brain*

Ms. BLUMSTEIN.

Introduction to the study of neurolinguistics — the study of the relation between brain organization and language behavior. Topics include the study of aphasia from a clinical, neurological, and linguistic perspective, split-brain patients, right-hemisphere language, and laterality of brain function. The effects of neurological deficits on higher cortical functions will also be considered. Prerequisites: one of the following courses Linguistics 11, 22, 32, 45, 52, Psychology 1 or written permission.

165. *Historical and Comparative Linguistics*

Mr. FRANCIS.

Introduction to the study of historical linguistics. Topics include: Language variation; types of language change; linguistic reconstruction; the comparative method and wave theory; the status of 'sound laws'; the causes of change; the relation between historical linguistics and linguistic theory from the models of the neogrammarians through structuralism to generative grammar. Prerequisite: 22 or written permission.

170. *Introduction to Computational Linguistics*

Mr. KUCERA.

Computer processing and analysis of language data; design and operation of digital computers and the structure of programming languages; discussion of linguistic theory and concrete programming problems in the area of diachronic linguistics, communication theory, generative grammar, machine translation, ATN parsing, and stylistic analysis. Also listed as Applied Mathematics 170.

172. *Introduction to Mathematical Linguistics*

Ms. JACOBSON.

An introduction to the basic concepts and goals of mathematical linguistics. Will investigate formal grammars, concentrating on the properties of regular, context-free and context-sensitive languages and will then look at the formalization of transformational grammars and at the question of the power of such grammars. Prerequisite: 22 and/or some background in basic set theory and logic. Some familiarity with syntax is also recommended.

191. *Foundations of Modern Linguistic Theory*

The STAFF.

Examination of the emergence of modern linguistic theory in the late 19th century and its subsequent development up until the present. The course will discuss how the shape of linguistic theory has been influenced by other scientific disciplines.

198. *Senior Conference*

The STAFF.

Special work in preparation of an Honors thesis under the direction of a member of the department. Open only to senior Honors concentrators.

III. PRIMARILY FOR GRADUATES**245. *Linguistic Theory and Models of Language***

Mr. KUCERA.

Contemporary issues, problems, and debates in linguistic theory. May be repeated for credit with different instructor. Open to graduate students in Linguistics and various language departments. Others should obtain permission from the instructor.

251, 252. *Seminars in Linguistic Theory***251A. *Seminar in Syntactic Theory***

Ms. JACOBSON and Mr. CHIERCHIA.

Topic will vary from year to year.

252A. *Seminar in Semantics*

Mr. CHIERCHIA.

Topic will vary from year to year.

In addition to those listed above, additional seminars on linguistic theory are generally offered each

year. Seminar topics in recent years have included: Phonological theory, pragmatics, philosophy of linguistics, Turkish structure, applications of mathematical linguistics to natural language, the evolution of language.

253. *Seminars in Psycholinguistics*

Ms. BLUMSTEIN.

The implications of psycholinguistic research for linguistic theory. Topics will alternate among research methods in psycholinguistics, neurolinguistics (language and related cortical functions) and speech perception (perception of segmental and prosodic aspects of the speech signal). Prerequisite: 142 or written permission.

261, 262. *Seminars in Historical Linguistics*

The STAFF.

Topics will vary from year to year. Past topics have included comparative Algonkian, Old English phonology, historical phonology, Shakespeare's grammar, written language.

291, 292. *Special Topics, Thesis Research*

The STAFF.

Individual reading and research under the direction of a member of the department. Permission of the graduate advisor and of the prospective supervisor required.

Chinese

I. PRIMARILY FOR UNDERGRADUATES

1-2. *Basic Chinese*

Messrs. LATTIMORE and WRENN and Ms. LEE.

Extensive practice of the pronunciation system and of the basic grammatical patterns. Introduction to the writing system and the beginning of character learning. Lecture and practice sessions six times weekly; tape-lab sessions to be arranged. A year course; no credit is given for the first semester alone.

3-4. *Intermediate Chinese (Spoken)*

Mr. WRENN.

Drill and practice in speaking Chinese with some reading of materials prepared for conversational use. Four practice sessions weekly. Additional tape-lab hours to be arranged. Prerequisite: Chinese 1-2.

5-6. *Intermediate Chinese (Reading)*

Mr. LATTIMORE and Ms. LEE.

Reading of annotated teaching materials. Four reading sessions weekly. Prerequisite: Chinese 1-2.

7-8. *Introduction to Literary Chinese*

Messrs. LATTIMORE and WRENN.

Introduction to Classical Prose. Three hours weekly. Prerequisite: Chinese 5-6.

II. FOR UNDERGRADUATES AND GRADUATES

101. *Specialized Readings in Chinese*

Ms. LEE.

Readings and translations of materials in modern Chinese fiction and essays. Three hours weekly. May be repeated for credit with different content. Prerequisite: Chinese 5-6.

103. *Introduction to Ch'ing Documentary Style*

Messrs. LATTIMORE and WRENN.

Three hours per week. May be repeated for credit with different content. An introduction to the documentary form and style of various classes of official government documents in the Ch'ing period (1644-1911). Prerequisite: Chinese 8.

104. *Introduction to Materials and Methods of Sinology*

Messrs. LATTIMORE and WRENN.

Three hours per week. An introduction to and practice in the use of basic reference materials and techniques necessary for advanced work in Chinese sources. Prerequisite: Chinese 8.

108-109. *History of Chinese Literature*

The STAFF.

Three hours per week. A broad historical survey of Chinese literature from the second millennium B.C. to the present, to develop an ordered sense of the development of the literary forms within the Chinese literary tradition. Extensive readings in English supplemented by intensive reading, discussion, and translation of samples from the various genres. Prerequisites: competence in modern written and spoken Mandarin at the 5-6 level, Literary Chinese at the 7-8 level, and History 41, 42, or an equivalent knowledge of the social and intellectual history of China.

Japanese

I. FOR UNDERGRADUATES AND GRADUATES

1-2. *Basic Japanese*

Mr. RABSON, Ms. YAMASHITA and STAFF.

A course intended for non-native speakers of Japanese. It will emphasize the attainment of good spoken control of the language, and will develop a foundation of literacy. The writing system will be introduced from the beginning of the course. A year course; no credit will be given for Japanese 1 alone. No prerequisites.

3-4. *Intermediate Japanese*

Mr. RABSON, Ms. YAMASHITA and STAFF.

Further oral and written practice based on readings about aspects of Japanese culture. Readings are designed to enhance vocabulary and provide points of departure for conversation in Japanese. A year course, no credit is given for the first semester alone. Prerequisite: Japanese 1-2 or equivalent.

5,6. *Advanced Japanese*

Mr. RABSON, Ms. YAMASHITA and STAFF.

Reading of actual articles and excerpts from works of literature. Emphasizes the development of reading proficiency in various styles of Japanese prose. Discussion in Japanese. Prerequisite: Japanese 3-4 or equivalent.

7,8. *Readings in Japanese*

Mr. RABSON, Ms. YAMASHITA and STAFF.

Reading and discussion of literary works and articles from Japan's current journals, particularly in the social sciences. Extensive materials will be covered to increase reading speed while maintaining accuracy. Practice in writing is also emphasized. Prerequisite: Japanese 6 or equivalent.

Hindi

1-2. *Beginning Hindi or Urdu*

The STAFF.

Training in conversation, reading, and writing of modern standard Hindi and some elements of Urdu. The Devanagari script is taught. Emphasis is on the active use of the language. Those who already know Devanagari but have rusty conversation skills may join the class second semester with the instructor's permission, which should be obtained before the end of the first semester. Those who prefer to learn Urdu and the Persian script should contact the instructor.

Master of Arts in Teaching

The Master of Arts in Teaching Program is open to qualified men and women who hold a bachelor's degree from a recognized liberal arts college or its equivalent. Previous study in the field of education is not required.

It is expected that those admitted to the program will have either an undergraduate major in their teaching field or a background that is adequate to warrant their pursuing the courses offered in fulfillment of degree requirements. Selection will be based on the scope and adequacy of the applicant's preparation, the academic record, and on the potentiality for advanced study of teaching. Scholarships toward tuition, Proctorships and assistantships are available.

Candidates for admission are required to present evidence of ability to pursue academic work of high quality at the graduate level. They must possess the purpose and personality needed for a successful career in teaching. An additional period of study or specific additional courses may be required as a condition of admission if a candidate's prior preparation warrants such requirement.

Application for admission to the program must be made on the official form obtainable from the Office of the Graduate School. All applications must be supported by official transcripts from each college or university attended, and a letter from the student stating his or her plans for graduate study. Also required are three letters of recommendation sent directly to the Dean of the Graduate School from persons well acquainted with the applicant and qualified to comment on the potentiality for teaching and capacity for graduate work.

Applications for admission should be filed as early as possible, preferably by February 15. Applications received after this date will be considered, but preference for admission and financial assistance will be given to those who apply by that time. No application for admission can be considered after May 15.

A booklet describing the Master of Arts in Teaching Program in detail is available from the Office of the Graduate School. All inquiries regarding the Program should be addressed to that office.

Mathematics

Professors ACCOLA, BANCHOFF, BAUM, BROWDER, BRYLINSKI¹ COLE, FLEMING, FULTON (Chairman), B. HARRIS, J. HARRIS, LUBIN, MACPHERSON; NOMIZU, ROSEN, STEWART, STRAUSS, WERMER; Associate Professors KALLIN, LANDMAN; Assistant Professors BAKER, GUPTA; HUGHES, MIROLLO, YUKIE.

Students are encouraged to take advanced courses whenever their preparation qualifies them to do so.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

Mathematics. All students contemplating a concentration in mathematics should take Mathematics 9, 10 or 17, 18 by their freshman year and Mathematics 18 or 29 or 35 and 52 or 54 or Mathematics 25, 26 by their sophomore year.

The concentration program consists of Mathematics 25 and 26 or Mathematics 18 or 29 or 35 and 52 or 54; and Mathematics 153; and any three of the following: 101, 104, 106, 111, 112, 113, 114, 126, 127, 141, 154, 156, 161, 162, 169, or any 200-level course in mathematics; and two additional courses chosen either from among those already listed, or in Applied Mathematics, Chemistry, Computer Science, Economics, or Physics, and approved by the concentration advisor.

Students who are thinking of applying for graduate school in mathematics are strongly urged to take Mathematics 154, 113, and 114.

Mathematics — Computer Science. See page 86.

Mathematical Economics. See page 87.

Mathematics — Physics. See page 87.

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF SCIENCE DEGREE

This program is intended for a student who has strong interests in pure mathematics but also wants to learn more science than is normally included in the A.B. program. It is expected that most students interested in this program will choose it at admission, but it will be possible for a student to be admitted to the program as late as the fifth semester.

Foreign Language: Ordinarily the candidate should demonstrate a working knowledge of French, German or Russian, either by an achievement test or by passing a course at the fourth semester level or higher. A student who receives placement beyond the fourth semester level in any other language is urged to study at least one of these three languages.

Course Requirements: Sixteen semester courses in Mathematics, Applied Mathematics, and Science. These must include Mathematics 52 or 54, 113, 114, 153, 154 or 156, at least five other courses in Mathematics, and four approved courses in Applied Mathematics or Science.

It is recommended that students take eight semester courses in Humanities and Social Sciences, including at least two in each category.

Honors: Candidates for Honors in mathematics are normally enrolled in an Honors program at the end of the sophomore year. The Honors program usually consists of a concentration program plus at least two but not more than six additional semester courses in mathematics or related subjects. An Honors Thesis must be submitted as a part of the program.

The Honors program in mathematics is extremely flexible. Some students take Mathematics 197 in one or more semesters. This course consists of independent reading and conferences with a faculty member. The Honors Thesis may be prepared as a part of the work in Mathematics 197. Some students take a graduate course. This is particularly valuable for those who contemplate graduate study. The Honors Thesis may consist of a report on a problem, or set of related problems, studied

in connection with a graduate course.

GRADUATE PROGRAM

The graduate program in mathematics is primarily a Ph.D. program planned to prepare especially able students for a career of basic research and college training. These students may also earn the Master of Arts or Master of Science.

The following are basic courses in the four main areas covered in our curriculum: Real Function Theory (221, 222), Complex Function Theory (225, 226), Algebra (251, 252) and Topology (241, 242). Normally, a student completes three of these in the first year and takes the fourth in the second year along with other courses. Students who enter with the equivalent of one or more of these basic courses may take the diagnostic examinations in order to qualify in the subjects. Students with less extensive background may be advised to take a 100-level course as preparation for one or more of the basic courses.

In addition to advanced courses, members and students of the department conduct formal and informal seminars on a wide range of topics. Prominent scholars are invited to lecture on their recent research at a weekly colloquium. The department has recently acquired a Symbolics 3670 computer which runs MACSYMA and which is available for faculty and graduate student research.

Students are admitted to candidacy for the Ph.D. degree on the basis of qualification in the four main areas and other evidence for a potential for mathematical research. For more course requirements beyond the level of candidacy, consult the department. The main requirement for the Ph.D. is a doctoral thesis, which must be original mathematical research of sufficient quality to be published in a recognized mathematical journal. Thesis research is done under the direction of a faculty member with whom the student has close scientific contact. Doctoral candidates present their completed thesis to the department in a final public oral examination. The department requires teaching activities as part of the requirement for the Ph.D.

For the Master's Degree, the department requires that at least four courses at the graduate level be completed (see General Regulations). In addition, the candidate is required to submit an acceptable thesis, which, in contrast to the Ph.D. thesis, may be purely expository.

Two foreign languages are required for the Ph.D. and one for the Master's degree. They are chosen from French, German and Russian. A foreign student whose native language is not English may substitute English for one of the languages by passing the TOEFL at the approved level. For details, consult the department.

The mathematical library is part of the Sciences Library. Its collection is one of the finest anywhere and provides complete facilities for research. It is the policy of the department to acquire all important new publications in mathematics. Many out-of-print books and journals are recorded on microfilm and are available for general use.

Attention is called to the courses offered by the Division of Applied Mathematics, the Department of Computer Science, the Department of Physics, and the Department of the History of Mathematics, which are open to students in the Mathematics Department.

I. PRIMARILY FOR UNDERGRADUATES

3. *Pre-Calculus Mathematics*

An intensive one-semester course for students planning to take Mathematics 9, 10 who require additional preparation for the calculus sequence. Topics will be taken from algebra, trigonometry, plane analytic geometry and exponential and logarithmic functions. Students with four years of secondary school mathematics are discouraged from taking this course. Students planning to register for this course should consult with the instructor during Orientation Week.

5, 6. *Analytic Geometry and Calculus*

A slower-paced introduction to calculus for students who require additional preparation for calculus. This sequence covers the same material as Mathematics 3 and 9, with pre-calculus and calculus topics interrelated. Placement in this course requires permission of the instructor.

7. Calculus with Applications to Social Sciences

A one-semester introduction to calculus recommended for students who wish to learn the basics of calculus for application to social sciences or for cultural appreciation as part of a broader education. Topics include functions, graphs, equations, inequalities, differentiation and integration, exponential functions; applications such as simple linear programming, marginal analysis, growth and decay. May not be taken for credit in addition to 9.

8. The Mathematical Way of Thinking

The content and history of mathematics with emphasis on the way mathematicians analyze and solve problems. Variable content is drawn from topics in logic, theory of sets, number theory, higher dimensional geometry, infinity, and probability. Does not satisfy prerequisites for concentration in the mathematical or physical sciences.

9, 10. Calculus

An intensive course in the calculus of functions of one variable; exponential and trigonometric functions; infinite series; applications. Required in the freshman year of candidates for the degree of Bachelor of Science and recommended for students intending to concentrate in mathematics or the sciences. Mathematics 9 may not be taken in addition to 5, 6, or 7; 10 may not be taken in addition to 17.

12. Introduction to Mathematical Modeling

The use of mathematics in the analysis of practical problems. Elementary topics from differential equations, matrix algebra, probability and statistics. Examples from biology and medicine. Prerequisite: 9 or the equivalent.

17. Advanced Placement Calculus

For students who enter with one semester of advanced placement in calculus. Includes topics covered in Mathematics 10, as well as other topics not usually treated in secondary school calculus courses: Vectors and the calculus of vector-valued functions, differential equations and infinite series, along with a review of fundamentals. Placement in the course is determined on the basis of advanced placement examinations given by ETS or the department during Orientation Week and after consultation with the instructors. Mathematics 17 may not be taken in addition to 10.

18. Intermediate Calculus

Three-dimensional analytic geometry; differential and integral calculus for functions of two or three variables; partial derivatives, multiple integrals, Green's Theorem. Prerequisite: Mathematics 10 or 17. Mathematics 18 may not be taken in addition to 25, 29, or 35. Offered both semesters.

25, 26. Intermediate Calculus with Linear Algebra

Covers the same topics as Mathematics 29 and 52, but integrates them into one course, emphasizing the relations between calculus and linear algebra. Mathematics 26, 52, or 54 is a prerequisite for all 100-level courses except 126. Prerequisite: 10 or advanced placement by the department. Mathematics 25 may not be taken in addition to 18, 29, or 35. Mathematics 26 may not be taken for credit in addition to 52 or 54.

29. Calculus and Differential Equations

Three-dimensional analytic geometry, differential and integral calculus of functions of two and three variables, partial derivatives, multiple integrals, and ordinary differential equations. Prerequisite: Mathematics 10 or 17.

35. Calculus, Honors Sequence

A third semester calculus course for students of superior aptitude and motivation. Topics covered include multiple integration, partial differentiation, line integrals, Green's theorem, plus additional material selected by the instructor. Prerequisite: Mathematics 9, 10 or Advanced Placement credit for Mathematics 9, 10 and permission of the instructor.

52. Linear Algebra

Vector spaces, linear transformations, matrices, systems of linear equations, inner products, eigenvalues, applications. Prerequisites: Mathematics 10 or 17.

54. Honors Linear Algebra

Linear algebra for prospective mathematics concentrators and science and engineering students who have a good mathematical preparation. Topics will include: matrices, linear equations, elementary

row and column operations; determinants, characteristic polynomials and eigenvalues; vector spaces and linear transformations; inner products, hermitian, orthogonal and unitary matrices; bilinear forms; elementary divisors and Jordan normal forms. Will provide a deeper and more extensive treatment of the topics in Mathematics 52 and can be substituted for Mathematics 52 in fulfilling prerequisites. Prerequisites: Mathematics 18, 29, or 35.

II. FOR UNDERGRADUATES AND GRADUATES

The standard requirements for all 100-level mathematics courses except Mathematics 101, 126, 127, or 169 are Mathematics 18 or 29 or 35 and 52 or 54, or Mathematics 25, 26.

101. *Analysis: Functions of One Variable*

Completeness properties of the real number system, topology of the real line. Proof of basic theorems in calculus, infinite series. Topics selected from ordinary differential equations. Fourier series, Gamma functions, as well as topology of Euclidean plane and 3-space. Prerequisites: 18, 29, 26, or 35. Mathematics 52 or 54 may be taken concurrently. Most students are advised to take 101 before 113.

104. *Topics in Geometry*

Topics chosen from affine, Euclidean, non-Euclidean, and projective geometries. Prerequisite: standard requirements.

106. *Elementary Differential Geometry*

Intrinsic and extrinsic, local and global properties of smooth curves and surfaces in three-space. Prerequisite: standard requirements.

111. *Ordinary Differential Equations*

Ordinary differential equations including existence and uniqueness theorems and the theory of linear systems. Topics may also include stability theory, the study of singularities, and boundary value problems. Prerequisite: standard requirements.

112. *Introduction to Differential Equations*

The classical equations of mathematical physics and their generalizations. Solutions in series of eigenfunctions, maximum principles, characteristics, Green's functions, well-posed problems. Prerequisite: 111 or written permission.

113, 114. *Functions of Several Variables*

Topology of Euclidean spaces, compactness and connectivity. Convexity, differentiability, inverse and implicit function theorems, exterior differential forms, integration on manifolds, Stokes formula, Lebesgue integration, applications to geometric and physical problems. Prerequisite: standard requirements. It is strongly recommended that a student take a 100-level course in analysis before attempting Mathematics 113.

126. *Elementary Complex Analysis*

Differential and integral calculus of complex functions of one complex variable, including Cauchy-Riemann differential equations, contour integration, and conformal mapping. Prerequisite: 18, 25, 29 or 35.

127. *Topics in Functional Analysis*

Infinite-dimensional vector spaces, with applications to some or all of the following topics: Fourier series and integrals, distributions, differential equations, integral equations, calculus of variations. Prerequisites: at least one 100-level course in Mathematics or Applied Mathematics, or permission of the instructor.

141. *Introduction to Combinatorial Topology*

Topology of Euclidean spaces, winding number and applications, knot theory, fundamental group and covering spaces, Euler characteristic, simplicial complexes, classification of two-dimensional manifolds, vector fields and the Poincaré-Hopf Theorem. Prerequisite: standard requirements.

153, 154. *Algebra*

Groups, rings, integral domains, fields, and related topics. Mathematics 153 is required of all students concentrating in mathematics. Prerequisite: standard requirements.

156. *Elementary Number Theory*

Selected topics in number theory treated from the algebraic point of view: Unique factorization, prime numbers, modular arithmetic, quadratic number fields, quadratic reciprocity, and related topics. Prerequisite: 153 or consent of the instructor.

161. *Introduction to Probability*

Basic probability theory, discrete and continuous distributions, normal, Poisson and related distributions, random variables. Prerequisite: standard requirements.

162. *Mathematical Statistics*

Central limit theorem, point estimation, interval estimation, multivariate normal distributions, tests of hypotheses, linear models. Prerequisite: 161 or permission of the instructor.

169. *Mathematical Population Models* (Applied Mathematics 169)

Population models with age structure; matrix projection and renewal equation methods. Differential equation models of interacting populations. Probabilistic models; birth and death processes, branching processes. Applications to models from demography, ecology, and population genetics. Prerequisites: Mathematics 52 or 54 and a course in differential equations (Applied Mathematics 33 or Mathematics 111) or written permission.

181, 182. *Special Topics in Mathematics*

Topics in special areas of mathematics not included in the regular course offerings. Offered from time to time when there is sufficient interest among qualified students. Contents and prerequisites vary and admission to this course is only by permission of the instructor.

197. *Honors Conference*

Collateral reading, individual conferences.

III. PRIMARILY FOR GRADUATES

201. *Differential Geometry*

Introduction to differential geometry (differentiable manifolds, differential forms, tensor fields, homogeneous spaces, fiber bundles; connections, linear connections, and Riemannian geometry; followed by selected topics in the field.

205, 206. *Algebraic Geometry*

Theory of algebraic curves: Riemann-Roch theorem. Abel's theorem, correspondences and Castelnuovo's inequality—elliptic, hyperelliptic and modular curves. General theory of algebraic varieties and schemes.

221, 222. *Real Function Theory*

Point set topology, function spaces, Lebesgue measure and integration. L^p spaces, Hilbert space, Banach spaces and applications.

225, 226. *Complex Function Theory*

Introduction to the theory of analytic functions of one complex variable. Content varies somewhat from year to year, but always includes the study of power series, complex line integrals, analytic continuation, conformal mapping, introduction to Riemann surfaces.

237, 238. *Partial Differential Equations* (Applied Mathematics 223, 224)

Distributions, Fourier transforms and Sobolev spaces. The Cauchy problem. Hilbert space methods. Elliptic boundary problems and regularity. Hyperbolic and parabolic systems. Semester I covers the basic linear theory. Semester II focuses on some spectral topic, usually nonlinear.

241, 242. *Topology*

An introductory course with emphasis on the algebraic and differential topology of manifolds. Simplicial and singular homology, de Rham cohomology, and Poincaré duality.

251, 252. *Algebra*

Basic properties of groups, rings, fields and modules. Topics included recently are: finite groups, representations of groups, rings with minimum condition. Galois theory, local rings, algebraic number theory, classical ideal theory, basic homological algebra, and elementary algebraic geometry.

263, 264. *Probability* (Applied Mathematics 263, 264)

This is the basic course in probability at the graduate level and serves as a prerequisite to all other graduate probability courses in the Department of Mathematics and the Division of Applied Mathematics. Semester I will not presume knowledge of measure theory, whereas Semester II definitely does.

271, 272. *Advanced Topics in Mathematics*

Courses recently offered include: *Elliptic and Modular Functions*, *Riemann-Roch Theorems*, *Advanced Differential Geometry*, *Advanced Algebraic Topology*, *Topology of complex varieties*, *Algebraic Number Theory*, *Geometry of Discrete Groups*, *Fourier Series and Group Representations*.

291, 292. *Reading and Research*

The STAFF.

Preparation of a thesis under the direction of a member of the faculty.

Modern Literature and Society

Professors L.P. CURTIS and R.B. HENKLE; Associate Professor D. SMITH; Assistant Professor E. ROONEY.

This interdisciplinary undergraduate program draws upon faculty in History, English, German, French, Slavic Languages, Comparative Literature, Italian, Semiotics, and Afro-American studies. The objective of the program is to study literature, history, and cultural expression in their mutual contexts; to learn how they cross-fertilize each other, how concepts such as ideology and culture emerge, and what assumptions historians and literary critics make about their disciplines. New theory of metahistory, social and ideological analysis of literary texts, discourse, and historiography is applied to fictional and non-fictional works. The period covered is the modern age (1750 to the present), and the cultures those of Great Britain, and Eastern and Western Europe, with emphasis as well on the interactions between those countries and their former African and Asian Colonies.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION. History 1 or 2 (or an equivalent Western History course) and a college level literature course emphasizing critical analysis are recommended. The concentration consists of 10 courses, 2 of which must be Literature and Society 149 and 150, and a third, which is Literature and Society 199 (Senior thesis). Concentrators are expected to participate in the senior theory and method course (Literature and Society 198), and may or may not take it as one of the concentration courses. Of the remaining courses for the concentration, students will normally take one or two other courses in Literature and Society and a balance of courses in modern history, relevant literatures, or critical theory. Individual concentrations will be designed in consultation with faculty advisors, and a faculty advisory committee reviews all concentration proposals. A senior thesis is required for the concentration, and its topic, determined by the student in consultation with his advisors, may deal with literature and society approaches to a literary or non-literary text or texts, an historical period, historiography, applicable theory, popular or "high" culture, the media, an intellectual or ideological development, etc. All concentrators should have reading proficiency in one foreign language, and should have a high degree of reading skill in that language if writing a thesis on a non-English culture.

I. FOR UNDERGRADUATES AND GRADUATES

149. *Literature and Society I*

Mr. HENKLE.

An introduction to literature and society approaches to literary texts, incorporating the social "context" of the work, the author's ideological positions, and the role of the work in cultural self-definition. We then confront issues of history vs. fiction, of the assumptions of historical representation, metahistory, in various historical theorists, on a problematic area of historical and literary representation, such as the French Revolution.

150. *Literature and Society II*

Ms. ROONEY.

This course will draw from the body of women's prose writing. We will be concerned first with the problem the woman writer presents to traditional efforts to constitute the canon, to identify central texts and marginalize others, and to define the literary. Questions include the historical construction of the category of the woman writer, the conditions under which women could produce literature.

170. *Crime in Victorian Society and Culture*

Mr. CURTIS.

After dealing with ways in which English historians have analyzed criminal activity in the nineteenth century, we will turn to the subject of criminal behavior, considering fictional representations of criminality ranging from Dickens' *Oliver Twist* and Mary Braddon's *Lady Audley's Secret* to the "new" detective fiction of Wilkie Collins and Arthur Conan Doyle.

171. *The Novel and Ideology: Dickens, Hardy, and Woolf*

Mr. HENKLE.

An "applied" literature and society approach to Dickens' *Bleak House*, Hardy's *Jude the Obscure*, and Woolf's *Mrs. Dalloway*. It will apply theory from Jameson, Williams, members of the Frankfurt School, *et al* to identify the changing ideological configurations represented in the characterization, situations, formal strategies, and imagistic patterns of these works.

190. *Theory and Method*

Mr. SMITH.

A Junior seminar inquiring into the theoretical and methodological issues posed by the interdisciplinary nature of Literature and Society. The class will read from works of Williams, Eagleton, Sinfield, and others. What distinguishes Literature and Society from intellectual history or the study of literary sociologies? What relationship does the study of Literature and Society have to the study of cultural theory?

198. *Senior Seminar*

Mr. CURTIS.

This course deals with some theoretical and practical aspects of the literature and society approach to texts, contexts, and intertextuality. Designed to help concentrators prepare for the process of choosing, researching and writing the senior thesis, the seminar will consider various definitions of this interdisciplinary approach.

199. *Senior Thesis*

The STAFF.

Music

Professors LAURENT, NELSON; Associate Professors ERMEY, JOSEPHSON, SHAPIRO (Chairman), WALDBAUER; Assistant Professors BAKER, KLEEMAN, LEWIS; Lecturer, Mr. MCGARRELL; Visiting Assistant Professor DAVIS; Adjunct Lecturer MR. OUE.

The courses of study in Music permit areas of specialization in composition, musicology, and ethnomusicology. Advanced degree courses presuppose a knowledge of the history and theory of music, of the requisite languages for graduate study, and at least a basic skill in playing a keyboard instrument. The Department wishes to cultivate in its students an approach to music that is both creative and scholarly; hence, the students are encouraged to devote a certain amount of time to both areas. Each student develops a program of study in consultation with a faculty advisor.

UNDERGRADUATE PROGRAM

Music 55, 56 is a prerequisite to concentration. It should be taken in the freshman year if possible; it must be completed by the end of the sophomore year. The basic keyboard skills expected of concentrators will be tested at the end of Music 56.

The concentration minimum includes Music 92, 93, which should be taken by the junior year; Music 120; two courses from among Music 101-108; and three electives. Students are urged to take a seminar from Music 135-138 or 198. Membership in chorus, orchestra, or wind ensemble is recommended.

Students intending to go on in composition are urged to take Music 81-82, 102, 104, 107, 108, 142, and 143. Additional composition courses are available through Music 191, 192. Students intending

to go on in history or theory are urged to take 2 courses from Music 135-138, as well as German.

Advanced Placement credit does not count for concentration. Neither does credit from courses numbered below Music 59. For concentration credit restrictions in Music 71-74, see the main entry under MUSIC in the Course Announcement.

A concentration is available in ethnomusicology. It requires 10 courses including Music 5, 6, 92, 93; Music 102 or 104; and 5 electives. Two courses in Anthropology may be credited towards the concentration.

Students considering an Honors Program in Music should consult with the Department Concentration Advisor at the time they register for concentration.

GRADUATE PROGRAMS

MASTER OF ARTS. The program of study leading to this degree will be either in composition or ethnomusicology. All students for the degree, however, will be expected to take courses in both history and theory.

Prerequisites for Admission: Candidates for the degree of M.A. in Music will be admitted by examination only. Prospective students are urged to take the examination at Brown at a time stipulated by the Department of Music. In the case of those who are unable to come to Brown for this purpose, the examination may be administered in absentia. Candidates will be examined in harmony, counterpoint, and the history and literature of music.

Requirements for the M.A. Degree:

1. General requirements of the Graduate School must be met.
2. Deficiencies shown by the entrance examination must be made up during the first year of graduate study.
3. Eight semester courses taken for graduate credit are required.

COMPOSITION: (ALL OF THE ABOVE REQUIREMENTS IN ADDITION TO THE following:)

4. A reading knowledge of French, German or Italian must be presented.
5. In certain cases final written and oral examinations may be required.
6. An original work, the form, style and scope of which shall have been approved by the department, must be presented. Work of high quality accepted during one of the graduate courses and fulfilling the requirements just stated may be acceptable.

ETHNOMUSICOLOGY: (REQUIREMENTS 1, 2, AND 3 listed above as well as the following:)

4. Course work must include Music 135, 136, 198, and two courses numbered 235, 236, or 238.
5. A reading knowledge of German must be presented.
6. A general examination in field theory and world music cultures is to be taken upon the completion of course work.
7. Two papers must be presented. Each must demonstrate the ability to investigate thoroughly the scholarship on a topic and to organize and articulate a scholarly argument.
8. After the first and third semesters of course work, students who wish to pursue the Ph.D. will be evaluated in writing.

DOCTOR OF PHILOSOPHY. In ethnomusicology only. Prerequisites for admission: Candidates for the Ph.D. in Music will be admitted by examinations only. Applicants will be eligible for examination upon completion of applications for admission to the Graduate School. Prospective students are urged to take the examination at Brown at a time stipulated by the Department of Music. In the case of those who are unable to come to Brown for this purpose, the examination may be administered in absentia. Candidates will be examined in harmony, counterpoint, and the history and literature of music.

Requirements for the Ph.D. degree:

1. General requirements of the Graduate School must be met.
2. Deficiencies shown by the entrance examination should be made up during the first year of graduate study.
3. The requirements of the M.A. in ethnomusicology must be met during the first two years of graduate study. Sixteen additional Tuition Units on the graduate level are required, and these must include Music 238 and two courses numbered 235 or 236 (including Transcription and

Notation.)

4. In addition to German, a second foreign language relevant to the area of primary or secondary research must be presented.
5. There will be comprehensive written examinations in Western music, field theory, and world music cultures. Two areas of specialization (geographical and/or theoretical) will be examined orally.
6. A 50-minute colloquium must be presented before the faculty and interested students.
7. A dissertation on an original subject must be presented. A written research proposal, including bibliography, must be approved by the dissertation committee before fieldwork is undertaken.

I. PRIMARILY FOR UNDERGRADUATES

1. *Introduction to Western Music* Mr. LAURENT, Mr. WALDBAUER and Ms. LEWIS.
Following an introduction to basic music notation and theory, the course examines selected works by Bach, Beethoven, Brahms, Brubeck, Cage, Chopin, Debussy, Ellington, Gershwin, Josquin, Machaut, McCartney, Monteverdi, Mozart, Schoenberg, Stravinsky, Verdi, Webern and others. While historical and social contexts will be discussed, the emphasis is on the music.
2. *Rock'n'Roll is Here to Stay* Ms. KLEEMAN.
The evolution of rock'n'roll music from rhythm and blues, Pop, and country music. Basic melodic, rhythmic, and formal characteristics of rhythm'n'blues, rock'n'roll, rockabilly, doowop, soul, folk rock, and acid rock. Instrumentation, aesthetics, and cultural context and significance.
3. *The Fundamentals of Music*
Elementary written and keyboard studies in rhythm, melody, harmony, tonality, and form. Two classes plus one additional piano laboratory session and a minimum of five practice hours per week are required. For students with no musical training. Limited enrollment. Written permission.
4. *Music in Modern Society* Mr. BAKER.
Survey of Western art music since Debussy, with special attention to the aesthetic and theoretical premises of the many compositional styles and methods that have emerged, and to the historical, political, and cultural factors that have contributed to their development. The survey will focus on certain major figures, including Debussy, Stravinsky, Bartok, Schoenberg, Webern, Ives, Cage, Varese, Stockhausen, Crumb, Glass, and Rochberg.
5. *World Music Cultures (Oceania, Africa, Indians of the Americas and Modern Syncretic Forms)* Ms. DAVIS.
A survey of these areas including: 1) historical, social and cultural context; 2) theoretical systems, form and aesthetics; 3) major representative musical and dance genres.
6. *World Music Cultures (Near East and Asia)* Ms. KLEEMAN.
A survey of North Africa, Iran, India, Indonesia, China and Japan, including: 1) historical, social and cultural contexts; 2) major genres of music and their use in dance and theater; 3) theoretical systems, form in composition and improvisation; 4) musical instruments.
7. *Folk Music of Europe and America* Ms. KLEEMAN.
An introduction to music as folklore. The history and function of traditional music in European peasant society; its transformation by cultural change and transplantation in America; the effects of urbanization, mass media, acculturation, and commercialization upon folk music. Music theory, aesthetics, and musical instruments are considered where relevant.
11. *Computers and Music* Mr. ERMEY.
An introduction to the use of computers in music composition, scholarship, performance, and instruction, including surveys of early attempts at synthesis using mainframe computers, digital storage of notation and sound, database research in music, music editors, recent instructional programs in music skills, and future possibilities. Experience in either computers or music is helpful. Some hands-on experience with computer music systems will be provided.

30. *Major Masters of Music* Messrs. JOSEPHSON and WALDBAUER and Ms. LEWIS.
The study of the life and work of a major composer. Tutorials in fundamental theory and score reading are offered to students requiring them. Composers recently studied: Beethoven, Brahms, Haydn, Mozart. Two-hour listening session per week.
31. *The Concerto* Mr. WALDBAUER.
A study of the concerto from the end of the seventeenth century to ca. 1950. Tutorials in fundamental theory and score reading are offered to students requiring them. Two-hour listening session per week.
33. *The Symphony* Mr. JOSEPHSON.
A study of the symphony from Haydn to Mahler. Tutorials in fundamental literary theory and score reading will be offered to students requiring them. Two-hour listening session per week.
34. *Chamber Music* Ms. LEWIS.
A study of masterpieces of chamber music from Haydn to the present, assisted by the International String Quartet. Tutorials in fundamental theory and score reading will be offered to students requiring them.
36. *Jazz* Mr. MCGARRELL.
The development of jazz from its roots in West Africa, Europe, and the colonial United States through "free jazz" of the 1960's, focusing on the study of style types (including New Orleans style, early piano jazz, swing, be-bop, and cool jazz) and their major instrumental and vocal exponents. Jazz as a social phenomenon will be studied in relation to contextual aspects of folk, popular and art music traditions in the United States.
37. *Opera* Mr. LAURENT.
A study of opera from Monteverdi to the present. Also examines the concepts of opera as drama, the literary and dramatic scores for librettos, and writings on the changing aesthetic principles underlying opera during the past four centuries.
38. *Choral Music* Mr. ERMEY.
A study of cantatas, mass, oratoria, and passion from the 15th-century to the present, with emphasis on orchestra accompanied composition. Major works studied include Handel's *Messiah*, the passions of Bach, the masses of Mozart and Haydn, Beethoven's *Missa Solemnis*, Brahms *Requiem*, Orff's *Carmina Burana*, and Bernstein's *Mass*. Tutorials in fundamental theory and score reading are offered to students requiring them.
40. *Introduction to Music Theory* Messrs. BAKER and ERMEY.
An introduction to musical terms, elements, and techniques. Deals with notation, intervals, scales and modes, triads and seventh chords, modulation, part-writing, analysis, and composition. Ear-training and sight-singing are included. For students with some musical training. Limited enrollment. Written permission.
45. *Elementary Music Theory with Keyboard*. Messrs. BAKER and NELSON.
An introduction to musical terms, elements and techniques for students with keyboard training. Deals with scales and modes, triads and seventh chords, secondary dominants and modulation, part-writing, analysis, clefs, 2-part counterpoint, and composition. Ear-training, sight-singing, keyboard exercises, and listening assignments are included. Limited enrollment. Written permission.
- 55, 56. *Music Theory* Mr. NELSON.
For students with keyboard ability and knowledge of the rudiments of music. The course is prerequisite to a music concentration, and must be taken by concentrators in freshman or sophomore year. It is an intensive study of the elements of tonal music, including melody, harmony, counterpoint, figured bass, and form. Analysis, ear-training, sight-singing, keyboard exercises, listening assignments and score reading are included. Limited enrollment. Written permission.
- 59-60. *Chamber Music Performance* Mr. BAKER.
Half course each semester. The practical study of the literature of chamber music through participation in a small ensemble. Regular rehearsals, supervised by the department staff, and performances are required. Reading assignments, analytical projects, and written essays. Enrollment is by audition and written permission. Restricted to skilled instrumentalists. May be repeated for credit.

61-62. *Chorus**

MR. ERMEY.

Half course each semester. A practical study of choral literature, techniques, and performance practice from Gregorian chant to the present, offered through rehearsals, sectionals, and performance. Seminar, reading assignments, and written essays and reports are required. Enrollment is by audition, based on voice quality, experience, and music-reading ability. Written permission. May be repeated for credit.

63-64. *Orchestra**

MR. OUE.

Half course each semester. A practical study of the orchestra repertory from Bach to the present, offered through coaching, rehearsals, and performances. Seminars, reading assignments, and written essays and reports are required. Enrollment is by audition and written permission. Restricted to skilled instrumentalists. May be repeated for credit. S/NC.

65-66. *Wind Ensemble**

MR. MCGARRELL.

Half course each semester. A practical study of the orchestra repertory from Bach to the present, offered through coaching, rehearsals, and performance. Seminars, reading assignments, and written essays and reports are required. Enrollment by audition and written permission. Restricted to skilled instrumentalists. May be repeated for credit. S/NC.

67-68. *African Drumming and Dance*

MS. KLEEMAN.

Half course each semester. Instruction, rehearsals, and performances in Ghanaian drumming and dance led by master drummer Freeman Donkor, supplemented with readings and written assignments. No prerequisite. S/NC.

71-72. *Applied Music Program: Instruction in Vocal or Instrumental Music***

Half course each semester. Restricted to skilled musicians. Openings are limited. Enrollments and re-enrollment are by audition and jury. Lessons are given by consultants to the Applied Music Program. Written permission is required, and a fee is charged for enrollment. Copies of the Applied Music Program Handbook giving detailed information are available at the Department.

73-74. *Applied Music Program: Instruction in Vocal or Instrumental Music***

Half course each semester. Restricted to skilled musicians. Openings are limited. Enrollments and re-enrollment are by audition and jury. Lessons are given by consultants to the Applied Music Program. Music 71-72 is prerequisite to 73-74. Copies of the Applied Music Program Handbook giving detailed information are available at the Department.

81-82. *Introduction to Electronic Music*

MR. SHAPIRO.

For students interested in composition using electronic means. The course is concerned with learning to manipulate the synthesizer, tape recorders, mixing console, and other apparatus in the studio to produce a series of short assignments and pieces. Enrollment is limited to 20 students, and background in music theory and computer science is strongly advised. Written permission.

91. *Medieval and Renaissance Music*

MR. WALDBAUER and MS. LEWIS.

A survey of Western music from the 9th through 16th centuries. Topics covered will include medieval secular song, church music, the madrigal and motet as text expression, liturgical drama, and music in Renaissance spectacles and celebrations. Among the composers studied will be Machaut, Dufay, Ockeghem, Josquin des Pres, Rore, Byrd, and Palestrina. Limited to students with music reading ability.

92. *Baroque and Classical Music*

MR. WALDBAUER and MS. LEWIS.

A survey of music from 1600 to 1827. Topics studied will include Monteverdi and early opera, the concerto from Vivaldi to Beethoven, Bach's keyboard and choral music, the symphonies of Haydn and Mozart, and the string quartet. Limited to students with music-reading ability. Concentrators should complete this course by the end of their sophomore year. Written permission.

93. *Romantic and Modern Music*

MR. WALDBAUER and MS. LEWIS.

A survey of music from Schubert to the present. We shall study the music of Schubert, Schumann, Brahms, Chopin, Berlioz, Liszt, Wagner, Schoenberg, Verdi, Mahler, Strauss, Debussy, Stravinsky, Berg, Webern, Bartok, Ives, Crumb, Penderecki, Stockhausen, Glass and others. Topics include new approaches to tonality and structure, conservative and revolutionary trends in the 19th and 20th centuries, new instrumental techniques, the increasing structural role of sonority, romantic chamber music, program music, the Lied, romantic opera, serial and electronic music. Limited to

students with music-reading ability. Written permission.

II. FOR UNDERGRADUATES AND GRADUATES

103. *Modal Counterpoint*

Messrs. BAKER and SHAPIRO.

An introduction to contrapuntal techniques of the 16th century with particular attention to the music of Josquin, Byrd, and Palestrina.

104. *Tonal Counterpoint*

Mr. SHAPIRO.

The contrapuntal techniques of the 18th century with emphasis on music of Bach and Haydn. Written exercises in and analysis of all styles including fugue. One hour per week of ear training and sight singing. Written permission.

107. *Advanced Music Theory I*

Mr. BAKER.

A study of 19th century musical styles, including melody, periodicity, rhythm, harmony, chromaticism, tonality, counterpoint, form. Analysis, ear-training, sight singing, keyboard exercises, and score reading are included. Prerequisite: 56 with grade of B or equivalent.

108. *Advanced Music Theory II*

Mr. BAKER.

A study of 20th century musical styles, forms, and theory. Analysis, ear training, sight singing, keyboard exercises, and score reading are included. Prerequisite: 107 with grade of B or equivalent.

120. *Introduction to Ethnomusicology*

Ms. KLEEMAN.

A study of selected music traditions (Japan, Africa, India, Latin America, Indonesia, European folk) based on the ethnomusicological premise that music is a reflection of cultural systems and values. Reading, listing, and written assignments will prepare the student for in-class analysis of the theoretical and aesthetic principles underlying each of the musical genres covered. Students should have some previous musical experience; open to all students by written permission.

121. *Theory and Method in Ethnomusicology*

Ms. KLEEMAN.

History and philosophy of the discipline, organology, current field theories, perspectives on ethnomusicology from related disciplines.

122. *Field Research in Ethnomusicology*

Ms. DAVIS.

Issues and techniques of field and lab work, project design, data-logging techniques, field ethics, equipment and recording techniques. Each student will prepare and carry out a guided fieldwork project.

126. *Afro-American Music*

Ms. DAVIS.

Stylistic and cultural history of black music from West African regions, through slave music in the colonial and ante-bellum periods, post-bellum sacred music and minstrelsy, to 20th century genres: blues, ragtime, boogie woogie, rhythm and blues, gospel music. No prerequisite.

130. *Major Masters and Repertories of Music*

Messrs. LAURENT and WALDBAUER and Ms. LEWIS.

The advanced study of a selected composer or genre of western music. Composers recently studied: Bach, Bartok, Stravinsky, Verdi, Wagner.

135. *Seminar in Medieval and Renaissance Music*

Written permission.

Messrs. JOSEPHSON and WALDBAUER and Ms. LEWIS.

136. *Seminar in Baroque Music*

Ms. LEWIS.

Written permission.

137. *Seminar in Classic and Romantic Music.*

Mr. JOSEPHSON.

Written permission.

138. *Seminar in 20th Century Music*

Ms. LEWIS and Mr. WALDBAUER.

Written permission.

141. *Seminar in Form and Analysis*

Messrs. BAKER and WALDBAUER.

A study of formal principles developed in western music since ca. 1300, and of critical and analytical methods, including those of Schenker.

142. *Seminar in Composition*

Mr. NELSON.

Written permission.

143. *The Technique of Orchestration*

Mr. NELSON.

Introduction to standard instrumentation; exercises in basis principles; analysis of styles of scoring. Written permission.

144. *Conducting*

Mr. ERMEY.

Theoretical and technical studies in choral and instrumental conducting, including approach to the score, performance practice and physical gesture. Written permission.

171-172. *Applied Music Program: Advanced Instruction in Vocal or Instrumental Music***

Half course each semester. Restricted to musicians demonstrating mastery of an advanced repertory in their fields. Openings are limited. Enrollment and re-enrollment are by audition and jury. Lessons are given by consultants to the Applied Music Program. Written permission required and a fee is charged for enrollment. Copies of Applied Music Program Handbook giving detailed information are available at the Department.

173-174. *Applied Music Program: Instruction in Vocal or Instrumental Music***

Half course each semester. Restricted to musicians demonstrating mastery of an advanced repertory in their fields. Openings are limited. Enrollment and re-enrollment are by audition and jury. Lessons are given by consultants to the Applied Music Program. 171-172 is prerequisite to 173-174. Written permission required, and a fee is charged for enrollment. Copies of the Applied Music Handbook giving detailed information are available at the Department.

181. *Seminar in Electronic Music*

Mr. SHAPIRO.

A study of advanced techniques of composition employing electronic media including composition in large forms, use of the recording studio, mixed media, and live electronic performance. Prerequisite: 82. Written permission.

198. *Seminar: Historical and Analytical Studies in the Literature of Music*

Mr. JOSEPHSON.

Structural, critical, and stylistic analysis of selected works from various periods. Written permission.

III. PRIMARILY FOR GRADUATES

225. *Seminar in Ethnomusicology*

Ms. DAVIS.

An intensive study of the cultural, aesthetic, and technical aspects of a single topic in ethnomusicology. Written permission for undergraduates.

226. *Seminar in Ethnomusicology*

Ms. KLEEMAN.

An intensive study of the cultural, aesthetic, and technical aspects of a single topic in ethnomusicology. Written permission for undergraduates.

Thesis Preparation

For Graduate students who have met the tuition requirement and are paying the Registration Fee to continue active enrollment while preparing a thesis.

Preliminary Examination Preparation

For graduate students who have met the tuition requirement and are paying the Registration Fee to continue active enrollment while preparing for a preliminary examination.

*A maximum of 2 course credits may be applied to baccalaureate degree credit from Music 59-66.

**Permanent credit is granted only when Music 40, 45 or 55-56 (for music concentrators, 55-56) is completed or proficiency in theory is established by passing an exam given by the Department. A maximum of 4 credits may be applied to baccalaureate degree credit (2 to the music concentration) from Music 71-74 and 171-174.

Neural Sciences

The program in Neural Sciences is an interdisciplinary concentration sponsored by the Center for Neural Sciences in conjunction with faculty from several departments. The concentration provides a firm foundation in the sciences important to an understanding of brain function and the mechanisms underlying the control of behavior. The concentration minimizes formal requirements in order to enhance flexibility in the design of individual programs. The research interests of affiliated faculty include both theoretical and experimental approaches to understanding the function of the nervous system.

UNDERGRADUATE PROGRAM

An undergraduate concentration in the Neural Sciences offers students at Brown a science-oriented program in the fields of knowledge that are important to an understanding of brain function. The pursuit requires a general science background, a number of courses especially devoted to the brain sciences and an in-depth experience that clearly defines the limits of knowledge in at least one aspect of the neural sciences. The concentration allows considerable flexibility for students to develop the last two years along lines of individual preference. They may focus in areas of biology, psychology, linguistics, applied mathematics and modeling theory, bioengineering, computer sciences, or combinations of these.

The general science courses for the Sc.B. include Mathematics 9, 10; Physics 3, 4; two Chemistry courses; Biology 11 or 12, plus one computer or engineering course, or their equivalent. The required Neural Science core-courses are NE 1, 2 and 192 (senior seminar), two neural science laboratory courses, three electives and one seminar course complete the concentration. Honors programs and independent studies are encouraged and projects are arranged with individual faculty members.

I. PRIMARILY FOR UNDERGRADUATES

1. *Nervous System*

The STAFF.

Designed as a systematic introduction to the structure and function of the central nervous system of mammals. The lectures assume some background in animal biology and chemistry, although no formal prerequisites are required. The main topics are: 1) structure and function of neurons; 2) neural integration underlying sensory and motor function; 3) neuronal mechanisms related to complex functions such as learning and memory.

2. *Neural Basis of Behavior*

The STAFF.

This course is a continuation of NE 1. Intermediate level lectures emphasize the brain mechanisms underlying various types of natural and laboratory-produced behavior. Prerequisite: NE 1.

52. *Understanding the Brain* (University 130)

Mr. ELBAUM.

II. FOR UNDERGRADUATES AND GRADUATES

100. *Experimental Neurobiology*

Mr. DONOGHUE

A laboratory experience in neural science with emphasis on cellular neurobiology. Laboratory sessions will be supplemented by informal lectures designed to introduce topics and to discuss experimental approaches and concepts. Prerequisites: NE 1-2, Biology 11.

102. *Neural Modelling Laboratory*

Mr. ANDERSON.

Numerical simulations of cognitively oriented nervous system models. Discussion of parallel, distributed, associative models, construction, simulation, implications, and use. Prerequisites: Mathematics 9, 10 or equivalent. Good to excellent knowledge of Pascal. Some background in Neuroscience or Cognitive Science.

192. *Neural Science Senior Seminar*

Mr. DONOGHUE.

Course will include critical reading, oral and written presentation on current research topics of importance to understanding neural function. The seminar will include outside speakers and discussion of undergraduate research topics. Required of all Neural Science Concentrators.

195, 196. *Independent Study*

The STAFF.

Course provides an opportunity for independent study. Laboratory oriented research in Neural Sciences, supervised by staff members. A student, under the guidance of a Neural Science faculty member, proposes a topic for research, develops the procedures for its investigation, and writes up a report of the results of his or her study.

III. PRIMARILY FOR GRADUATES

201, 202. *Proseminar in Neural Science*

The STAFF.

A study of selected topics in experimental and theoretical Neural Sciences. The topics will be presented by Center faculty, with readings, for discussion in the seminar. A required course for all first year students in the Neural Science graduate program.

Thesis Preparation

A study of selected topics in experimental and theoretical Neural Sciences. The topics will be presented by Center Faculty, with readings, for discussion in the seminar. A required course for all first year graduate students in the Neural Science graduate program.

Preliminary Examination Preparation

For graduate students who have met the tuition requirements and are paying the Registration Fee to continue active enrollment while preparing for a preliminary examination.

Center for Old World Archaeology and Art

The Center for Old World Archaeology and Art exists to bring together faculty and students in this field at Brown University. While retaining departmental affiliation (in Classics or Art) and following departmental degree programs, students benefit from unified curricula planning, daily contact and office space in common with others working in the same field, and participation in coordinated research. The Center sponsors a series of colloquia throughout the year, and publishes monographs and collected papers in its own series *Archaeologia Transatlantica*. It occupies its own facilities including a professional dark room on three floors of a building on the main campus near the John D. Rockefeller Library, which houses one of the most important library collections in classical archaeology in North America. At the Museum of Art, Rhode Island School of Design, there is one of the major collections of Greek and Roman art in the United States. Providence is located within one hour of Boston and four hours of New York City, which places further important resources within reach of the members of the Center.

Since 1965 activities in the field took place principally in Southern Italy. The results of excavations at Satrianum and Buccino have been published in monograph form, and excavations are now in progress at La Mucalufa, Sicily. Members of this Center are also active on other excavations such as in Caesarea Marittima, Israel and in Soissons, France. Additional excavations are being planned. For up-to-date information contact the Center. The Center also offers a course in the Methods of Field Work.

Pembroke Center for Teaching and Research On Women

The Pembroke Center for Teaching and Research on Women brings together faculty and students interested in questions relating to sex roles and the status of women and men in society. It works with departments, programs, and other centers to encourage the development of new women's studies courses and the inclusion of material on women in existing courses. Faculty associated with the Center are available to advise students, who may concentrate in women's studies or who may develop a cluster of women's studies courses to enrich a standard concentration. In addition to its curricular interests, the Pembroke Center develops and encourages research projects through its auspices, and works with the John Hay Library to expand the existing Pembroke Archives. The Pembroke Center sponsors colloquia and other opportunities for scholarly exchange and, with the Sarah Doyle Women's Center, provides a wide range of programs on the changing social, political, and cultural roles of women.

Philosophy

Professors BROCK (Chairman), CHISHOLM, LADD, LENZ, NUSSBAUM, SCHMITT, SOSA; Associate Professors ACKERMAN, LUSCHEI, VAN CLEVE; Assistant Professors PITOWSKY, ZIMMERMAN; Mellon Post-Doctoral Fellow GUYOT.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

Standard Concentration: Eight semester courses in philosophy, which may not include more than one introductory level course. They must include 35, 125, or 126; one of the following: 36, 40, 41, 170, 171, 172; one of the following: 166, 175, 177; one of the following: 14, 163, 188; and one of the following: 50, 164. At least one of the courses must be an undergraduate or graduate seminar. Advisor: Mr. VAN CLEVE.

Ethics and Political Philosophy: Eight semester courses, which may not include more than one introductory course. They must include at least two of the following: 50, 56, 164. Others are to be chosen from among the following: 6, 7, 12, 18, 19, 40, 41, 50, 51, 52, 53, 54, 55, 56. Related courses in social science, independent study projects or graduate seminars may be used with the approval of the concentration advisor. Advisor: Mr. ZIMMERMAN.

Logic and Philosophy of Science: Either Philosophy 163 or Philosophy 188 and at least four and as many as seven courses from among the following: 35, 65, 159, 161, 170, 171, 172. At most three courses among the eight required may be selected from among the appropriate non-elementary offerings of the mathematics and science departments with the approval of the concentration advisor. Examples of appropriate courses are the following: Applied Mathematics 100, Biology 144, Chemistry 114, Geology 161; Mathematics 153, 154; Physics 151; Psychology 108. Independent study projects or graduate seminars may be substituted for the non-philosophy courses with the approval of the concentration advisor. Advisor: Mr. SOSA.

GRADUATE PROGRAMS

MASTER OF ARTS. This degree will be conferred upon the completion of eight courses and a satisfactory thesis or upon the fulfillment of the preliminary distribution requirements for the Ph.D.

DOCTOR OF PHILOSOPHY. The preliminary requirements may be satisfied by demonstrating competence in logic, philosophy of science, ethics, epistemology, metaphysics, and history of philosophy. This may be done either by passing examinations or by passing prescribed courses with a quality grade. Alternatively, the preliminary requirements may be satisfied through satisfactory completion of an individually tailored major-minors program, one initially composed in

consultation with several department members and submitted to the department, through the chairman, for approval.

In the Final Examination considerable importance will be attached to the student's ability to present and defend the results of his or her investigation in a clear and resourceful manner.

I. PRIMARILY FOR UNDERGRADUATES

1. *The Place of Persons*

Some main problems of philosophy; God, faith, and religious experience; persons and personal identity; free will and responsibility; the relativity and subjectivity of values; egoism and morality; the meaning of life. What place is left for religion, personhood, freedom, values, and meaning in the universe of scientific naturalism? A main objective is to facilitate the student's own thinking. Making useful distinctions; stating issues lucidly; formulating arguments concisely — these are capacities and skills to be exercised and developed.

3. *Skepticism and Knowledge*

What is knowledge? What is the extent and basis of one's own knowledge about physical objects, other people, oneself, the future, morality, and religion?

6. *Modern Science and Human Values*

An introduction to ethical theory and its applications to problems generated by modern science, such as the nuclear arms race, nuclear power plants, genetic engineering, the allocation of scarce medical resources, and the teaching of creationism along with evolutionary theory in public schools.

7. *The Individual, Society and the State*

Mr. SCHMITT.

Will focus on different traditional conceptions of the individual, society and the state. It will develop alternative views about the relations between individual and society, between the members of any given society, and of strategies for social change.

8. *Existentialism*

An introduction to philosophical questions and modes of discourse through the study of a particular movement in recent philosophy. The properly philosophical, as contrasted with the popular or literary, writings of the Existentialists will be read and discussed. Camus, Kierkegaard, Nietzsche, Sartre, etc.

9. *Philosophy East and West*

Comparison of the views of classical Eastern and Western thinkers on such issues as immortality and reincarnation, the nature of the self, spiritualism and materialism, perception and illusion, mystical experience, and the nature of knowledge. Readings will be drawn from the Upanishads, works of major Hindu and Buddhist thinkers, and writings of Plato, Descartes, Hume, Schopenhauer, Russell, and others.

10. *Critical Reasoning*

A study of the techniques and principles of correct reasoning and clear communication. Topics to be covered include the following: uses of language, informal fallacies, definition, deduction and induction, syllogistic logic, Venn diagrams, propositional logic, and essentials of scientific method.

12. *Freedom, Responsibility, and Punishment*

Mr. ZIMMERMAN.

An introduction to philosophy by way of consideration of such issues as: whether or not we are, can be, or ought to be free to think and act as we choose; whether or not we are or can be responsible (morally or legally) for any of our thoughts, actions, or the consequences of these; whether or not we ought to be punished for any of our thoughts, actions, or the consequences of these. Readings from both classical and contemporary sources.

13. *Nature, Change, and the Soul in Ancient Greek Thought*

Ms. NUSSBAUM.

14. *Logic*

Mr. LUSCHEI.

Introduction to deductive logic, beginning with the basic propositional logic and proceeding through the elementary logic of quantification and predication (including the logic of identity and descriptions). Opens with a brief history of logic; ends with a preview of ontology, foundations of mathematics, metalogic, and applications of logic, together with an examination of problems in critical reasoning.

15. *Reason and the Human Good in Ancient Ethical Thought*
(Classics 15)

Ms. NUSSBAUM.

16. *Science, Perception, and Reality*

Mr. VAN CLEVE.

Modern science seems to lead to a view of the world variously at odds with common sense, ordinary perception, religious teachings, and received philosophical truths. In this course we will examine some of the apparent conflicts, seeking to determine whether they are genuine and, if so, which side has the better claim to truth. We will also examine current claims that 20th-century physics confirms central tenets of Oriental philosophy.

18. *Theories of Social Change*

Mr. SCHMITT.

The course has three goals: 1. to introduce students to some of the basic issues connected with social and political change, 2. to introduce students to some of the classics in the relevant literature, and 3. to give students some practice in discussing issues surrounding social and political change in detail and with care. Authors to be read include Locke, Jefferson, Marx, Freud, Oakeshott.

19. *Moral Problems*

Messrs. BROCK or ZIMMERMAN.

A systematic study of a few selected moral problems such as abortion, euthanasia, discrimination, war, etc. Emphasis will be given to both the substantive moral problems themselves and to the structures of moral reasoning and argument they exemplify. Readings from contemporary sources.

35. *Greek and Medieval Philosophy*

Mr. LENZ.

Main emphasis is upon Socrates, Plato and Aristotle, and their subsequent influence upon Judaeo-Christian thought (particularly St. Thomas Aquinas) in the medieval period. Also, the Pre-Socratics, Neo-Platonism and Stoic and Epicurean ethics.

36. *Modern Philosophy*

Mr. LENZ.

The ethical, political, metaphysical and epistemological thought of Hobbes, Descartes, Spinoza, Locke, Leibniz, Berkeley, Hume and Kant. Their continuing debate concerning problems arising from the scientific and cultural revolution of the Renaissance will be emphasized.

40. *Marxism*

Mr. SCHMITT.

Topics include Marx's relation to Hegel, the meaning of "materialism" and "dialectic," Marx's conception of science, his notion of alienation, the unity of theory and practice, the labor theory of value, the controversy between Lenin and Luxembourge about the role of a 'vanguard party'. Offered every other year, alternating with 41.

41. *Marxism After Marx*

Mr. SCHMITT.

Reading and discussion of major writers in the Marxist tradition; examination of ongoing controversies about such issues as the nature of the state, classes, social change and culture. Offered every other year, alternating with 40. Prerequisite: 7 or 40.

45. *History of Ethics*

Mr. ZIMMERMAN.

A close study of the ethical theories of key figures in the history of philosophy: Plato, Aristotle, Aquinas, Hobbes, Butler, Hume, Kant, Bentham, Mill, Sidgwick, and others.

50. *Moral Theories*

Mr. ZIMMERMAN.

A systematic study of the principle alternative moral theories: consequentialism (including utilitarianism), moral duties, moral rights. Special attention will also be given to the different conceptions of justice. Readings from both classical and contemporary sources.

51. *Philosophy of Law*

Mr. LENZ.

Philosophical examination of the chief classical and contemporary theories of the nature and function of law. Topics to be considered are: the definition of law, the nature of a legal system, the logic of legal reasoning, the analysis of basic legal conceptions (e.g. of right and duty), legal rules and principles, law and justice, law and morality.

53. *The Ethics of War, Defense and Deterrence*

Mr. LADD.

A critical survey of philosophies of war with special reference to their applicability to nuclear war, terrorism and insurgencies. Reading will include writings by Augustine, Machiavelli, Hobbes, Kant, Clausewitz, Lenin, Tolstoy, and William James, as well as by contemporary writers on nuclear war such as Freedman, Wieseltier, Kissinger, Thompson, Zuckerman, and others.

55. *Ethics of Professionalism*

Mr. LADD.

The purpose of the course is to scrutinize critically the basis, limits and adequacy of professional ethics in general and of the professional ethics of specific professions such as medicine, law and engineering. Students will be encouraged to focus on the ethical problems connected with a profession that interests them.

56. *Political Philosophy*

Mr. BROCK.

An analytical investigation of certain central problems and topics in political philosophy. Among topics to be studied are different theories of democracy, distributive justice, freedom or liberty, equality, human rights, the public interest, and political obligation and civil disobedience. Readings will be drawn from recent work in the field.

65. *Philosophy of Science*

Mr. LUSCHEI.

Logic and mathematics and their application in empirical science; the language of science; definition and concept formation; scientific laws, description, explanation, understanding and testing; empirical import of concepts and laws; theories about unobservables, their import, testing, and cognitive status; convention, relativity and objectivity; causality and determinism; probability and statistical explanation; composition laws and theoretical reduction; various relevant "isms."

80. *Philosophy and the Novel*

Ms. NUSSBAUM.

The course will examine the treatment of consciousness, memory, imagination, emotion, and the self in selected novels of Henry James, Marcel Proust, Virginia Woolf, and Samuel Beckett. What makes these novels "philosophical?" Could there be certain important truths about human life that can be truthfully conveyed only in literary form?

85. *Philosophy of Language*

Ms. ACKERMAN.

Discussion of the nature of linguistic meaning and also of some additional topics such as vagueness, metaphor, and language, thought, and culture.

S92. *Undergraduate Seminar in the Philosophy of History*

Mr. SCHMITT

Topic for 1985-86: From Dialectic to Hermeneutics.

II. FOR UNDERGRADUATES AND GRADUATES

125. *Aristotle* (Classics 126A)

Ms. NUSSBAUM.

126. *Plato* (Classics 126)

Ms. NUSSBAUM.

150. *Methodology of Philosophy*

Ms. ACKERMAN.

Does successful philosophical inquiry yield new facts or new ways of looking at old facts? Is philosophical truth absolute or relative? Relative to what? Why does philosophy lack not only a body of generally agreed-upon truths, but even an established method of settling disputes? Must the results of philosophical inquiry accord with "common sense" and, if so, why?

156. *Philosophy of Education* (Education 156)

Mr. ARCHAMBAULT.

157. *Philosophical Analysis of Educational Concepts* (Education 157)159. *Philosophy of Biology*

Ms. GUYOT.

161. *Philosophy of Physics*

Mr. PITOWSKY.

Examination of philosophical topics related to substantive results in the physical sciences. Among issues to be discussed are problems about space and time that arise in the context of the Special Theory of Relativity and the conflict between determinism and indeterminism in classical and quantum physics.

163. *Deductive Logic*

Mr. LUSCHEI.

An innovative computerized introduction to deductive logic. Each student proceeds at his own pace, advancing to the next stage as soon as he has mastered the last.

164. *Theoretical Ethics*

Mr. ZIMMERMAN.

A systematic study of such issues as: the nature of intrinsic value; the distinction between consequentialist and deontological theories; supererogation; moral dilemmas; the analysis of moral concepts; naturalism; subjectivism; emotivism; prescriptivism; the possibility of ethical knowledge; universalizability; the justification of morality. Readings from contemporary sources.

166. *Metaphysics*

Mr. CHISHOLM.

Basic questions of ontology; the distinction between abstract and concrete objects; change and becoming; identity; necessity; agency.

170. *British Empiricism*

Messrs. VAN CLEVE and LENZ.

A detailed study, both historical and critical, of selected writings of Locke, Berkeley, and Hume. Readings will include contemporary discussions of these philosophers. Prerequisite: one course in philosophy.

171. *Continental Rationalism*

Mr. VAN CLEVE.

A detailed study, both historical and critical, of selected writings of Descartes, Spinoza, and Leibniz. Readings will include contemporary discussions of these philosophers. Offered in 1985-86. Prerequisite: one course in philosophy, preferably 36.

172. *Kant: The Critique of Pure Reason*

Mr. VAN CLEVE.

A detailed study, both historical and critical, of Kant's first *Critique*. Offered in 1986-87. Prerequisite: one course in philosophy, preferably 36.

173. *Nietzsche*

Ms. NUSSBAUM.

A study of Nietzsche's major works, focussing on his critique of morality and religion. What does it mean to claim that God is dead? What perceived crisis motivates Nietzsche's accounts of truth, value, and the will, and how does the notion of the "overman" constitute a response to this crisis?

175. *Theory of Knowledge*

Mr. VAN CLEVE.

The nature of knowledge and its relation to thought, experience, truth, and inference. Perception, memory, and reason. Skepticism, relativism, and other "isms."

177. *Philosophy of Mind*

Ms. ACKERMAN.

A selection from the following topics: dualism and behaviorism, the mind-brain identity theory, thought and language, perception and sensation, the unconscious, human action, the nature of experience, types of experience, distinguishing marks of the mental, emotions and their objects, epistemic problems about mental phenomena.

188. *Mathematical Logic*

Mr. PITOWSKY.

A general introduction to mathematical logic, including such topics as proof theory, set theory, recursion theory, and possibly some topics in the philosophy of mathematics such as constructivity. Prerequisite: no formal prerequisite, but 163 or some mathematical background is advisable.

195. *The Light of Reason*

Mr. SOSA.

Integrative course. Prerequisite: three previous courses in philosophy. What is reason? What is rationality? Implications in five areas: religion; the nature of persons; freedom and responsibility; the status of values and morality; the meaning of life. Twenty pages of written work. This course is designed to integrate issues from several central areas of philosophy: epistemology, ethics, and metaphysics. One main objective will be to show how an answer to an important question in one such area often has implications for main issues in the other two.

199. *Topical Investigations*

The STAFF.

Tutorial course designed primarily for Honors students. Independent study under individual guidance. Elective by written consent of the Department for seniors who have taken at least five philosophy courses.

III. PRIMARILY FOR GRADUATES

Advanced graduate instruction is carried on mainly in seminars, which vary in subject matter from year to year, and in independent studies, which are supervised by members of the Department. There are frequent colloquia given by staff members and by speakers from other institutions.

201. *Research in Philosophy*

The STAFF.

203. *Seminar*

Mr. CHISHOLM.

Topic for 1984-1985: The Concept of Substance. Topic for 1985-1986: Intentionality.

204. *Seminar*

Mr. VAN CLEVE.

Topic for 1984-1985: Ontology and Objectivity.

205. *Seminar* Mr. SOSA.
Topic for 1984-1985: Forms and Objects of Intentionality. Topic for 1985-1986: To be announced.
207. *Seminar* Mr. ZIMMERMAN.
Topic for 1985-1986: Moral Responsibility.
209. *Seminar* Mr. LENZ.
Topic for 1984-1985: Contractarian Theories of Ethics. Topic for 1985-1986: The Philosophy of David Hume.
210. *Seminar* Mr. LUSCHEI.
Topic for 1984-1985: The Logic of Being and Existence.
211. *Seminar* Mr. CHISHOLM.
Topic for 1985-1986: To be announced.
213. *Seminar* (Classics 213) Ms. NUSSBAUM.
Topic for 1984-1985: Aristotle's Ethical Theory. Topic for 1985-1986: Hellenistic Ethics.
216. *Seminar* Ms. ACKERMAN.
Topic for 1985-1986: Reference and Propositional Attitudes.
217. *Seminar* Mr. PITOWSKY.
Topic for 1984-1985: Logical Positivism.
218. *Seminar* Mr. VAN CLEVE.
Topic for 1985-1986: Epistemological and Metaphysical Themes in the Great Philosophers. To be taught by five distinguished visitors and co-ordinated by Mr. Van Cleve.

Physics

Professors BAIRD, BEYER,¹ BRAY, COOPER, ELBAUM (Chairman), ESTRUP, FALLIEROS, FARNSWORTH,¹ FELDMAN, FRIED, GERRITSEN, GURALNIK,² HOUGHTON, KANG, KOLSKY,¹ KOSTERLITZ, LANOU, LEVIN, MARIS, MASSIMO, MAXSON, PECK, QUINN, SEIDEL,³ SHAPIRO,² STILES, TAN, TAUC, WEINER, WESTERVELT, WIDGOFF, WILLIAMS,¹ YING; Associate Professors CUTTS (Executive Officer), JEVICKI;² Assistant Professor PELCOVITS; Assistant Professors (Research) BRICK, HOFTUN, NINOMIYA; Adjunct Associate Professor PETERSEN; Adjunct Assistant Professors LEVINE, REILLY; Visiting Associate Professor LI; Visiting Professor (Research) GUERIN; Research Associates ALLEN, DALY, HAWRYLAK, MAIZE, READ, SHAU, SHIN, SUZUKI, THORNTON, WU, YAMAGISHI; Visiting Research Associates CHANG, GAO, B-Y. QI, D-W. QI, SENNA, SOHN, ZHANG; Visiting Lecturer WEBER.

The Department aims to develop in its students a comprehensive grasp of the principles of physics, together with a productive capacity in research. The courses of study are flexible in subject matter and are conducted by means of lectures, seminars, laboratories, and colloquia. Undergraduate as well as graduate students have opportunities to carry out research in fields of current interest.

The principal research fields of the Department are physical acoustics, low-temperature physics, optics, surface physics, radio-frequency and microwave spectroscopy, solid-state physics, classical nuclear physics, and high-energy physics. There are also opportunities in the Metals Research Laboratory, in which several staff members collaborate with members of other departments. Interdepartmental study with the Departments of Chemistry and Geology and with the Divisions of Applied Mathematics, Biological and Medical Sciences, and Engineering is encouraged for students interested in such subjects as physical metallurgy, high-polymer physics and chemistry, surface physics and chemistry, semiconductor physics, properties of solid continua, geophysics, and biophysics. A center for Biophysical Sciences and Biomedical Engineering has been formed within the University, as have interdisciplinary centers for Neural Studies and for Scientific Computation.

¹ Emeritus

² On leave, 1985-86.

³ On Sabbatical, Semester II, 1985-86.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAMS FOR THE BACHELOR OF ARTS DEGREE

Physics: Prerequisites: Physics 7, 8; 5, 6; (or 3, 4). Courses: Physics 47, 50, 56, 141, 142, and two additional 100-level courses (excepting Physics 110), or one additional 100-level course (excepting Physics 110) and Mathematics 18 or 29 or approved equivalent.

Interdepartmental Programs. See also the interdepartmental programs in Mathematics and Physics, page 87.

STANDARD CONCENTRATION PROGRAMS FOR THE BACHELOR OF SCIENCE DEGREE

Physics: Prerequisites: Physics 7, 8 (or 5, 6) Mathematics 9, 10; Courses: Physics 47, 50, 56, 141, 142, 151, 152, 198. Two additional science courses, chosen from Physics 26, 118, 125, 162, 241, or upper level courses in related fields of science chosen by the student with adviser. Mathematics: 4 courses beyond 9, 10, including choices from Applied Mathematics. In addition, a course in computer programming is recommended.

A senior thesis is required. This is to be prepared in connection with Physics 198 under the direction of a faculty supervisor. The topic may be in experimental or theoretical physics. By arrangement with the department adviser and thesis supervisor, it may be in a related department or of interdisciplinary nature. In any event, a dissertation must be submitted.

Honors. Candidates for Honors in Physics will be expected to pursue a more rigorous and extensive program than those merely concentrating in the subject. In addition they will be required to begin an Honors thesis during the seventh semester and to complete it (as part of Physics 198) during the eighth semester. Honors candidates are also expected to take a special oral examination on the thesis at the end of the eighth semester. Further details about the program may be obtained from the Chairman of the Department or the departmental Honors adviser.

PREPARATION FOR SPECIAL FIELDS. Students planning to study medicine may satisfy the requirements in physics for most medical schools by taking Physics 3, 4 or 5, 6 or 7, 8.

Astronomy

Astronomy. Members of the Physics Department, other departments, and members of the Ladd Observatory Staff compose the staff. Facilities are those of the Physics Department and those of Ladd Observatory and its associated equipment. For courses in Astronomy, see Physics 21, 22, 24, 26, 125; Geological Sciences 5, and courses in the history of astronomy in the department of History of Mathematics.

Standard concentration programs do not now exist; however, it is possible to arrange an independent concentration in astronomy. For advice on such a program, see Professor Stiles, Department of Physics. For those students desiring an excellent undergraduate preparation for graduate work in astronomy, the recommended courses listed below, or their equivalents, should be taken.

Suggested program for the A.B. degree

Prerequisites: As in Sc.B. program below. Courses: Physics 26, 47, 50, 118, 125, 141, 152, 142 or 162; Mathematics 18 or 29. Recommended: Physics 21, 22 or 24.

Suggested program for the Sc.B. degree

Prerequisites: Physics 7, 8 (or 5, 6 or 3, 4); Mathematics 17 or 9, 10. Courses: Physics 24, 26, 47, 50, 56, 118, 125, 141, 151, 152, 142 or 162, and one other upper level course in the physical sciences; Mathematics 52, 111 following upon 17, 18 or 9, 10, 18 or 35; or Mathematics 24, 26, 111 following upon 9, 10, and one other course in Mathematics or Applied Mathematics. Applied Mathematics 33, 34 may replace Mathematics 52, 111.

GRADUATE PROGRAMS

MASTER OF SCIENCE. The minimum requirements for this degree consist of eight courses or equivalent. These would normally be 200-level physics courses, e.g., the core courses Physics 201, 205, 206, 209, 214, 217, 241, and Applied Mathematics 205, 206. Other courses outside the department or 100-level courses can be substituted by permission of the Physics Department. No more than two courses can be research courses. The usual program for a half-time assistant is the same as Semesters 1-3 of the Doctor of Philosophy program described below. These courses and the general requirements of the Graduate School lead to the Master's degree.

DOCTOR OF PHILOSOPHY. The usual program for a half-time assistant is shown below; other arrangements are possible, depending on the student's background, interests and special requirements.

Semester 1: Physics 205, Applied Mathematics 204 or 213, and one elective (or Physics 201). Semester 2: Physics 201 (or one elective), 206 and Applied Mathematics 206 or 214. Semester 3: Physics 207, 209, and 217 or 241. Semester 4: Physics 214 and one or two electives. Semester 5: Physics 241, or 217 if not taken earlier, and one or two electives. A Qualifying Examination is given at the beginning of Semester 3, and the Preliminary Examination is given during Semester 5. These examinations may be taken earlier, by permission of the department. These courses and examinations, together with the general requirements of the Graduate School, including a research thesis, lead to the Ph.D.

Students with insufficient preparation in certain subjects may postpone some of the usual first-year programs and take courses on the 100-level.

All new graduate students take a diagnostic examination during the registration period preceding their first semester. The results of this examination are used solely as an aid to the selection of suitable courses.

I. PRIMARILY FOR UNDERGRADUATES

1, 2. *An Introduction to the Meaning and Structure of Physics*

The aim of this course is to introduce students, whose primary interest is not in the sciences, to such topics in classical and modern physics as Newtonian mechanics, relativity, and the quantum theory. Through an examination of twentieth century, classical, and ancient theories such as those of Aristotle and Euclid, the so-called scientific view of the world will be explored. A fear of or even an aversion to the sciences or an absence of previous instruction in physics is not an obstacle. The principle requirements are an interest in ideas and a willingness to analyze and develop them. The course will be organized around lectures, outside reading, class discussion, and a laboratory. This course is not designed to satisfy medical school admission requirements.

3, 4. *Basic Physics*

Intended for concentrators in sciences other than physics who take the course as juniors or seniors, or without prior exposure to physics, and require a less rigorous course than Physics 5, 6. This is a quantitative course, employing the elementary concepts of calculus but very little of its technique. The subject matter is as specified above (unchanged). Changes contemplated are in emphasis (more on applications, less on derivations) and in pace (closer adherence to topics covered by MCAT tests, more study time per topic). Six hours of attendance. Corequisites: Mathematics 9, 10 or written permission.

5. *Foundations of Mechanics*

The mechanics of particles and systems, emphasizing principles and using elementary calculus freely. For prospective science majors with some prior knowledge of physics or students who (regardless of background) are motivated for a strong course. Uses the classic concentrator's text, *Physics Part 1* by Resnick and Halliday. The course presupposes no background but operates well above the most rigorous high school course. *Lectures, conferences and laboratory*. Six hours of attendance. Corequisite: Mathematics 9.

6. *Foundations of Electromagnetism and Electromagnetic Radiation*

The fundamentals of electro-magnetism and optics, introducing the basic concepts of modern physics in the same style as Physics 5. Intended for non-physics science concentrators who, having taken Physics 5, will limit their college physics to two semesters and require the subject matter of this course in preference to that of Physics 8 (q.v.). The course may also enroll a few physics majors; see below. The text is *Part 2* of the Physics 5 text. *Lectures, conferences and laboratory*. Six hours of attendance. Corequisite: Mathematics 10.

7. *Analytical Mechanics*

A course in classical mechanics taught well above the Halliday-Resnick level. Intended for concentrators in science, having a year each of high school physics and calculus. Physics 7 is a faster and mathematically more sophisticated alternative to Physics 5, passing quickly through the basics to

which Physics 5 is devoted and concentrating upon more challenging problems and more advanced applications of basic theory.

8. *Physics of Waves, Relativity and Quantum Mechanics*

Deals with wave phenomena (including optics), relativity and quantum mechanics at a level substantially higher than Physics 5, 6. The second course in the three-semester introductory sequence for physics majors, Physics 47 (Electricity and Magnetism) being the third, a sequence intended as well for those non-physics concentrators able to invest the time for the strongest available foundation. Physics 8 is also suitable for those students who, while choosing to limit their college physics to two semesters, will be better served by an in-depth introduction to modern physics than by classical electromagnetism.

21, 22. *Beginning Astronomy* (Foundations F31,32)

For the student who has little exposure to physics and mathematics. Emphasis on why we believe certain statements to be true, how we acquired our knowledge, and why we attempt certain new observations. Semester I: historical and conceptual developments, and the study of the solar system. Semester II: stars and their evolution, our galaxy, and the universe at large. The role of pulsars, quasars, neutron stars, and black holes in modern views of the universe is covered. Will acquaint the student with celestial events by eye and by aids such as telescopes and cameras. Three hours of attendance. Conference sections, as well as numerous laboratory experiments on the sun, stars, and planets, are offered. See also Physics 24. Either semester may be taken independently.

24. *Introduction to Astronomy*

For students interested in studying basic astronomy in a more rigorous manner than is offered in Physics 21, 22. Conferences and laboratory work will be required. This course or an equivalent will be required for students taking an independent concentration in astronomy. Six hours of attendance.

26. *Introduction to Astrophysics and Cosmology*

A survey of astrophysical phenomenology and the application of physical theory to its interpretation. Prerequisite: Physics 4, 6, 8, or written permission.

47. *Electricity and Magnetism*

Electric and magnetic fields. Motion of charged particles in fields. Electric and magnetic properties of matter. Direct and alternating currents. Maxwell's equations. Laboratory is provided. Prerequisites: Physics 4, 6, or 8, and Mathematics 9, 10 or approved equivalents.

50. *Advanced Classical Mechanics*

Dynamics of particles, rigid bodies, and elastic continua. Normal modes. Lagrangian and Hamiltonian formulations. Prerequisites: 5, 6, and Mathematics 18 or 29, or approved equivalents.

56. *Sophomore Laboratory*

A program of experiments and measurements chosen to broaden the student's understanding of DC and AC circuitry, the electronics of basic laboratory equipment, and techniques of data and error analysis. Required of all physics concentrators. Prerequisites: 5, 6, 47.

60. *Elements of Modern Physics*

Fundamentals of wave physics. Elements of optics. Kinetic theory; origin of quantum theory; structure and spectra of atoms. Molecules and solids. Four hours of attendance. Primarily for engineering students at the second-semester level, but open to others with these prerequisites: Physics 3 and Mathematics 10, or approved equivalents.

79. *Physics of Matter*

Selected topics from the modern physics of matter: Kinetic theory of gases; Origin of quantum physics, including black-body radiation, particle and wave phenomena; Schrodinger's equation; Structure and spectra of atoms and molecules; Crystal structure and diffraction; Electronic, optical and thermal properties of solids. Four hours of attendance. Primarily for engineering students in the junior or senior year as an Advanced Science Course in the Engineering Curriculum. Open to other qualified students by permission. Prerequisites: Engineering 4 (or equivalent), Applied Math 34A (or equivalent).

II. FOR UNDERGRADUATES AND GRADUATES

114. *Biomedical Radiation Physics*

A survey of the nature, origins and byproducts of ionizing particles and radiations; technology of production and use; physical and biological phenomena underlying effects on living matter. Applications relate to radiation biology, nuclear medicine, cancer therapy, environmental and industrial problems. Acceptable for concentration credit for Sc.B. in Biomedical Sciences. Prerequisites: Biomed 1, Chemistry 3; corequisite, Physics 4; or written permission.

118. *Optics and Wave Theory*

Elements of applied optics; analogous topics in ion topics. Propagation, interference, diffraction, absorption, and polarization of waves, with particular reference to light and acoustics. The wave properties of matter; Schrödinger's equation. Laboratory work is provided. Six hours of attendance. Prerequisites: Physics 47 and Mathematics 18 or 29, or approved equivalents.

125. *Stellar Interiors*

The physical state of the stellar interior with emphasis on models for hydrogen-burning and degenerate stars. Topics will include hydrostatic and thermal equilibrium, chemical composition, equation of state, energy transport mechanisms, opacity, and nuclear reactions. Prerequisites: Physics 26 and 152, or written permission.

141, 142. *Modern Physics A, B*

A unified treatment of quanta, photons, electrons, atoms, molecules, matter, nuclei, and particles. Quantum mechanics will be developed at the start and used to link and explain both the older and the newer experimental phenomena of modern physics. Laboratory work is provided. Six hours of attendance. Prerequisites: Physics 47, 50, 56, or approved equivalents.

151. *Advanced Electromagnetic Theory*

Maxwell's laws and electromagnetic theory. Electromagnetic waves and radiation. Special relativity. Prerequisites: Physics 47 and Mathematics 18 or 29 or approved equivalents.

152. *Thermodynamics and Statistical Mechanics*

The laws of thermodynamics and heat transfer. Atomic interpretation in terms of kinetic theory and elementary statistical mechanics. Applications to physical problems. Prerequisites: Physics 141 and Mathematics 18 or 29. Corequisite: Physics 142.

162. *Nuclear and Elementary Particle Physics*

A study of modern nuclear and particle physics, with emphasis on the theory and the interpretation of experimental results. Topics will include symmetry principles and conservation laws, properties of nuclei, nuclear forces, shell and collective models, scattering and reactions, weak interactions, pion physics, and the systematics of elementary particles. Prerequisites: Physics 141, 142, or written permission.

198. *Senior Conference*

Offered either semester. Preparation of thesis project. Required of candidates for the degree of Bachelor of Science with concentration in Physics. Elective for other undergraduates with written permission of the department.

199. *Special Topics in Experimental and Theoretical Physics*

Topics in special areas of physics, offered from time to time upon sufficient demand from qualified students. Elective by special permission of the department. Open also to students in the Master of Arts in Teaching program.

199A. *The Physics of Music*

The physical basis of the sounds of music; how they are produced and perceived.

III. PRIMARILY FOR GRADUATES

201. *Techniques in Experimental Physics*

Introduction to modern experimental techniques. Projects in nuclear physics, particle physics, solid state, low-temperature physics, spectroscopy (radio-frequency, microwave, optical and x-ray) and acoustics. Offered every year. May be taken either semester.

205. *Introduction to Quantum Mechanics*

Hamilton's equations. Uncertainty principle, Schrödinger equation, potential well and barrier problems. Harmonic oscillator, angular momentum, hydrogen atom. Matrix mechanics. Offered every year.

206. *Intermediate Quantum Mechanics*

Scattering theory. Approximation methods. Identical particles and spin. Semi-classical theory of radiation. Application to atomic and molecular problems. Offered every year.

207. *Advanced Quantum Mechanics*

Relativistic wave equations for spin 0 and $1/2$. Dirac solution of hydrogen atom. Relativistic potential scattering. Elementary quantization of fields. Offered every year.

209. *Electrodynamics and Relativity*

Maxwell equations and electromagnetic potentials. Radiation fields; multipole expansions. Electrodynamics in material media; dispersion, absorption, scattering. Lorentz transformation, relativistic mechanics, covariant electrodynamics. Radiation by moving charges, bremsstrahlung, radiation damping. Offered every year.

210. *Relativity and Cosmology*

Review of special relativity. Principle of equivalence and fundamental precision experiments. Introduction to differential geometry; Einstein field equations. Simple solutions and comparison with experiment. Relativistic cosmology.

214. *Statistical Mechanics*

Fundamentals of classical and quantum statistical mechanics. Ensemble theory, density matrix, Ideal Fermi and Bose gases. Imperfect gases, molecular distribution functions. Phase transitions, critical phenomena, renormalization group. Offered every year.

217. *Introduction to Nuclear and High Energy Physics*

Symmetry principles and conservation laws. Nucleon-nucleon forces and the deuteron. Analysis of scattering experiments, interaction of nucleons with radiation. Systematics of elementary particles. Classical pion physics. Weak interactions. Offered every year.

218. *Physics of the Nucleus*

Properties of bound and continuum nuclear states and their interpretation. Shell and collective models. Electromagnetic decays. Resonance reactions. Optical model for elastic and inelastic scattering. Particle-transfer reactions.

220. *Elementary Particle Physics I*

Phenomenological study of elementary particles and their strong, electromagnetic and weak interactions. Structure of particles. Invariance and symmetry principles. Introduction to current algebras and gauge theories. Offered every year.

221. *Elementary Particle Physics II*

Applications of modern techniques such as dispersion relations, gauge theories, current and field algebras to problems of interest in particle physics. Offered every year.

230. *Quantum Theory of Fields I*

Lagrangian field theory. Free and interacting fields. Soluble and semi-soluble models; renormalization. Level shift, bremsstrahlung and scattering calculations in quantum electrodynamics. Either 230 or 232 offered every year.

232. *Quantum Theory of Fields II*

Functional methods, gauge fields, renormalization group, special expansion techniques, semi-classical methods, asymptotic properties, critical phenomena. Either 230 or 232 offered every year.

234. *Group Theory I*

Abstract groups. Theory of group representations; the symmetric group and the many-electron problem. Point and space groups with applications to solid state physics. Rotation groups. Either 234 or 236 offered every other year.

236. *Group Theory II*

Lie groups and Lie algebra. Classification of semi-simple Lie algebras and their representations. Non-compact groups, the Poincaré group. Applications to elementary particle physics (unitary sym-

metry). Either 234 or 236 offered every other year.

237. *Ultrasonics*

Generation, propagation and detection of high-frequency sound in solids, liquids and gases. Theories of ultrasonic absorption and dispersion. Use of ultrasound in studying the structure of matter.

238. *Nonlinear Acoustics*

Generation of sound by turbulence; radiation pressure; scattering of sound by sound; generation of rotational flow by sound; absorption of high-amplitude sound waves.

241. *Solid State Physics I*

Introduction to the solid state. Crystal structures and lattice vibrations. Dielectric, magnetic and optical properties of solids. Free electron theory of metals; energy bands. Semiconductors. Offered every year.

242. *Solid State Physics II*

The solid view as a collection of nearly independent excitations. Lattice dynamics, and phonon spectra. Band structure, symmetry considerations and calculational schemes. Scattering processes and transport theory. Electron correlations. Offered every year.

243. *Solid State Physics III*

The study of solids as many-particle systems. The formalism of Green's functions applied to problems such as the electron gas, the normal Fermi liquid, superconductivity and ferromagnetism. Offered every year.

246. *Magnetism*

Topics may vary from year to year. Ions in crystals, ligand field theory. Electronspin resonance. Nuclear magnetism, resonance and relaxation. Ferromagnetism, spin waves, antiferromagnetism. Magnetic properties of metals.

248. *Interaction of Radiation with Matter*

Topics may vary from year to year. Optical properties of metals, semiconductors and insulators. Nonlinear optics. Resonance phenomena. Propagation of electromagnetic radiation in plasmas.

249. *Theory of Quantum Fluids*

Phenomenological and microscopic theories of liquid helium-three, liquid helium-four, and type I and type II superconductivity.

261A. *Mathematical Methods in Physics — I*

Introducing variational principles, differential equations, linear algebra, group theory, functional analysis, Sturm-Liouville problems, etc., with emphasis on their applications to dynamics of particles and fields.

262A. *Mathematical Methods in Physics — II*

Complex analysis, application of contour integrals, asymptotic expansion, special functions, boundary-value problems in electrostatics, group representation, differential geometry and tensor analysis.

261, 262. *Special Topics in Physics*

Upon sufficient demand, advanced instruction in special areas is available, including the following topics: Atomic Physics; Nuclear Physics; Reactor Physics; Physics of Metals; Surface Physics; Lattice Imperfections; Theory of Liquids; Topics in Advanced Statistical Mechanics; X-rays.

271, 272. *Seminar in Research Topics*

The STAFF.

Instruction via reading assignments and seminars is frequently provided for graduate students on research projects. The speed of instruction may vary, but will normally be such as to offer one semester-course credit for work extending over two semesters. Half-course.

291, 292. *Research in Physics*

The STAFF.

Offered every year. Credit varied.

Related Courses

Attention is called to the following closely related courses offered in other departments. Applied Mathematics 205, 206, *Mathematical Methods of Applied Science*; Applied Mathematics 213, 214, *Methods of Applied Mathematics*; Chemistry 201, *Advanced Thermodynamics*; Engineering 203, *Advanced Dynamics*; Engineering 263, 264, *Electromagnetic Theory*. Consult the appropriate portions of the catalogue for further details, as well as for other courses in these departments and in the Department of Mathematics.

Political Science

A. ALFRED TAUBMAN Professor of American Institutions THOMAS J. ANTON, Professors BEISER, COBB (Chairman), CORNWELL, GOODMAN,¹ HOPMANN, KAU, NORDLINGER, SMOKE, STULTZ, ZUCKERMAN,² Associate Professor ROSENBLUM,³ Assistant Professors COOK,³ MORONE,³ MUCCIARONI, RICH, WEST,¹ WHITING.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

Eight courses in Political Science are required for concentration. Students must choose two from among the following courses: Political Science 1, 10, 11, 40 and 50, with Political Science 50 being strongly recommended, and one research seminar (Political Science 182). At least one departmental offering must be completed from three of the following four sub-fields of the discipline: political theory; American politics and government; comparative politics; and international relations. In addition to the eight courses required for concentration, it is recommended that students take a minimum of two courses (numbered 100 and above) in at least one other Social Science Department.

Honors. As above, except that ten courses are required, including Political Science 172 (the Honors Seminar) which must be taken before the student's seventh semester, and Political Science 191 and 192 (Senior Honors Thesis Preparation). Political Science 172 may be substituted for the required departmental research seminar. Students who have given evidence of superior work in Political Science may be admitted to Honors candidacy at the beginning of the sixth semester. A written application must be submitted to the Chairman of the Undergraduate Studies Committee no later than the preceding December 1. The application should include a copy of your transcript, a list of courses you are taking this semester along with the actual/expected grade, as well as two or more of your better papers in any of the social sciences. The Undergraduate Studies Committee will announce its decisions by the end of the first semester.

GRADUATE PROGRAMS

MASTER OF ARTS. Master of Arts degrees are awarded to students who have completed eight approved courses with a grade of B or better, passed an oral examination, and submitted an approved A.M. thesis.

I. PRIMARILY FOR UNDERGRADUATES

- | | |
|--|-----------------|
| 1. <i>Introduction to the American Political Process</i> | Mr. COBB. |
| 10. <i>Introduction to Public Policy</i> | Mr. MUCCIARONI. |
| 11. <i>On Political Philosophy</i> | Ms. ROSENBLUM. |
- An introduction to political philosophy focusing on liberal theory and its critics. Covers the work of major theorists ranging historically from Locke and Mill to contemporaries Dworkin and Rawls.

¹ On leave Semester II, 1985-86.
² On leave Semesters I and II, 1985-86.
³ On leave Semester I, 1985-86.

14. *American Legislative Politics*

Mr. CORNWELL.

The internal politics of Congress and the role that Congress plays in government policymaking. Consideration will be given to legislative recruitment and elections, socialization and informal folkways, leadership styles, the committee system and how these affect Congress' role in foreign and domestic policymaking.

22. *City Politics* (Urban Studies 22)

Mr. MORONE.

Bosses, reformers, states, bureaucrats, politicians, the poor, the homeless, and the citizen. An introduction to the major themes of urban politics.

40. *International Politics*

Mr. HOPMANN.

An analysis of the problem of limiting anarchy in an international system composed of sovereign nation-states. Evaluates future prospects for world order, including the role of international law and organizations.

50. *Foundations of Political Analysis* (Foundations F50)

Mr. ZUCKERMAN.

Examination of various modes of thought taken from the different social sciences and used in systematic political analysis. Comparison of different ways of thinking about politics as complementary and competing approaches to political knowledge. Limited to freshman and sophomores.

101. *Liberal Political Theory*

Ms. ROSENBLUM.

A historical and thematic study of liberal political thought from Locke to Rawls. Two lectures and one discussion session/week.

102. *Theories of Justice*

Ms. ROSENBLUM.

The course analyzes six classical and contemporary theories of Justice: Plato's "Republic," Aristotle's "Ethics" and "Politics," Kant's "Groundwork," Rawls' "A Theory of Justice," Nozick's "Anarchy, State, and Utopia," and Walzer's "Spheres of Justice". Permission of the instructor is required.

104. *Radical Political Thought*

Ms. ROSENBLUM.

A survey of varieties of radical political thought. Topics include Marxism, non-Marxist socialism, anarchism, radical individualism, modern utopianism. Some background in moral or political philosophy is recommended.

105. *Ethics and Public Policy.*

Mr. SCHULMAN.

106. *Psychological Approaches to the Study of Politics*

Mr. COBB.

What types of psychological explanations can account for attitudes and behavior? The approaches considered include: human needs, Freudian perspective, authoritarianism, alienation and symbolism. Prerequisite: PS50.

109. *Bureaucratic Politics*

Mr. RICH.

The course will focus on the role of public bureaucracies in the policymaking process. Topics covered include characteristics of government organizations; leadership and control of government agencies; and relationships between government bureaus and their environment (e.g., congress, the president, the judiciary, interest groups, the media). PS01 or PS10 strongly recommended.

110. *Political Parties and Interest Groups*

Mr. WEST.

Analysis of national political parties and interest groups in the American setting. Topics include history of parties, the role of parties in elections and government, party reform, history of groups, the role of groups in elections and government, and future prospects for political organizations.

111. *Party Organizations and Machines*

Mr. CORNWELL.

Focusing largely on parties at the state and local levels. This course is designed to acquaint the student with the development, staffing and functions of political party organization in the United States, with special attention to the political machine.

112. *Campaigns and Elections*

Mr. WEST.

Analysis of campaigns and elections in the contemporary political process. Topics include the changing nature of campaigns, role of media, money, and issues in recent elections, and the significance of elections for the democratic process.

113. *The American Presidency* Mr. CORNWELL.
The origins and evolution of the current Presidency, the role of the President and the presidential institution in the American political and policymaking system. Evaluation of the proper role of the office, and critical examination of recent administrations.
114. *Comparative Public Policy* Mr. MUCCIARONI.
Considers how differences in political culture, the ideology of governing coalitions, and the structure of political institutions across nations affect public policy. Not open to freshman.
115. *Government and Business* Mr. MORONE.
Government efforts to regulate and deregulate business placed in the larger context of the relationship between the state and the economy. Not open to freshmen.
116. *The Politics of the Legal System* Mr. BEISER.
A study of the American legal system, from both behavioral and normative perspectives. Not open to freshman.
117. *Political Economy of the United States* Mr. MUCCIARONI.
Considers the role of government in the contemporary economy. Explores various theories of state intervention within economics and political science. Not open to freshman. Written permission is required.
118. *The Problems of American Cities* (Urban Studies 118) Mr. MORONE.
The politics of urban dilemmas in health care, poverty, pollution, housing, crime, finance, and planning placed in the context of individual American cities. Prerequisite: 22, or written permission of the instructor.
119. *Federalism and Public Policy* Mr. ANTON.
Federalism as a structure of influence upon American public policies. Beginning with a review of legal, political, and economic perspectives on federalism, the course proceeds to examine structural characteristics of American intergovernmental relations.
120. *Policy Analysis and Program Evaluation* Mr. RICH.
This course offers a broad overview of public policy analysis and program evaluation with an emphasis on methodological issues involved in the analysis and assessment of government programs. PS/10 strongly recommended.
121. *Latin American Politics* Mr. WHITING.
Introduction to the politics of Latin America.
122. *The Soviet Political System* Ms. COOK.
Brief overview of revolutionary period; comparative analysis of the Stalin, Khrushchev, Brezhnev, and post-Brezhnev regimes.
123. *Comparative Communist Systems* Ms. COOK.
A comparative analysis of the Soviet, Chinese, and East European political systems, focusing on differences in the processes which brought these regimes to power, political and social structures, crises of political order, and major systematic problems in the 1980's. PS/50 or some background in at least one system is recommended.
124. *The Bonds of Politics: Social and Political Groups in Different Cultures* Mr. ZUCKERMAN.
Deals with the formation of political groups. The tools of political science will be used to explain why political groups emerge, stay together, and collapse. Prerequisite: PS/50.
125. *Politics of European Democracies* Mr. ZUCKERMAN.
What are the inter-relationships between social and political structures in the European democracies? How have these regimes responded to the demands of industrial societies? These and questions relating to political parties and elections will provide the focus for the course. Prerequisite: PS/50.
127. *Marxism-Leninism and The Soviet State* Mr. GOODMAN.
A study of the historical and ideological foundations, the organization, and the power structure of the Soviet system.

128. *Industrialization and Development in Latin America*

Mr. WHITING.

How have some countries shifted from being the "hewers of wood and drawers of water" to being industrial producers and sovereign debtors?

129. *Chinese Politics and Government*

Mr. KAU.

An examination of the process of Communist revolution in China followed by a structural functional analysis of the Chinese political system with particular emphasis on the Party, bureaucracy, army, and mass organizations.

130. *The Japanese Political System*

Mr. KAU.

An in-depth analysis of the politics of the Japanese model of stable democracy and high-growth economy. Special attention given to the pattern of political development, major political institutions, governmental performance, the process of agenda building, and the characteristics of social and economic policy.

135. *Modern African Political Systems*

Mr. STULTZ.

Comparative study of the politics of representative African states. Emphasis placed on alternative methods of analyzing political systems.

136. *Politics in Southern Africa*

Mr. STULTZ.

Examination of major political questions within and among countries in Africa from Zambia southward.

138. *Politics of Divided Societies*

Mr. STULTZ.

Consideration of the difficulties of maintaining "open" regimes in societies wherein deep divisions of ethnicity confound the search for political consensus and institutional legitimacy. Countries to be considered include (among others) Canada, Northern Ireland, Cyprus, and Nigeria.

141. *Contemporary International Politics*

Mr. NORDLINGER.

The course deals with some of the central issues of international politics such as the causes of war and the consequences of the security dilemma, primarily with respect to American foreign and defense policy and Soviet-American relations.

142. *Problems for International Policy*

Mr. MENNING.

Will focus on the years 1943-1956, a period when the present political and economic constellations first took on the forms by which we recognize them today. Open only to seniors who have taken PS/40 or PS/141 or receive written permission from the instructor.

143. *World Communism*

Mr. GOODMAN.

A survey of various theoretical explanations motivating Soviet foreign policy and a systematic study of actual Soviet policy abroad in both the developed and underdeveloped countries of the world.

144. *Soviet Foreign Policy*

Ms. COOK.

Changing Soviet strategies, behavior, and perceptions of international relations from the inter-war years to the present will be assessed. PS/121; PS/141; History 124 or 139 recommended.

145. *International Political Economy*

Mr. WHITING

North-South Relations. Problems of structure and action that link developing countries with the world economy. Foreign lending, direct investment by transnational enterprises, technology transfer, trade, nationalization and regulation are among the topics studied.

146. *The Arms Race and Arms Control*

Mr. HOPMANN.

Considers the causes and effects of the arms race, especially between the United States and the Soviet Union. Analyzes alternative strategies for limiting the arms race in the future. Introduction to the dynamics of weapons competition, the components of the arms race, and the possible solutions to the pre-eminent problem of our time.

147. *The Dynamics of Community Formation*

Mr. COBB.

What factors produce viable political communities? Four major explanations will be considered: common values, interaction levels, threat of violence, and formal collaboration through new organizational units.

148. *American Foreign and National Security Policy*

Mr. HOPMANN.

Examines the process of decision-making in United States foreign policy. Considers major themes of U.S. foreign and national security policy since 1945.

150. *East Asian Security and U.S. Policy* Mr. KAU.
The geopolitics and security relations of the Asia-Pacific Basin.
160. *Political Research Methods* (Formerly PS/60) Mr. WEST.
An introduction to basic research methods in political science. Students will have a chance to attempt some original data analysis.
172. *Honors Seminar* Mr. NORDLINGER.
Required for all Honors concentrators in the junior year. Others with written permission from the instructor. Please see the relevant parts of the concentration requirements.
182. *Research Seminars* The STAFF.
Open to junior and senior concentrators and to non-concentrators. The seminar will be divided each year into sections taught individually by various members of the staff. Most sections will focus on a specific topic relating to the field of interest of the instructor. The size of each section is limited. Written permission of the instructor is required.
- 191, 192. *Senior Honors Thesis Preparation* The STAFF.
- 193, 194. *Individual Reading and Research Project* The STAFF.

III. PRIMARILY FOR GRADUATES

- 291, 292. *Thesis Research and Preparation* The STAFF.
- 293, 294. *Independent Reading and Research* The STAFF.

Population Studies and Training Center

EXECUTIVE COMMITTEE

SIDNEY GOLDSTEIN, PH.D. *George Hazard Crooker University Professor and Professor of Sociology, Director*; HOWARD P. CHUDACOFF, PH.D., *Professor of History*; PETER EVANS, PH.D., *Professor of Sociology*; EDWIN GOLD, M.D., *Professor Emeritus of Bio-medical Science*; PHILIP E. LEIS, PH.D., *Professor of Anthropology*; LUCILE F. NEWMAN, PH.D., *Assistant Professor of Bio-medical Science*; ALDEN SPEARE, JR., PH.D., *Professor of Sociology, Associate Director*

The Population Studies and Training Center is a multidisciplinary unit associated with the Department of Sociology. The Center is organized to facilitate and strengthen research and graduate training in demography at Brown. In addition to sociology faculty, its members include faculty from history, bio-medical science, mathematics, economics, American civilization, and anthropology whose interests focus on population problems.

The Center provides logistic support to and promotes the population training program within the Department of Sociology which leads to the M.A. and Ph.D. degrees in Sociology with major specialization in population. Ph.D. students in Sociology also select a minor from among comparative development, medical sociology, anthropology, urban studies, social organization, or another field of particular relevance to the individual student. It is also possible for students in Anthropology to offer population studies as a major field. The degree requirements are described under the departmental listings. Demography trainees in Sociology are encouraged to take relevant courses in other departments, and students in other departments are encouraged to enroll in population courses in Sociology, to offer population studies as a major or minor field, to write their dissertations on population related topics, and to make use of the Center's staff and research and training facilities. Dissertation projects which integrate demographic interests with related areas of specialization, such as population change and modernization, or population and community health, are welcomed.

Fellowship and traineeship awards for both American and foreign students are available through grants from the National Institutes of Health and the Hewlett Foundation, as well as through University awards. The training provided students is designed to enable them to carry on scholarly research whether they enter universities or take positions in state, national, or international organizations, or with private firms. A small number of post-doctoral fellowships are awarded by the Center. Visiting

research appointments are also made to allow both young scholars and established faculty to make use of the facilities and training opportunities available through the Center.

The Center maintains a wide range of facilities, some in cooperation with other social science groups, to aid the research and training activities of its program. It also provides liaison with various population and health research organizations and agencies in the community, nationally, and overseas. At Brown, the Center partially supports the Social Science Data Center, which is a central repository of data tapes; it maintains a comparative data bank which includes information for countries around the world to facilitate comparative research on the interrelations of demographic, economic, social, and cultural variables. The Social Science Data Center also maintains a bank of computer terminals and provides seminars and workshops on the use of computers in demographic and social research. The Population Studies and Training Center also sponsors a series of sample survey studies in less developed countries, which provides field experiences and dissertation materials on migration, fertility, urbanization, and development. Training, and experience in survey research as well as access to data are also available through the Population Research Laboratory, and from sample surveys of the Rhode Island population, undertaken semi-annually. The Center also maintains a Demography Library, which has an extensive collection of census and vital statistics reports as well as books, monographs, periodicals, and unpublished papers covering all facets of population studies.

Current research activities of Center faculty encompass a wide range of topics, including studies of natural and regulated fertility; interrelations among modernization, urbanization, fertility, and migration; migration and household change; social mobility and fertility; health status and its effects; the aged and demographic change; morbidity and mortality; nuptiality and divorce; family life cycle; demographic transition; methodological innovations in demographic survey research; mathematical modelling; and population policy formation and evaluation. As part of the ongoing research and training, the Center sponsors colloquia and pro-seminars which bring visiting scholars to campus and also allow resident faculty and students to discuss innovative methods and ideas as well as research findings.

Portuguese and Brazilian Studies

Center for Portuguese and Brazilian Studies

Professors MONTEIRO, PADDEN, VIEIRA (Chairman); Visiting Professor DIAS; Assistant Professors ALMEIDA and DZIDZIENYO; Adjunct Assistant Professors BECKER and PINSORF; Visiting Lecturer, Mr. VALENTE; The Undergraduate Program in Portuguese and Brazilian Studies is advised by a cooperating committee including the above and the following: Associate Professors EVANS (Sociology) and L. MONTEIRO (Biological and Medical Sciences).

The Center for Portuguese and Brazilian Studies offers four degree programs: (1) A.M. degree in Portuguese Studies and Bilingual Education, (2) A.M. degree in Brazilian Studies, (3) A.B. degree in Portuguese and Brazilian Studies (interdisciplinary) and (4) A.B. degree in Portuguese Studies (with the possibility of specializing in Bilingual Education). Besides its academic programs, the Center coordinates literary activities, lecture series and community services. Along with its primary goal of offering academic programs in Portuguese language, Portuguese and Brazilian literature and culture, and Bilingual Studies, as well as a semester study abroad program at the Federal University in Bahia, Brazil, the Center has become an integral part of the surrounding Portuguese bilingual communities. Organizing cultural and artistic exhibits in addition to providing educational counseling to non-native speakers of English, the Center actively extends its resources beyond the immediate academic community. Cooperation with the University of the Azores, consultation in bilingual curricular and technical assistance exemplify the Center's broader social and educational contributions. It is the Center's philosophy that these activities contribute to each student's total experience of his or her work at the Center.

UNDERGRADUATE PROGRAMS

The Nature of the Concentration: Using the Portuguese language as a basis, this interdisciplinary concentration program in Portuguese and Brazilian Studies allows the student to develop interests in the areas of language, literature, linguistics, education, history, anthropology, and the other social sciences. In arranging a program, the student can choose either a combination of four courses in two of these disciplines or a combination of four courses in one discipline plus the interdisciplinary core courses listed below. Each program requires one seminar or special project.

The core for this concentration will usually consist of enrollment in:

Program A: (1) seminar in Portuguese and Brazilian studies; (2) Portuguese language course(s), Portuguese 1-2 is a prerequisite, Portuguese 19; (3) Portuguese 31; (4) Portuguese 32; (5) Portuguese 150, 160, or 198; (6) plus four courses in a related discipline.

Program B: (1) seminar; (2) Portuguese language course(s), Portuguese 1-2 is a prerequisite, Portuguese 19; (3) either History 121, 122 or 153; (4) Sociology 60; (5) either Anthropology 2, 122 or 142, plus four related courses in one discipline.

GRADUATE PROGRAMS

A.M. DEGREE PROGRAM IN PORTUGUESE STUDIES AND BILINGUAL EDUCATION

This interdisciplinary program will offer graduate level study, conducted in Portuguese and English, in advanced language, literature, civilization, and bilingual education for the native or near-native speakers of Portuguese. Candidates with an A.B. degree will apply for admission to this graduate program with the aim of completing eight graduate-level courses in Portuguese and Bilingual Studies (this is the required number for fulfillment of the Master's program.)

Other Requirements:

- Candidates will successfully complete at least 3/4's of their required course work (six graduate courses) in courses conducted in Portuguese.
- Candidates will select and successfully complete at least *one* course from each of the following disciplines: (a) Advanced Portuguese Language, (b) Portuguese Literature and (c) Portuguese Civilization.
- Candidates will develop and complete a special project related to bilingual materials, curriculum or Portuguese Studies. This project is subject to the staff's prior approval.
- As partial fulfillment of their requirements for the A.M. degree, candidates will successfully pass an advanced oral and written proficiency exam in Portuguese, at the beginning of their last semester of graduate study.
- Candidates may be part-time or full-time. In case of the former, candidates will be required to complete at least two courses per semester thereby enabling them to complete their requirements in two years.

This interdisciplinary Master's Degree program is an advanced course of study that follows the format of the existing A.B. concentration in Portuguese and Brazilian Studies. The emphasis on Bilingual Education is designed for those educators who need graduate level courses in this field conducted in Portuguese. If a candidate is well prepared in bilingual pedagogy he or she may complete his or her program with specialization in a related field. In other words, given the fulfillment of the prerequisites listed above, a candidate could follow a program with a minimum of four graduate courses in a related area; i.e., literature, anthropology or history. With sufficient preparation in a related area, such a candidate could prepare an individual interdisciplinary program with the guidance of the faculty which comprises the Executive and Advisory Committees of the Program in Portuguese and Brazilian Studies.

A.M. DEGREE PROGRAM IN BRAZILIAN STUDIES

This interdisciplinary degree program is designed to provide students as well as mature professionals holding an A.B. degree and possessing a reading and conversational knowledge of Portuguese, with a social science/humanities curriculum in Brazilian. The program offers graduate level training with special focus upon Brazil for students at the prespecialization phase for careers in academia, foreign service, and international organizations including transnational business and foundations. Drawing upon a candidate's knowledge of Portuguese, this program will develop a unique combination of linguistic and interdisciplinary skills via course offerings in English and Portuguese. Areas of special focus from the social science/humanities components are:

- Social Structure and Social Change in Contemporary Brazil
- Counterpoints in Brazil's National History
- A Sociological and Historical Economic View of Brazil
- The Modern Brazilian Novel
- Social Change and Criticism in Modern Brazilian Drama

Core Program: Candidates will complete a program of 8 graduate courses. Each candidate will take an introductory seminar ("Brazil-New Patterns of Development and Progress") in addition to two required courses in the social sciences, and two in the humanities component. Besides these 5 required courses, students will complete one 292 course as a culminating in-depth experience in their area of focus (social science or humanities). Students will thus round out their program with at least two electives in their field of interest. Consequently, for a student focussing upon the social sciences it is conceivable that, in addition to the introductory seminar, he/she will be able to complete 5 courses in a field of interest. Students will be expected to complete at least 3 of their courses via the Portuguese language.

RELATED COURSES

Attention is called to the following courses related to the Portuguese and Brazilian Studies curriculum and offered by other Departments:

- Anthropology 112-Peoples of Latin America. Mr. Heath.
- Political Science 182K-The State and Public Policy: Mexico and Brazil. Mr. Whiting.
- Sociology 187J-Social Structure and Social Change in Contemporary Brazil. Mr. Evans.

PRIMARILY FOR UNDERGRADUATES

1, 2. *Intensive Portuguese*

Mr. VIEIRA and STAFF.

A highly intensive course for students with little or no preparation in the language. Stress will be placed upon acquiring the fundamental language skills of understanding, speaking, reading, and writing. The course also presents aspects of Portuguese and Brazilian culture. A two-semester sequence in one semester with ten meetings each week. Elective for students who have not presented Portuguese for admission, course carries double credit and a common grade will be assigned for 1 and 2.

19. *Conversational Portuguese*

Mr. VIEIRA and STAFF.

This course will develop conversation skill, i.e., colloquial language, via current works and events that reveal socio-cultural aspects of the Luso-Brazilian world. Using anecdotes, proverbs, political and social ballads, puns, slang, grafitti, popular verse, idioms, articles, short stories, plays, students will discuss contemporary topics. Emphasis on developing knowledge of syntax and writing ability. Four hours weekly. Prerequisite: 1-2 or placement. Conducted in Portuguese.

31, 32. *Modern Luso-Brazilian Literature*

Mr. VALENTE.

Reading and textual analysis of selected Portuguese and Brazilian writers of the nineteenth and twentieth centuries: Eça de Queiroz, Fernando Pessoa, Machado de Assis, Jorge Amado, Guimarães Rosa, Carlos Drummond de Andrade, and others. Various literary genres will be studied and discussed. A two-semester sequence. Special permission of the instructor is required to elect 32 before 31. Prerequisite: 4 or placement. Conducted in Portuguese.

72. *In Search of the Melting Pot: A Global Perspective on Multi-Ethnic Societies* (see Special Themes and Topics 72)

Mrs. BECKER.

90. *Development and Modernization in a Colonial Society: Origins of the Third World in Brazil*

Mr. PADDEN.

This course will examine the impact upon pre-literate societies in America of European development and modernization programs that were conceived and carved out some 200 years before the Industrial Revolution. Students will confront the major theoretical problems of knowing the Third World and acquire an extensive interdisciplinary foundation for future thought about the Third World and its problems. Conducted in English.

FOR UNDERGRADUATES AND GRADUATES

103. *Portuguese Stylistics: Advanced Language Study and Creative Writing*

Mr. ALMEIDA.

Introduction to : (1) Portuguese structural forms, (2) various writing styles (literary, colloquial, expository, anecdotal, epistolary, etc.) and genres (short story, poetry, novel, drama, (3) various texts for purposes of stylistic analysis and practice in writing. Conducted in Portuguese.

121. *Afro-Brazilians and the Brazilian Polity* (Afro-American Studies 121)

Mr. DZIDZIENYO.

150. *Topics and Themes*150A. *Machado de Assis*

Mr. VIEIRA.

The major novels and short stories of Brazil's master realist will be studied with focus on narrative technique, theme and style. Aimed at critically evaluating the realist elements in these psychological works, the course will deal with textual analysis and Machado's contribution to the Realist School. Conducted in Portuguese.

150B. *Modern Brazilian Prose Fiction*

Mr. VIEIRA.

The major novels and short stories of twentieth-century writers. Attention will be given also to the analysis of Brazil's cultural development and nationalist image vis-a-vis the burgeoning awareness of the dynamics of the modern Brazilian novel. Authors to be studied are: Jorge Amado, Antonio Callado, Autran Dourado, Fernando Sabino, Guimarães Rosa, Clarice Lispector, and Dalton Trevisan.

150C. *Theories and Practice of Written Discourse*

Mr. ALMEIDA.

Intensive course designed for students who possess basic writing skills in Portuguese but who want to improve them particularly in the more demanding genres including fiction and the essay.

150D. *The Modern Brazilian Short Story*

Mr. VIEIRA.

Centers upon such twentieth-century short story writers as Monteiro Lobato, Mano de Andrade, Anibal Machado, Guimaraes Rosa, Rubem Fonseca, Clarice Lispector, Luiz Vilela and Murito Rubiso. With the aim of studying the aesthetics of the short form, this course will trace the development of the regional, psychological and fantastic short story and its remarkable vitality and florescence in modern Brazil. Conducted in Portuguese.

150E. *God is Brazilian — The Fictional World of Jorge Amado*

Mr. VIEIRA.

The major novels of Jorge Amado will be studied with the aim of analyzing this author's interpretation of Brazil's Human Comedy. From his early works to such modern and acclaimed novels as Gabriels and Teresa Batista, the class focuses on Amado's lyrical realism, character development, narrative form, and his depiction of class struggle, masculine/feminine roles, social injustice, and racial diversity. Conducted in Portuguese.

160. *Topics and Themes in Portuguese and Brazilian Literatures and Civilizations*160A. *Introduction to Portuguese Literature*

Mr. DIAS.

The study of literary theory and criticism for analysis of the most significant periods of Portuguese Literature. Attention given to such literary currents as structuralism and the New Criticism. Conducted in Portuguese.

160B. *The Social-Political Novel of Contemporary Portugal*

Mr. DIAS.

Focusing upon the pre-revolutionary writers who criticized the *modus vivendi* of dictatorial and imperialistic Portugal, course will discuss elements such as class struggle between the upper and middle bourgeoisie, Marxist dialectics vis-a-vis the proletariat, and the complicated network of social views among all classes. Conducted in Portuguese.

160D. *Eça de Queiroz*

Mr. DIAS.

The realism, naturalism and impressionism of Eça de Queiroz along with the objectives and programs of the Generation of 1870. Works under study will be *O Crime do Padre Amaro*, *Os Maias* and *A Cidade e as Serras* as examples of the various stages of the author's production. Conducted in Portuguese.

160E. *Twentieth-Century Portuguese Prose*

Mr. DIAS.

Critical Realism as seen in the works of Aquilino Ribeiro, Vitorino Nemésio, José Régio, Miguel Torga, J. Rodrigues Miguéis e Jorge de Sena. Conducted in Portuguese.

160F. *Counterpoints in Brazil's National History, 1824-1981.*

Ms. PINSdorf

Course integrates Brazil's role within world events of the 19th and 20th centuries; blends Brazilian aspects of other disciplines, such as economics, literature and Afro-Brazilian relations; stresses the analytic, dynamic nature of the historical method. Included are an historical overview from empire through old and new republics to the present military governments and the role of empire and army as the moderating power.

160G. *Research in Luso-Brazilian Studies*

Mr. DZIDZIENYO.

Topic: "The Afro-Luso-Brazilian Triangle. Socioracial and Political Perspectives, 1945-1982" Focuses on recent political developments in the historical triangular relations between continental Africa, Brazil and Portugal. Topics include: Luso-Brazilian relations and independence movements in Luso-phone Africa, Afro-Brazilians and Brazil's African Relations, and Post-colonial bilateral or multi-lateral relations within the Portuguese-speaking world. Conducted in English. Written permission.

160L. *Iberian and Latin American Value System: A Comparative Analysis*

Mr. ALMEIDA.

Analysis of the Iberian value systems (Portuguese and Spanish) and a comparison of their transformation in Brazil and Spanish-speaking Latin America. Readings from Gilberto Freyre, Sergio Buarque de Hollanda. Unamuno Octavio Paz, John Dos Passos, and others. Conducted in English.

160M. *Portugal and Brazil: Satire, Irony and Parody*

Mr. ALMEIDA.

Portuguese and Brazilian societies seen through a critical analysis of the representative and humorous fictional writings of Cardoso Pires, Alexandre O'Neill, Millor Fernandes, Paulo Francis, Carlos Eduardo Novaes, and Luis Veriasimo. Conducted in Portuguese.

198. *Reading and Guided Study.* S/NC

Mr. VIEIRA.

PRIMARILY FOR GRADUATES

201. *Bilingual Education*

Mrs. BECKER.

Will analyze and stress definition of bilingualism, the relationship between bilingualism and ethnicity; a history of bilingual schooling, the psychology of the bilingual child. Lectures and discussions as well as group study projects will guide the students toward research and analysis for their final papers or projects. Conducted in English.

202. *Problems in Bilingual Education*

Section 1. Language Arts for the Bilingual Curriculum

Section 2. Bilingual/Bicultural Education in Social and Cultural Contexts: A Comparative Approach

Mrs. BECKER.

The relationship of culture to educational practices is explored through investigation of the teaching/learning process in diverse cultural settings. Field work in the Portuguese community is encouraged as a means of interpreting the effectiveness of bilingual education within specific social contexts. Conducted in English.

212. *Methods and Materials for Portuguese-English Bilingual Programs*

Language learning theory for the first and second languages: the differences between the cognitive and behavioral schools, the basic phonological and structural differences between the two languages, the various approaches and activities dealing with language teaching; the adaptation and creation of bilingual teaching materials, and measurement for the bilingual course of study. Conducted in English.

291, 292. *Reading and Guided Study*

Reading in Portuguese language, literature, civilization, and bilingual studies. Conducted via Portuguese readings and discussions.

Psychology

Professors D. BLOUGH, CHURCH, DAVIDS, EIMAS, ENGEN, JONES, KLING, LIPSITT, MILLWARD, RIGGS (Emeritus), SCHRIER, SHEPP (Chairman), SORRENTINO; Associate Professors ANDERSON, P. BLOUGH (Research), HAYDEN (Adjunct); SIQUELAND, SPOEHR, WINCZE, WOOTEN; Assistant Professors GARCIA-COLL, MEGELA-SIMMONS, MEGELA, MURPHY, WALKER, WARREN, WRIGHT; Assistant Professors KERSTEN, MOORE (Research), Academic Department Manager, Mrs. DEVINE;

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

Psychology 1 or placement by examination (given at the beginning of each semester); Psychology 9 or 17 (Statistics); an advanced laboratory course, i.e., Psychology 103, 119, 120, or 153, an advanced course numbered from 170 through 196; five additional courses, which may include any of the above not used to satisfy the above requirements for a minimum total of eight Psychology courses beyond Psychology 1; Biomed 6 or Neural Sciences 1 to be taken before Semester VI. Applied Mathematics 165 or an alternative approved by the concentration advisor may replace Psychology 9. Another Biology course may replace Biomed 6 or Neural Sciences, with permission of concentration advisor.

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF SCIENCE DEGREE

The Sc.B. program in Psychology provides a framework within which students with scientific interest and abilities may concentrate in the behavioral sciences. Satisfactory completion of this program will provide the background needed for graduate study in any field of psychology.

A. Nine Courses to be taken in the Department of Psychology:

1. Psychology 1; 9 or 17; and 199.
2. One course to be selected from each of the following groups: Psychology 103, 119, 120 or 153. An advanced seminar course numbered from 170 through 196.
3. Four additional courses may include any of the above not taken to satisfy the above requirements. If the Psychology 1 requirement is satisfied by the placement examination (given at the beginning of each semester) the student should take five additional psychology courses in this category. A research sponsor for Psychology 199 must be selected not later than the first week of Semester VII, preferably by the end of Semester VI. Graduate courses may be substituted for some of these required courses upon approval of the Sc.B. advisor.

B. Eight supporting science courses selected from at least three of the following areas, with the approval of the Sc.B. Advisor: Applied Mathematics, Biomedical Sciences, Chemistry, Computer Sciences, Engineering, Linguistics, Mathematics, Neural Sciences, Physics. At least one course must be from either Biomedical Sciences or Neural Sciences. (Some courses offered by science departments, such as those intended for non-science concentrators may not meet this requirement).

Honors. The Honors program in psychology offers A.B. and Sc.B. candidates an opportunity to perform semi-independent research on topics of their own choosing. This research starts as independent reading during the junior year and culminates in a Senior Honors Thesis. Any member of the Staff may direct this research. Honors candidates must enroll in Psychology 199 during Semester VII or VIII.

The Honors program normally will consist of ten semester courses beyond the introductory course. In addition to the standard concentration program, A.B. candidates typically include two or more courses in other sciences or mathematics related to the Honors Thesis. Attendance at the weekly Psychology Colloquium is open to all candidates and it is expected that they will attend regularly.

At the end of the Senior year, honors candidates will take an oral examination on the special and general aspects of the Honors Thesis. (For information concerning eligibility and requirements, consult the Departmental Honors Advisor.)

GRADUATE PROGRAMS

DOCTOR OF PHILOSOPHY. Admission to the Graduate Program usually is limited to candidates for the doctoral degree. In addition to the general University requirements, candidates for the degree of Doctor of Philosophy must include in their programs three types of courses: (1) proseminars, (2) quantitative courses, and (3) speciality and general seminars. In addition, a candidate must complete two major research projects and write a preliminary examination. The program of each student is arranged with his/her committee. Potential applicants should write to the chairman for a brochure describing the areas of specialization in which graduate study is possible.

I. PRIMARILY FOR UNDERGRADUATES

All Undergraduate courses assume Introductory Psychology as a prerequisite.

1. *Introductory Psychology*

The STAFF.

The major methods, theories, and principles of psychology with emphasis on human behavior. Lectures, laboratory, discussions and demonstrations.

9. *Quantitative Methods in Psychology*

Messrs. SCHRIER and KERSTEN.

A survey of statistical methods and their application to behavioral data. Topics to be covered include elements of probability theory, correlational techniques, and principles of hypothesis testing and computer programming.

21. *Social Psychology*

Mr. WRIGHT.

The extension of general psychological principles and methods to the study of social behavior.

23. *Gender Issues in Psychology*

Ms. BLOUGH.

Gender issues from biological, developmental, social psychological and educational perspectives. Topics will include gender differences in various areas of behavior, but the emphasis will be on attempts to understand these differences. Will examine research and theory that focuses on gender variables in normal behavior.

27. *Perception*

Mr. WOOTEN.

The experimental and theoretical literature dealing with all aspects of the perceptual process. Emphasis on physiological mechanisms. Specific topics include the perception of color, form, motion and depth. Demonstrations used to illustrate phenomena.

30. *Personality*

Messrs. SIQUELAND and HAYDEN.

A survey of the psychology of personality. Such topics as conflict, anxiety, defense mechanisms, and aggression will be emphasized. Relationships between data and theory will be stressed.

33. *Abnormal Psychology*

Mr. DAVIDS.

The study of anxiety, stress, and neurotic disorders, psychosomatic disorders, deviant social behavior, affective disorders, and schizophrenia. Theories of etiology (causes) and methods of therapeutic treatment are considered. Case studies, experimental research and clinical research are presented, with the emphasis on controversial issues in contemporary psychopathology.

41. *Environmental Psychology*

Mr. ENGEN.

Both under — and overstimulation will be considered. The psychological effects of sensory deprivation associated with the almost total lack of daylight in northern countries in winter contrasted with midnight sun in summer and the sensory stimulation of constant noise and air pollution. Attention will be given to design of working and living environments, including concern with aesthetics as well as the perception of the environment.

50. *Animal Behavior*

Mr. SCHRIER.

The similarities and differences in the behavior of animals, ranging from the unicellular forms to the nonhuman primates. Topics include: the concept of evolution as it applies to behavior, and, very broadly considered, the evolution of the central nervous system; sensory capacities; species specific behavior (including instinctive behavior); learning and intelligence; and selected topics in the area of social behavior, such as animal communication.

74. Psychobiology

Mr. WALKER.

Goal is to explain behavior in terms of what we currently know about how brain cells communicate, and about how the nervous system transforms these nerve signals into behavior such as sensing, moving, sleeping, and remembering. This course is not open to students who had Neural Science I.

75. Biological Bases of Behavior

Ms. MEGELA-SIMMONS.

Analysis of physiological and anatomical bases of animal behavior, both vertebrate and invertebrate. Focus is primarily on neuroethology, the biological bases of species-specific behavior. Also offered as Neural Sciences 2. Prerequisite: Psychology 74 or Neural Science 1.

81. Child Psychology

Mr. LIPSITT.

Children's behavior and development including infancy. Learning processes, attachment, motivation, perception, language, intelligence, and effects of early experience on subsequent behavior. Empirical research on effects of environmental and constitutional factors development and behavior is emphasized. Major theories and considered as organizers of factual information within the field as well as source of testable hypotheses.

II. FOR UNDERGRADUATES AND GRADUATES**100. Cognitive Development**

Mr. EIMAS.

A study of some major aspects of cognitive development with an emphasis on the very early acquisition of knowledge. Prerequisite: 9.

101. Psychopharmacology

Mr. WALKER.

The study of the relationship between brain and endocrine chemicals, drugs, and behavior. The involvement of specific neurochemical systems in behavior and the use of drugs to manipulate these systems is covered. Prerequisite: 74 or Neural Science 1 or written permission.

103. Techniques in Physiological Psychology

The STAFF.

Laboratory course for advanced students in physiological psychology. Students observe prepared brain sections through a microscope, record the responses of isolated neurons in the visual system, map areas of motor cortex by electrical stimulation, observe behavioral changes following removal of certain areas of the brain, measure eye movements, and record gross electrical potentials from the human scalp. Prerequisite: 74 or Neural Science.

104. Psychological Assessment

Mr. DAVIDS.

A comprehensive survey of the tests, techniques and procedures used for psychological assessment of children and adults. Topics include measurement of intelligence, aptitude, and achievement; objective and projective methods of personality assessment; behavioral assessment; and diagnostic interviews. Emphasis on contemporary concerns and legal, ethical, and practical issues in psychological assessment. Prerequisite: 9.

105. Black Psychology (Also Special topics in Afro-American Studies 101B).

Ms. COLLINS.

119. The Psychology of the Senses

Ms. SORRENTINO.

The senses, primarily vision, hearing, touch, taste, smell, and pain with emphasis on psychophysics and physiology. The application of such knowledge on practical perceptual problems. Lecture plus laboratory one afternoon per week. The laboratory will teach psychophysics, such as audiometry, necessary for basic sensory assessment. Prerequisite: 9.

120. Simple Learning and Conditioning

Mr. BLOUGH.

Theories and principles of conditioning understood in the context of genetic, physiological and cognitive factors. This field is based largely on animal experimentation, but applications to human behavior and pathology will be discussed. Laboratory, involving animal subjects, meets one afternoon per week. Prerequisite: 9.

130. Behavioral Medicine

Mr. CHURCH.

Many health problems are essentially behavioral problems that are markedly affected by dietary habits, smoking, drinking, drugs and exercise. In each case, evidence from original studies will be evaluated and general explanations for the relationship between behavior and health will be developed. Prerequisite: 9.

142. *Perception: Odors and Sounds*

Mr. ENGEN.

To psychologists perception usually means visual perception, but this course presents other modalities, primarily olfaction and hearing, and will compare them. PY/142 deals with non-cognitive, affective, as well as cognitive functions of perception. In case of odor perception a popular question is whether or not there are aphrodisiacs, but in the case of hearing one tends to ask different questions, for example, how hearing impairment affects cognitive development. Recommended: Psychology 27.

152. *Human Information Processing and Cognition*

Mr. EIMAS.

Presents a broad introduction to the field of human information processing and cognition, organized around the topics of information processing, memory, and language. Prerequisite: 9.

153. *Laboratory in Cognitive Processes*

Mr. MURPHY.

Laboratory course for advanced students in human information processing and cognition. Will introduce techniques for experiments in perception, memory, problem-solving and psycholinguistics. Instruction in operation of experimental equipment (tachistoscopes, timers and microprocessors), and in principles of experimental design. Students will design and perform their own experiment using the techniques learned in the course. Prerequisite: 9, 152.

160. *Computational Vision*

Mr. KERSTEN.

How do we see? How can we design machines which see like us? Psychophysics, artificial intelligence, cognitive science, neurophysiology and communication theory will be applied to these questions. Biological and physical processing of images will be compared with respect to encoding and representation. We will study the computational theory and algorithms for problems of visual detection, recognition, stereo, motion, color constancy and shape-from-shading. Prerequisites: PY/27, MA/9 or 10, CS/11 or equivalent programming experience.

163. *Social Development*

Mr. WRIGHT.

An analysis of social development from early childhood through adolescence, with an emphasis on major theoretical models of socialization and social cognition. Topics will include parent-child interactions, person and self-perception, peer relations and group influences, sex role development, moral reasoning, and the development of antisocial behavior.

165. *Advanced Quantitative Methods in Psychology*

Mr. CHURCH.

Advanced quantitative methods in Psychology, with special emphasis on exploratory data analysis, nonparametric statistics, and complete applications. Prerequisites: 9 and written permission.

171. *Principles of Behavior Modification*

Mr. WINCZE.

Issues in the application of principles of general experimental and social psychology to human behavior disorders. Principles of learning and conditioning will be emphasized in the modification of problems from simple emotional and sexual disorders through complex "psychotic" syndromes. Measurement, experimental design questions, and ethical issues in the modification of behavior disorders. Prerequisites: 33 and written permission.

173. *Seminar in Social Psychology*

Mr. WRIGHT.

An advanced undergraduate seminar, with lectures and discussion dealing each year with a special topic in social Psychology. Prerequisites: 21 and written permission.

174. *Psychology and the Study of "Self"*

Mr. SIQUELAND.

Current humanistic and cognitive-social approaches to the study of "self-theory" offer contrasting solutions to the central paradox in personality theories as to how man can be both the cause and consequence of his society, as well as concepts of psychological health, pathology, and therapeutic models. Issues of theory, research and clinical practice, within frames of reference variously labelled "phenomenological," "existential," "interactional," "cognitive-social" or "humanistics." Prerequisite: 30. Enrollment limited. Written permission.

176. *Sociocultural Aspects of Development*

Ms. COLL.

The literature on cross-cultural and social class differences in cognitive and socio-emotional development from infancy to adulthood will be reviewed. Basic areas of development as attachment, emotions, social relations, perception, cognition and intelligence will be approached from a cross-cultural framework. Methodological and research issues in cross-cultural psychological studies explored through a project in the Providence area. Prerequisite: 81. Written permission.

181. *Artificial Intelligence/Human Intelligence*

Mr. MILLWARD.

What is the IQ of AI? AI work in vision, thinking, and language is reviewed and results compared to human capacities and theories. The role AI has and will play in theoretical psychology and cognitive science will be discussed. The programming language LISP will be taught. Prerequisite: a good knowledge of a programming language and advanced standing or written permission.

182. *Topics in Cognitive Science*

Mr. MILLWARD.

Project oriented. Each year a special topic will be considered. Students will work individually on background material and in groups developing special computer systems related to Cognitive Science. Examples of topics are: natural language understanding, models of semantic memory, image processing and vision, and intelligent computer assisted instruction. Prerequisite: 181 or Computer Science 141 or written permission.

183. *Current Issues in Cognitive Development*

Mr. SHEPP.

Specific topics may vary from year to year. Topics are chosen to reflect significant progress in research and/or social impact. In past years the seminar has examined research in attention and memory, psychological sex differences, and the Jensen controversy. Prerequisites: 9, 81, and 152 and written permission.

184. *Infant Learning and Development*

Mr. LIPSITT.

Behavior in the first two years of life, with particular attention to sensory and learning processes, and affect development. Smiling, walking, talking, and fear development are of special interest. The pleasures and annoyances of sensation are emphasized as cornerstones of social development. Each student conducts a research project or does a critical synthesis of knowledge about an aspect of infant behavior. Prerequisites: 9, 81.

185. *Language and Communication*

Mr. MURPHY.

A study of human communication as a function of psychological, linguistic and social factors. Topics covered include language comprehension and production, language acquisition by children, discourse, language and reasoning, and language as a social activity. Approaches from cognitive psychology, linguistics and artificial intelligence will be considered.

187. *Seminar in Physiological Psychology*

Mr. WALKER.

Lectures and discussion deal each year with a special topic in physiological psychology. For 1985-86, the topic will be: Pain and analgesia: physiological and neurochemical aspects. Prerequisites: Psychology 74 or Neural Science 1 and written permission.

189. *Current Research in Personality Theory*

Mr. HAYDEN.

A critical review of the current contributions to personality theory and their relationship to past and present personality theories. Emphasis on personality assessment, anxiety, cognitive variables, social learning theory, and notions of self. Formulation of research ideas toward clinical application and an integration of existent findings with theoretical constructs in personality theory are stressed. Prerequisites: 9 and 33.

190. *Advanced Abnormal Child Psychology*

Mr. DAVIDS.

Determinants and effects of psychopathology in children and families. Emphasis is on personality dynamics, motivation, learning, and interpersonal relations of children suffering from various emotional, neurological, behavioral and social disorders. Field trips to local institutions. Enrollment limited to senior concentrators in psychology. Written permission.

192. *Seminar in Psychological Measurement*

Mr. ENGEN.

Psychological testing (both clinical and educational) and the nature of the attributes it purports to measure. Essentially theoretical but will have practical implications for testing minority populations such as hearing-impaired children. Topics: statistical principles, IQ and its limitation, age levels whereby children are classified as delayed or not, performance vs. verbal tests, normative vs. criterion-referenced tests, and test validity. Prerequisites: 9 (or similar). Courses in child, personality, and assessment will also be helpful.

195. *Hearing and Deafness*

Ms. SORRENTINO.

An examination of hearing and hearing loss. Topics will include: the perception of pitch, loudness, noise, music and the location of sounds in space. The relations between hearing loss and aging, noise, and drugs will be explored. The current status of theories of audition will be evaluated. Lec-

tures, seminar reports, and demonstrations. Prerequisites: 119, 174 or written permission.

197. *Special Topics in Psychology*

Enrollment limited to Psychology concentrators who receive written permission of a Psychology department sponsor. Junior or senior standing and Psychology 1 plus at least three other Psychology courses are required. Apply through departmental advisor.

199. *Experimental Problems*

The STAFF.

An opportunity for advanced students to engage in directed research. Students develop research plans, carry out a project, and analyze the data. Credit is not given solely for assisting in an ongoing project. Students should seek out a sponsor and arrange for the course before the beginning of the term. Required of senior Honors and Sc.B. candidates, who must work under the direction of a member of the Psychology Department staff. May be taken by others with written permission of the Department. May not be taken more than once for concentration credit.

Psychological Colloquium

A weekly meeting for the discussion of research problems presented by visiting scholars and members of the Department. Attendance is required of graduate students and seniors who are candidates for Honors.

III. PRIMARILY FOR GRADUATES

200, 201. *Introduction to Psychological Research*

Ms. SORRENTINO and STAFF.

Required of and restricted to first-year graduate students.

202. *Quantitative Methods in Psychology*

Messrs. EIMAS and MOORE.

A study of quantitative methods in psychology, including psychological applications of mathematical techniques, and analysis of variance.

203. *Research in Experimental Psychology*

The STAFF.

205. *Practicum in Teaching*

The STAFF.

Each student will be assigned to one or two laboratory sections, with increasing responsibility for supervision of the laboratory work, giving lectures under supervision, and for reading reports. This course is repeated with progression from elementary to advanced courses.

207, 208. *Proseminar in Psychology*

Mr. CHURCH and STAFF.

A study of selected topics in sensory and physiological psychology, learning, animal behavior, human cognition, information processing, and developmental psychology. Offered every year. S/NC.

210. *Seminar in Perception*

Messrs. WOOTEN and KERSTEN.

A seminar in the basic processes of vision.

232. *Seminar in Animal Behavior*

The STAFF.

Offered every year. May be repeated for credit. For current topics, see Course Announcement.

233. *Seminar in Cognition*

The STAFF.

Offered every year. May be repeated for credit. For current topics, see Course Announcement.

234. *Seminar in Child Psychology.*

The STAFF.

Offered every year. May be repeated for credit. For current topics, see Course Announcement.

238. *Seminar in Physiological Psychology*

Ms. MEGELA-SIMMONS.

Religious Studies

Professors DIETRICH, FRERICHs, MILHAVEN, MOEHRING, REEDER (Chairman), TWISS, WULFF; Assistant Professor STOWERS, Mellon Post-Doctoral Fellow in Religious Studies ROTH.

The Department offers instruction in the academic study of religion (undergraduate and graduate) and preparation for college and university teaching. Descriptions of the graduate programs are available from the administrative assistant of the Department.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

Requirements: Religious Studies 11 and seven other courses. Each student, in consultation with appropriate faculty members, devises a concentration program, which may include courses given outside the department. The student presents for approval by the concentration advisor a written statement of the objectives of his or her concentration program and a list of the component courses. The program is expected to encompass the study of at least two religious traditions. It will take account of more than one approach to the study of religions, e.g., philosophical, historical. A Religious Studies concentration with Honors requires, in addition, an Honors thesis (Religious Studies 192, during both semesters of the senior year). Students interested in graduate work in Religious Studies should include the study of French and German in their programs. In some fields a knowledge of the appropriate classical languages is also essential for advanced work. Students should start work in these languages as early as possible.

RELATED COURSES OR PROGRAMS. The study of religion can be related to literature, art, the human and social sciences, philosophy, the study of antiquity, and other areas. In addition to the courses offered in the Department, students should be aware of the possibilities which the University offers in such departments as Anthropology, Art, Classics, Comparative Literature, Egyptology, English, History, History of Mathematics, Linguistics, Philosophy, and Sociology and in such programs as Afro-American Studies, American Civilization, Bio-Medical Ethics, Judaic Studies, and Renaissance Studies.

GRADUATE PROGRAMS

The focus of departmental graduate work is on the doctoral program. The Ph.D. program is open to both college graduates and persons holding the M.Div. or its equivalent. The A.M. program is open to college graduates; the Department does not admit students holding the M.Div. or its equivalent to this program. Students whose previous study of religion is considered by the Department as too limited in scope may be directed to take undergraduate courses in addition to those usually required for the degree.

MASTER OF ARTS. The Master of Arts in Religious Studies will be conferred upon the completion of an approved program of eight semester courses and a thesis. One or two of the required courses may be used for research in connection with the thesis. The candidate is expected to develop competence in the Theory of Religion through formal course work. The candidate must pass an ETS examination at the appropriate level in either French or German.

DOCTOR OF PHILOSOPHY. The Department offers advanced work in two areas: History of Religions: Early Christianity and Western Religious Thought.¹ Students in both doctoral programs will satisfactorily complete Religious Studies 200 (Theory of Religion). The candidacy of the student for the degree of Doctor of Philosophy shall be certified no later than the end of the seventh semester in the student's program.

HISTORY OF RELIGIONS: EARLY CHRISTIANITY

Qualifying examinations

1. History, literature, and cults of the Graeco-Roman age from the death of Alexander till the reign of Constantine the Great.
2. History, literature, and religion of ancient Israel and of Judaism during the second commonwealth (including the writings of Flavius Josephus).

Preliminary examination

The preliminary examination must be completed by the end of the first semester of the year in which the student expects to receive the degree. This examination is comprehensive in character. In addition to the central issues called for in the questions, the responses should reflect the student's understanding of the following: theories of religion; history of scholarship, including the philosophical and theological presuppositions of selected researchers in the field.

1. History, literature, and religion of Christianity till the end of the second century, with special emphasis upon the New Testament.

¹ During the Orientation Program preceding the opening of classes in September, entering graduate students will discuss with the faculty a topic submitted in advance by the student. The topic will be selected from the general area in which the student wishes to specialize.

2. Christianity till the Council of Nicaea.
3. Area of dissertation.

Language requirements

Applicants for admission to the program must have done *at least* one year of formal work at college level in Greek; preference will be given to applicants with a second year of Greek and one year of a modern language, preferably German.

1. Ability to read Greek and Latin texts, to be tested by annual written examinations administered by the department, until the student is excused.
2. Area of specialization may require further languages (especially Hebrew and Aramaic); appropriate competence in such languages must be demonstrated by examination administered by the Department before the student may take the preliminary examination in the area of his or her proposed dissertation.
3. French, German: requirement in German to be met by ETS examination during first year of residence; in French, by ETS examination before admission to the preliminary examination.

WESTERN RELIGIOUS THOUGHT

The doctoral program in Western Religious Thought has three major areas of concentration:

1. Philosophy of Religion: religious language and symbol; problems of religious knowledge; theories of religion and methods of religious inquiry.
2. Issues in Theology: methods of theological investigation; classical and contemporary problems in theological discussion.
3. Religious Ethics: methods (including comparative) of religious ethics; issues in theological ethics; contemporary moral problems.

Students will ordinarily focus their work in one of these areas. The candidacy of the student for the degree of Doctor of Philosophy shall normally be certified by the beginning of the seventh semester of the student's program of study.

General Requirements

Students will study a religious tradition in an upper-level course which employs the methods of the history of religions, and will take two advanced courses or pro-seminars in the history of Christian or Judaic thought.

Preliminary Examination

Students will ordinarily take a preliminary examination in one of the three areas of the program. The precise scope and content of the examination will be determined by consultation between each individual student and the faculty in Western Religious Thought. Foci of the preliminary examination for each area of the program may be illustrated as follows:

1. Philosophy of Religion:
 - logical status of religious discourse; verifiability debate; theories of religious symbolism and myth;
 - concepts of faith; status of religious experience; theistic proofs;
 - projectionist theories of religion; phenomenology of religion.
2. Issues in Theology:
 - human experience in theological argument; transcendental method;
 - discussions of divine transcendence; understandings of the human person; comparison of 19th and 20th century Christian and Judaic theological systems.
3. Religious Ethics:
 - relations between religion and morality; comparative religious ethics;
 - love and justice; divine action and human response; natural law; value implications of psychotherapy;
 - abortion and infanticide; sexual values; morality of war; religious critiques of social injustice; issues in bioethics.

Language requirements

The student must demonstrate by ETS examination a reading knowledge of at least two modern foreign languages (ordinarily French and German).

SPECIAL STUDIES

Students after one year of graduate study at Brown University may apply to the Department and the Graduate Council for entrance into a Ph.D. program in Special Studies. The Department of Religious Studies encourages discussion of this program with students whose professional goals, centered in the study of religion, cannot be accommodated within existing departmental or interdepartmental programs.

I. PRIMARILY FOR UNDERGRADUATES

2. *Introduction to Christianity*

Mr. DIETRICH.

What is constant and what is changing in forms of religious life and expression from the first to the twentieth century? Jesus as the Christ and the church as sect of first century Judaism; the social and cultural success of Christianity in the late Roman Empire; papal primacy and Latin Catholicism; Byzantine Christianity; medieval Europe as a Christian culture; the Reformation; the sense of sin and conversion to Christ in modern times; secularization as a post-Christian phenomenon; the 20th century modernization of Roman Catholicism; Christianity and the American experiment.

3. *Introduction to Eastern Religions*

Ms. WULFF.

Fundamental forms and structures common to the Hindu and Buddhist religious traditions: 1) the goal of realization or enlightenment and such means to that goal as asceticism, study, meditation, and paradox; 2) ritual forms such as image worship, pilgrimage, and festivals; and 3) the tantric symbolism of mudra (gesture), mantra (mystic syllable), and mandala (sacred diagram). Attention to traditional roles, including those of the Hindu holy man, the Buddhist monk, and the guru, in relation to society.

5. *Introduction to Islam*

Introduction to the meaning and significance of the religion of Islam. Islamic scripture, doctrine, ritual, architecture, law, and sects. The origins and early development of Islamic religion, through Abbasid times. The life of Muhammad and the Qu'ran; the caliphite and sectarian movements; Islamic theology and law; Sufism and mysticism. Classical and contemporary materials.

11. *Approaches to the Study of Religion*

Mr. MOEHRING.

An examination of the various approaches taken to the study of religion and religions during the past two centuries. A correlation of the study of religions with the development of intellectual history in general and attention, in particular, to the influence of philosophical systems, the growth of linguistic and ethnographic studies, historiography and historicism, evolutionary thought patterns (from animism to monotheism), anthropology (e.g., Frazer), psychology, sociology (e.g., Max Weber). Discussion of attempts to reduce religion to a function of some other dimension of human experience (e.g., Marx Freud, and Jung) and its classification as a merely human attempt to understand reality (Karl Barth).

15. *Introduction to the Bible: Ancient Israel* (Judaic Studies 71)

Mr. FRERICHS.

An approach to Ancient Israel with primary focus upon the Hebrew Bible and related readings from Mesopotamia and Egypt. Legal, historical, prophetic and wisdom literature in translation.

16. *Myth and Religious Experience*

Myth as an expression of religious experience. The problem of distinguishing myth from other types of religious literature. Ways of interpreting myth. Reading of selected texts, together with the criticism of such writers as Levi-Strauss, Girard, Ricoeur, Jung.

19. *Contemporary Religious Thought: Judaic and Christian* (Judaic Studies 3)

Mr. DIETRICH.

God the problem, the death of God, and God "after Auschwitz." Secular progress and Judaic and Christian projections of the future: Christian "theology of liberation," liberal Judaism and Messianic humanity; theological interpretations of Zionism. Is Christianity intrinsically anti-Judaic? The relation of Judaism and Christianity. Major Judaic and Christian thinkers, e.g. Baeck, Rosenzweig; H.R. Niebuhr. Rahner, Moltmann, Metz, Rosemary Ruether.

21. *Faith and Reason*

Mr. TWISS.

This course explores critically the nature of religious faith to provide a coherent understanding of this central religious phenomenon and concept. Inquiry is guided by two basic questions: How are

we to conceive of faith's principal elements — of knowledge, will, emotion and action — and their interrelations? Is the person of faith, especially in the modern context, to be regarded as reasonable or unreasonable? Additional topics: the nature of religious experience, subjectivity and religious truth, the role of faith in the moral life.

22. *Religious Ethics and Moral Issues*

Mr. REEDER.

An introduction to basic concepts in Judaic and Christian ethics. The course examines the relation of moral teachings to the broader theological framework in which they occur and compares the positions of religious moralists with those of secular thinkers. Attempts to formulate new versions of the traditions will be analyzed by focusing on contemporary debates about abortion and war.

23. *Religious Thought and Modern Culture*

Mr. MILHAVEN.

Certain groups in modern culture struggle for their freedom and identity in the face of constrictions long imposed on them by the culture and endorsed in part by the Christian tradition. Certain contemporary Christian thinkers argue that Christians should rather support these struggles. The course focuses on some of these Christian arguments for the movements towards greater freedom and self-affirmation of blacks, women, and homosexuals.

24. *Religious Thought and the Human Sciences*

Mr. MILHAVEN.

Certain images of the person formed by psychoanalytic practice and theory and current in contemporary Western culture challenge images of the person affirmed in the Christian tradition. Examination of some of these challenges and some sympathetic responses of Christian thought. Authors studied include Freud, Marcuse, N. Brown, E. Becker, M. Luther, N. Kazantzakis, S. Keen.

25. *Religious Thought in Modern Literature*

Mr. TWISS.

Topic for 1984-85, 1985-86: Moral Selfhood and Religious Commitment.

Themes and issues of moral and religious thought as represented and explored in imaginative literature. Topics: meaning and project of selfhood; immorality, evil, and subversion of the self; strategies of personal redemption and ideas of grace. Readings include literary works coordinated with reflective philosophical and religious essays. Authors include Kierkegaard, Sartre, Murdoch, Conrad, Camus, C.S. Lewis, Dostoyevsky, Flannery O'Connor, Walker Percy. Emphasis on critical writing and discussion.

51. *Greek and Hellenistic Religions (Classics 51)*

Mr. MOEHRING.

An introduction to the religious traditions of the Eastern Mediterranean basin from the Minoan Age to the Greco-Roman period; the interaction of political, social, and cultural factors with religion; the Homeric tradition and the cult of the *poleis*; religious aspects of the great philosophical schools; syncretistic mystery cults; cults of rulers; popular religion, including astrology.

63. *Judaism before A.D. 70*

Mr. MOEHRING.

The religious developments within Judaism during the period from Ezra-Nehemiah to the destruction of the Second Temple; the interaction of Judaism and Hellenistic culture.

71. *Introduction to the Bible: Earliest Christianity*

Mr. STOWERS.

Introduction to earliest Christianity through literary and historical investigation centered on its oldest literature. How, in historical situations and social contexts, systems of religious concepts were used to form and maintain distinctive human communities. Scope: from Christian origins in Greco-Roman Judaism to the attempt to comprehend various ways of being Christian in the normative self-definition of catholic Christianity in the second century.

72. *Christianity in Late Antiquity*

Mr. STOWERS.

The social and intellectual history of Christianity in the crucial period from the second to the sixth centuries when it grew from a minor, persecuted sect to the master of Western culture. Special attention to Origen, Gregory Nyssa, Gregory Nazianzus, Augustine. Topics: types of Christianity; doctrine, controversy and self-definition; relations to the state; relations to Judaism and classical culture; forms of Christian community and Christian literature.

81. *The Hindu Tradition*

Ms. WULFF.

Development of religious forms in India from the time of the Indus Civilization to the present, including some attention to the Jain and Buddhist reform movements. Representative texts include Rigvedic hymns, Upanishads, the *Bhagavad Gita*, puranic mythology, devotional poetry, and medi-

eval and modern philosophical treatises. Aesthetic materials, both visual and aural, will be employed to provide a sense of the rich texture of Indian spirituality.

82. *Buddhism in South and Southeast Asia*

Mr. ROTH.

The development of Buddhist thought and practice in India and Southeast Asia. Pre-Aryan and Vedic antecedents; the traditional account of the life of the Buddha and his fundamental teachings; the early monastic community; the emergence of doctrinally divergent sects; the Mahayana; tantric symbols and practices. Emphasis on the reading of primary texts; attention also given to Buddhist sculpture, monastic discipline, and meditation practices.

83. *East Asian Buddhism: China and Japan*

Mr. ROTH.

A survey of the transmission of Buddhist teachings and practices from India through Central Asia to China and Japan, and the development of unique Buddhist forms in the East Asian context. Particular attention to the encounter between the Indian teachings and Taoist and Confucian components of the Chinese religious complex, and the subsequent mingling of Chinese Buddhist teachings and indigenous Chinese elements with the emerging Shinto tradition in Japan.

88A. *Parables and Paradoxes: The Limits of Language and the Redescription of the Self* (Issues in the History of Religions)

Mr. STOWERS.

A study of literary, philosophical, and religious thinkers; i.e., Jesus, Kierkegaard, Tolstoy, Kafka, and Wittgenstein, who understood themselves to be living in times of acute cultural crisis and who turned to parables to show what could not be said by means of normal discourse. An investigation of forms of language which have been used to challenge accepted boundaries of belief and knowledge and have resulted in new descriptions of the human situation.

II. FOR UNDERGRADUATES AND GRADUATES

112. *Old Testament Theology*

Mr. FRERICHS.

Historic and systematic analysis of central themes in Old Testament theology. Prerequisite: Religious Studies 15 or written permission.

117. *Studies in Early Christianity*

Mr. STOWERS.

Studies in the history, literature, and doctrinal developments, both Eastern and Western, of the first nine centuries of Christianity. Topic for 1985-86: Paul and His Interpreters; topic for 1983-84: Greco-Roman Society and Early Christian Ethics.

122. *Ethics of Judaism*

MESSRS. REEDER and TWISS.

The aim of the course is to analyze the moral elements in the world-view of rabbinic Judaism. After a preliminary inquiry into the structure of moral codes and the nature of religious ethics in particular, the course will examine representative literature from critical periods in the history of Judaism: biblical, classical rabbinic, medieval, and modern. Offered on a cyclical basis.

123. *Ethics of Christianity*

Mr. REEDER.

Critical examination of basic elements of the ethics of Christianity in their scriptural origin, historical development, and contemporary form. Christian ethics as part of a framework of beliefs about the origin and destiny of man. Interpretations of the figure of Jesus and, in particular, views of the relation of the Kingdom of God, seen as present or future, to the demands of social and individual morality. Offered on a cyclical basis.

124. *Ethics of Buddhism*

The concept of *sila* (precepts, ethical principles) in Buddhism: its role in Hinayana Buddhism in both lay ethics and monastic regulations (the *Vinaya Pitaka*); the general role of the precepts in the Mahayana — its situational ethics — and a general outline of the position of the precepts in Chinese Mahayana Buddhism. Developments in Japan, in practice and in theory; the decline of Japanese monastic practice; recent scholarship in the field. Prerequisites: Religious Studies 82 or 83, or permission. Offered on a cyclical basis.

125. *Religion and Morality* (University Course 125)

Mr. TWISS.

Topic for 1983-84, 1985-86: Virtues. Examination of the nature, function, and justification of moral and religious virtues. Special attention to such topics as: psychology of the moral virtues; concepts and contexts of altruism; models of faith and hope; the relativity of virtues. Readings from moral philosophy and religious ethics.

126. *Religion and the Good Society: I. Sex, Children, and Gender Roles*

(University Course 132)

Mr. REEDER.

Moral and legal codes deal with the goals and norms of sexual intercourse (who, when, where, how, and why), modes of childrearing, and the roles of men and women. The course will examine religious teachings on these subjects (principally Judaic and Christian) and the views of contemporary philosophers and other writers. Concrete social institutions such as *kibbutzim* will be discussed. Written permission.

127. *Religion and the Good Society: II. Economic Justice* (University Course 133)

Mr. REEDER.

Religious visions of the good society; interpretations of economic and political institutions; comparisons with thinkers such as Marx and Rawls. Connections between views of human nature and history and prescriptions for social change, in particular, the relation between notions of ultimate salvation and responsibility for the alleviation of suffering and injustice; the relation of socio-scientific analysis to normative social thought. Written permission.

128. *Biomedical Ethics*

Mr. TWISS.

The conceptual, moral, and social issues raised by recent developments in genetics and genetics-related research, including medical genetics, molecular genetics, and evolutionary theory. Topics include: justifications for the practices of applied human genetics; issues of social control of applied genetics research; moral presuppositions and implications of inquiry into the genetic basis of human behavior.

131. *Religious Language and Symbol*

Mr. TWISS.

A critical inquiry into the logic of religious discourse and the nature of religious symbolism. Topics: meaning and cognitivity in theological discourse; mythic expression and the notion of symbolic meaning; concealed meanings and the problem of hermeneutic. Readings from work in philosophical theology, analytical philosophy of religion, and hermeneutical theory. Offered on a cyclical basis.

132. *Problems of Western Religious Thought*

Mr. MILHAVEN.

Topic for 1985-86: Anger. Study of various understandings and evaluations of anger in Greek sources of the Christian tradition, e.g., Plato and Aristotle; in the Hebraic and Greek Bible; in Christian theologians of the tradition, e.g., Thomas Aquinas, Martin Luther; in contemporary thought, religious and secular. Students will eventually develop and present their own understanding and evaluation.

132B. *Mysticism and Meditation*

Mr. MILHAVEN.

Study of various understandings and evaluations of mysticism and meditation and their impact on personal life. Works discussed will include the *Phaedrus*, *Symposium*, the Bible, the *Enneads*, *The Clouds of Unknowing*, as well as modern writings of G.M. Hopkins, George Bernanos, Simone Weil, Annie Dillard and Thomas Merton. Students will eventually develop and present some understanding and evaluation of their own.

135. *History and Hermeneutics*

Mr. TWISS.

An inquiry into the nature of historical interpretation through the analysis of modern descriptions of historiography and their application to historiographic examples from Judaism and Christianity. Attention will be given to recent work in analytic philosophy of history and hermeneutical theory. Topics include: the role of causal analysis in history, the logic of historical explanation, and the epistemology of historical judgment. Offered on a cyclical basis.

137. *Issues in the Philosophy and Theory of Religion*

Mr. TWISS.

Current issues in the philosophy and theory of religion. Attention to such issues as: concepts of deity and their coherence; arguments about divine existence; nature of religious faith; status of religious experience; miracles and the modern world view; the self and immortality; theories about the nature, function, and rationality of religious beliefs and practices. Topic for 1985-86: Religious Experience, Numinous and Mystical. Examination of recent inquiry into the nature of religious experience. Offered on a cyclical basis.

138. *Topics in Western Religious Thought*

Topics for 1984-85: Augustine, Luther, and the Introspective Conscience of the West (Mr. DIETRICH); Religion and Alienation in Twentieth Century Culture (Mr. DIETRICH). Topic for 1985-86: Freudian Ego and Id from Perspectives of Western Religious Thought (Mr. MILHAVEN.)

161. *Israelite Religion in Its Near Eastern Context*

Mr. FRERICHS.

Religion of ancient Israel through an examination of selected literary and archaeological evidence from Mesopotamia, Egypt, and Israel. Primary emphasis upon first-millennium religious life to the period of Ezra. Offered on a cyclical basis.

170. *Biblical Interpretations of Judaism and Christianity* (Judaic Studies 31)

Mr. FRERICHS.

Major methods of biblical interpretation used in the Jewish and Christian traditions. Attention to the following methods: allegorical, typological, literary-historical, formcritical, traditio-historical, theological. Application of these methods to biblical texts of major doctrinal or historical concern in Judaism and Christianity. Offered on a cyclical basis.

171. *History of Christian Thought: Early*

Mr. STOWERS.

Intellectual developments in the church of the first ten centuries, and their relationship to concomitant developments of Christian life and history. Offered on a cyclical basis.

172. *History of Christian Thought: Medieval*

Theological, metaphysical, and ethical elements of the Christian religious tradition in the church of the medieval Western period. Representative thinkers and movements. The relation of such conceptual and theoretical elements to religious practice, ecclesiastical institutions, and civilization. From the period of theological renewal about 1080 (Anselm) through the fifteenth century. Offered on a cyclical basis.

173. *History of Christian Thought: Reformation and Early Modern*

Theological and ethical elements of the Christian religious tradition in the period of the sixteenth century Protestant and Catholic reformations; development and disintegration of Christian thought during the seventeenth century and the Enlightenment. The varieties of Protestant (Luther, Calvin, the Anabaptists), Anglican, and Roman Catholic (Erasmus, Trent, and Catholic mysticism) reformation. The impact of rationalist metaphysics, empiricism, historical criticism, and the Enlightenment critique of religion. Offered on a cyclical basis.

174. *History of Christian Thought: Nineteenth Century*

Mr. DIETRICH.

Theologies and anti-theologies (Kant, Romantic theology, Hegel; Feuerbach, Nietzsche). Religious belief and critical history (science, belief, and biblical criticism in Britain; Liberal Catholicism and Catholic Modernism; Kantian liberal Protestant theology and the History of Religions School in later nineteenth century Germany). Offered on a cyclical basis.

175. *History of Christian Thought: Twentieth Century*

Mr. DIETRICH.

Late nineteenth and twentieth century interpretations of the Christian theological tradition. Christianity as ethical monotheism; the History of Religions School; Roman Catholic Modernism; Schweitzer and the quest of the historical Jesus; Troeltsch and historical relativism; American religious pragmatism; the Kierkegaard revival; neo-Reformation, neo-orthodox theology, e.g., Barth, Reinhold Niebuhr; existentialist theologies; Tillich; new forms of Roman Catholic thought. Offered on a cyclical basis.

176. *Types of Contemporary Christian Thought*

Mr. REEDER.

Topic for 1985-86: Western Liberalism and its Theological Critics. Critiques of individualism and equality by feminist and liberation theologians; social location, ideology, and the relation of theory and practice; the "abstract individualism" of neo-Kantian and natural rights traditions; notions of community based on concepts of human good and benevolence.

177. *History of Religion in America* (History 177)

Mr. McLOUGHLIN (History).

188. *Topics in the History of Religions*

Ms. WULFF

Topics for 1985-86: Religion and Drama in India.

191. *Individual Study Project*

The STAFF.

Directed reading, research.

192. *Thesis Preparation*

The STAFF.

Required of seniors in the Honors Program. Open to others only by permission of the chairman of the department.

193. *Topics in Biblical Studies*

Mr. FRERICHS.

194. *Topics in Hellenistic Judaism*

Mr. MOEHRING.

195. *Topics in Early Christianity*

Mr. STOWERS.

III. PRIMARILY FOR GRADUATES

200. *Theory of Religion*

Mr. MOEHRING.

Critical examination of major approaches to the study of religion, together with disciplined efforts to define and explain religious phenomena. Particular attention to such topics as: psychological and social functions of religion; theories of religious myth and ritual; debates about the rationality of religious beliefs and practices. Readings from the human sciences (including the history of religions), hermeneutical theory, and philosophy of social science.

201. *Interpreting Religion: Theory and Practice.*

MESSRS. FRERICHS and TWISS.

Critical examination of contemporary theories and methods of interpretation — phenomenological, psychological, anthropological, historical, literary, semiotic, philosophical — in relation to the academic study of religion. Consideration of different kinds of religious texts and cultural forms and ways of analyzing them. Attention to the problems and issues of articulating a general theory of interpretation as the methodology for the human sciences and the science of religion. Prerequisite: Religious Studies 200 or written permission.

211, 212. *Seminar: Western Religious Thought* (Judaic Studies 207: Seminar in Modern Judaism.

Topic for 1985-86: Franz Rosenzweig and Emmanuel Levinas: On Confrontation with the Personal and the Collective Religious "Other." Mr. DIETRICH.

221, 222. *Seminar: Biblical Studies*

Mr. FRERICHS.

231, 232. *Seminar: Early Christianity*

Topics for 1984-85: Alexandrian Christianity, especially Clement and Origen. Mr. MOEHRING; Paul's Letter to the Romans. Mr. STOWERS; Topics for 1985-86: The Greek Apologists. Mr. STOWERS.

291. *Independent Research*

The staff is willing to offer independent reading courses in the following areas:

Mr. DIETRICH:

- Sec. 1 Late 19th and Early 20th Century Christian Thought: Protestant and Roman Catholic
- Sec. 2 Comparative Modern Judaic and Christian Theology

Mr. FRERICHS:

- Sec. 3 Nineteenth-Century Biblical Interpretation, especially Jewish
- Sec. 4 Contemporary Biblical Hermeneutics and Methods of Interpretation

Mr. MILHAVEN:

- Sec. 5 Issues in Contemporary Christian Ethics
- Sec. 6 Christian and Psychological Understandings of the Human Person
- Sec. 7 Theological Perspectives on Secular Values and Divine Transcendence

Mr. MOEHRING:

- Sec. 8 Hellenistic Judaism: Philo
- Sec. 9 Hellenistic Judaism: Josephus
- Sec. 10 Early Christianity and the Roman Empire
- Sec. 11 Representative Historians of Early Christianity in the 19th and 20th Centuries
- Sec. 12 Current Issues in the Study of Early Christianity
- Sec. 13 Issues in Greek and Hellenistic Religions

Mr. REEDER:

- Sec. 14 Notions of a Religious Source of Moral Obligation
- Sec. 15 Moral Evil and Religious Notions of the Triumph of Goodness

Sec. 16 Salvation as Transmoral

Mr. STOWERS:

- Sec. 17 Cynicism, Stoicism, Epicureanism and Early Christianity
- Sec. 18 The Form and Function of Early Christian Literature
- Sec. 19 Early Christian Ethics
- Sec. 20 Studies in Early Christian Social History

Mr. TWISS:

- Sec. 21 The Virtues
- Sec. 22 Comparative Religious Ethics
- Sec. 23 Phenomenology of Religion
- Sec. 24 Philosophy of Religion
- Sec. 25 Biomedical Ethics

Ms. WULFF:

- Sec. 26 Interpretations of Myth
- Sec. 27 Hindu Texts
- Sec. 28 Indian Philosophy
- Sec. 29 Religion and Drama
- Sec. 30 Religion and Music
- Sec. 31 Religion and Aesthetics

292. *Preparation of Theses and Dissertations*

The STAFF.

Note: Extended descriptions of all courses open to undergraduates are posted in the Department of Religious Studies, 59 George Street.

Renaissance Studies

DE WITT ALLEN, *Assistant Professor of English*; PHILIP J. BENEDICT, *Assistant Professor of History*; WALTER DAVIS, *Professor of English: Chairman*; LAURA DURAND, *Associate Professor of French*; STEPHEN FOLEY, *Assistant Professor of English*; JONATHAN GOLDBERG, *Professor of English*; MARY S. LEWIS, *Assistant Professor of Music*; ANTHONY MOLHO, *Professor of History*; JEFFREY M. MULLER, *Assistant Professor of Art*; KAREN A. NEWMAN, *Assistant Professor of Comparative Literature*; ANTHONY J. OLDCORN, *Associate Professor of Hispanic and Italian Studies*; MICHAEL C. PUTNAM, *Professor of Classics*; ANDREW J. SABOL, *Professor of English*; JUERGEN SCHULZ, *Professor of Art*; IVAN F. WALDBAUER, *Associate Professor of Music*; SUSANNE WOODS, *Associate Professor of English*.

UNDERGRADUATE PROGRAM

The concentration in Renaissance Studies is designed to encourage a comprehensive view of a period for which the interdisciplinary approach is especially fruitful. Students will be invited to explore several aspects of the period and several disciplinary approaches to it — e.g. history, literature, thought, art, music. The aim is to enhance the student's understanding of the period itself, and also of the uses, limitations and interrelationships of the methods of particular disciplines. Sponsoring departments are: Art, Music, History, English, French Studies, Hispanic and Italian Studies, Comparative Literature, German, Classics, History of Mathematics.

Requirements:

1. History 107 (Renaissance Italy) and History 108 (Europe in the Age of Charles V).
2. Three courses on Renaissance topics in one field in which the student has primary interest and training. (The Renaissance concentration can easily be combined with standard departmental concentrations.)

3. Three courses related to the Renaissance chosen from two other fields.
4. A project seminar in the final semester, designed to enable students to gain perspective on their concentration programs through the preparation and presentation of an original paper or project. During the first part of the semester, the student will work closely with one or more members of the cooperating faculty in the definition and preparation of his paper. During the final weeks, students will present their papers to the seminar for discussion and criticism, thus contributing to and benefiting from the experience and perspectives of other students and faculty. Credit for the work will be granted through the medium of registration by the concentrator for one course credit of Independent Study (Reading and Research) in the Department in which the topic of research lies.
5. Reading knowledge of a relevant modern or ancient language other than English.

Interested students may discuss the program with any member of the Committee.

Semiotics

The Interdepartmental Program in Semiotic Studies is administered by an Executive Committee consisting of Professors AHEARN (French and Comparative Literature), GOUX (French), HENKLE (English), MAYER (Art and Semiotics); Associate Professors BEEMAN (Anthropology), DOANE (English; Acting Program Director), SCHOR (French), SILVERMAN (English; Director of Film Studies; Program Director), SMITH (German); Lecturer TANNENBAUM (Theatre Arts); and Ms. WEED (Director, Sarah Doyle). In addition, the following faculty are active in teaching or advising in the Program: Professors SCHOLLES (English and Comparative Literature), WALDROP (English), WILMETH (Theatre Arts); Associate Professor HUGOT (French); Assistant Professors GOLOPENTIA-ERETESCU (French), ROONEY (English); Lecturers DUNBAR (Theatre Arts), and THORNTON (Semiotics).

UNDERGRADUATE PROGRAMS.

This concentration emphasizes the study of systems that organize, regulate and classify the production, transmission, and interpretation of signs. The individual human subject, the specific text, and the surrounding culture are all linked by a network of languages, media, discourses, and genres which are the main objects of semiotic study. Concentrators are expected to improve their own expressive and interpretive skills in at least one medium, while developing a firm grounding in semiotic theory.

A concentration in Semiotics consists of ten semester-courses, distributed as follows: at least four in theory (one of which must be Semiotics 12, 66, or 112), at least three in analysis, and at least two in production. For Honors in Semiotics a Senior Project must be approved at the beginning of the student's seventh semester. While the concentration has no language requirement as such, work in a foreign language, especially French, German, and Italian is recommended. Students are in addition strongly encouraged to spend at least one semester studying at a foreign university.

I. PRIMARILY FOR UNDERGRADUATES

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| <p>12. <i>Foundation of the Theory of Signs</i> (Foundations 18)</p> <p>An introduction to the basic concepts in semiotics and the work of major thinkers in the field. In 1985-86 the emphasis will fall on a reading of a select number of key texts by Marx and Freud, and their subsequent re-reading by Barthes, Levi-Strauss, Derrida, Althusser, Wilden, and others. Films by Hitchcock, Sirk, Godard, Fassbinder, and others will provide supplements and alternative textual instances.</p> | <p>Ms. DOANE and Ms. ROONEY.</p> |
| <p>22. <i>Persuasive Communication</i> (Theatre Arts 22)</p> | <p>Ms. TANNENBAUM.</p> |
| <p>66. <i>Introduction to Cinematic Coding and Narrativity</i> (Theatre Arts 66)</p> <p>Film history, theory, and analysis, with emphasis on the production of meaning in the dominant narrative cinema. Topics include: film technology, genre criticism, auteur theory, language and the</p> | <p>Mr. SILVERMAN.</p> |

cinema, the formalist and realist tendencies in film theory, and the cinema in society.

71. *Introduction to Film-Making* (Theatre Arts 71) Ms. THORNTON.
An introduction to the elements of film-making.

72. *Intermediate Film-Making* Ms. THORNTON.
Will enable students to refine skills learned in the introductory course (71) and will provide further preparation for work on honors projects.

73. *Video Production* Ms. THORNTON.
Will provide a basic knowledge and experience in the principles of video technology and electronic image.

81. *Study at R.I.S.D.*
Courses in film-making, video production, and semiotics. A list of courses approved for cross-registration will be posted in the Registrar's Office and the Semiotics Office.

II. FOR UNDERGRADUATES AND GRADUATES

113. *Semiotics and the Arts* Mr. WALDROP.
The problem of texts and artistic codes, aesthetic creation and reception, with emphasis on the history of the European avant-garde.

163. *Special Topics in Semiotics*

163A. *Film Noir* Ms. DOANE.
An investigation of the American *film noir* of the 40's and 50's with particular attention to the film's activation of paranoia, the representation of female sexuality, the role of the law and transgression, and the inscription of subjectivity.

163C. *Socio-Linguistics* Mr. BEEMAN.
Interested students should register for Anthropology 180.

163D. *Literature and Social Thought* Mr. GOUX.
Interested students should register for French 75.

163G. *Non-Western Theatre and Performance* Mr. EMIGH.
Interested students should register for Theatre Arts 125.

163I. *The Performance Film: Music and Dance* Mr. SILVERMAN.
A general trans-generic model of musical performance will be examined in an attempt to assess its effectiveness as a strategy for narrative disruption and as a desire for some alternative textual practice.

163J. *Film and the Monstrous* Ms. DOANE.
An investigation of the inscription of the "monstrous" in the cinema from its incarnation in German Expressionism to classical instances of the American horror film (Frankenstein, Dracula) to contemporary paranoid thrillers.

163L. *Linguistic Theory and Practice* (Anthropology 280) Mr. BEEMAN.
Interested students should register for Anthropology 280.

163M. *French in the World: Le Francais Dans Le Monde* (French 131A) Ms. GOLOPENTIA-ERETESCU.
Interested students should register for French 131A.

163P. *Origin and Development of Popular Forms of Entertainment* (Theatre Arts 126) Mr. WILMETH.
Interested students should register for Theatre Arts 126.

163Q. *Text and System: Fassbinder's Berlin Alexanderplatz* Mr. SILVERMAN
A close examination of Fassbinder's 13-part tv production, taking up problems of serialization and enunciation, the uses of historical and melodramatic representation, questions of verisimilitude and stylization.

166. *Senior Seminars*

166A. *The Politics of Melodrama: Sirk, Chabrol, Fassbinder* Mr. SILVERMAN.
An examination of form and ideology in relation to a critique of social institutions.

166B. *Aspects of Marxist Aesthetics*

Mr. SMITH.

The origins of theories of Marxist aesthetics in the works of Marx and Engels; the development into the three present major positions, i.e. Soviet and Eastern European "orthodoxy," Euro-Communist "Revisionism," and Freudian-Marxist syntheses.

166E. *Michel Foucault*

Mr. SILVERMAN.

An examination of the writings, with emphasis on the terms and procedures through which discursive formations emerge and evolve. Although ancillary readings will be drawn from Heidegger, Nietzsche and others, the emphasis throughout will be placed on problems raised centrally by Foucault: techniques of power, the organization of subjectivity within the social field; forms of institutionalization, strategies of refusal.

166F. *American Cinema and the Social Field, 1945-1950*

Mr. SILVERMAN.

By concentrating on a suturing moment in American life (the return of the absent male, the return of "femininity," the re-integration of familial production) we will trace the marks of this closure on a number of American films by such directors as Capra, Wyler, Ford, Sturges, etc.

166H. *Words and Pictures*

Mr. SCHOLLES.

The interaction between words and pictures in various texts: art, document, criticism and advertising.

166I. *Maternal Melodrama* (Theatre Arts 210)

Ms. DOANE.

An investigation of the maternal melodrama in film focussing on instances of the American Cinema from 1920-1950.

166J. *Feminist Film Theory*

Ms. DOANE.

166K. *Philosophical and Theoretical Constructions of the Feminine*

Ms. DOANE.

An examination of the various ways in which philosophical and theoretical writings produce concepts/images of the "Woman" or femininity in order to support their own epistemological or ontological systems.

166L. *Modernism and Post-Modernism in the Arts*

Mr. SILVERMAN.

198. *Senior Conference in Semiotics*

The STAFF.

Preparation of Honors Projects under the supervision of the staff.

Slavic Languages

Professors ARANT, DRIVER, KUCERA, TERRAS; Associate Professors CAREY, LEVITSKY, MATHIESEN (Chairman); Visiting Assistant Professors CHECHELNITSKY, SINGLETON; Lecturer, Ms. MONAHAN.

PLACEMENT. See page 64.

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAMS FOR THE BACHELOR OF ARTS DEGREE

Russian Language and Literature. Prerequisite: A reading knowledge of Russian to be demonstrated by satisfactory completion of Russian 4 or 4I, or by equivalent examination. The requirements for concentration are Russian 19, 51, 29, 30, plus any four 100-level Russian or Slavic courses.

With the approval of the Department, and in consultation with the concentration advisor, one course from the other offerings of the Department, or where appropriate, from another department, may be substituted for one of the four 100-level courses in Russian or Slavic literatures or languages.

Honors in Russian Language and Literature. Prerequisites and requirements as in the standard program, plus Russian or Slavic 198 for preparation of an Honors thesis.

Russian Studies. Prerequisite: A reading knowledge of Russian to be demonstrated by

satisfactory completion of Russian 4 or 4I, or by equivalent examination. Requirements: Russian 19, 29, 30, two 100-level courses in the social sciences (normally in Russian history), and an appropriate course in Political Science, plus two 100-level courses in Russian or Slavic literatures or languages.

With the approval of the Department, and in consultation with the concentration advisor, one course from the other offerings of the Department, or where appropriate, from another department, may be substituted for one of the four 100-level courses in Russian or Slavic literatures or languages.

Honors requirements are the same as those for a standard concentration in Russian Studies, plus Russian 198 or Slavic 198 for the preparation of an honors thesis.

RELATED COURSES. Students in Slavic should consider the election of one or more courses in the principal periods of other literatures, in comparative literature, in linguistics, and in related fields such as philosophy, art, history, and political science.

GRADUATE PROGRAMS

The Department of Slavic Languages accepts properly qualified candidates for the degree of Master of Arts and Doctor of Philosophy in Slavic languages and literatures. Students interested primarily in Slavic linguistics should also consult the offerings of the Department of Linguistics. The University Library has good basic holdings in all principal fields. Research materials are particularly strong in most aspects of pre-Soviet and post-Soviet literature and intellectual history, Slavic literary theory, and Slavic linguistics. Excellent exchange connections with libraries in the Soviet Union and other Slavic countries are being maintained.

MASTER OF ARTS. Work for the master's degree may be wholly in Russian or Czech language and literature or in Slavic linguistics, or may include one or two courses in such related fields as a second literature, general linguistics, history, philosophy, or art. A candidate will be required to have a spoken and written command of the Slavic language of specialization. The student will usually demonstrate this knowledge by passing, if the language of specialization is Russian, Russian 171. A candidate whose concentration is in literature is required to have written two substantial course papers which the instructor judged acceptable; a candidate whose concentration is in Slavic linguistics is required to complete satisfactorily two 200-level courses in Slavic linguistics. In addition, one of the following is required of all Master's candidates: (a) a reading knowledge of French or German, (b) a reading knowledge of a second modern Slavic language, (c) a suitable substitute in consultation with the graduate advisor.

DOCTOR OF PHILOSOPHY. Doctoral candidates may select either of two programs of study:

1. Concentration on Russian or Czech literature, with Slavic linguistics as a minor field.
2. Concentration on Slavic linguistics, with Slavic literature as a minor field. Under the latter program, the main language of specialization may be either Russian or Czech.

All candidates in either program are normally required to have a knowledge of a second Slavic language in addition to their main Slavic language, a good acquaintance with Old Church Slavonic, which may be demonstrated by successful completion of Slavic 221, and a reading knowledge of French or German (literature concentrators), or of French and German (linguistics concentrators). They are usually expected to complete sixteen semester courses, of which at least eight are in the department.

The specific doctoral degree requirements in the two programs are as follows:

1. In the literature program, the candidate is expected to have a command of the Russian (Czech) language, spoken and written, and an awareness of its structure and potentialities for expression; a knowledge of Russian (Czech) literature, consisting of wide acquaintance with the chief movements and writers and a thorough knowledge of selected authors and works, including the historical and intellectual environment; and, in addition to a basic knowledge of Old Church Slavonic, an understanding of the development and structure of modern Russian (Czech). It is recommended that a student take at least two courses in the following areas: approaches to the study of literature, 19th century criticism, 20th century criticism.
2. In the linguistics program, the candidate is expected to have a command of his major Slavic

language, spoken and written, and a thorough understanding of its structure, history, and relationship to other Slavic and Indo-European languages. In addition to a knowledge of Old Church Slavonic, a linguistics candidate is expected to have a knowledge of at least one other Slavic language and is encouraged to have an acquaintance with a third. A linguistics candidate is required to have a reading knowledge of both French and German. Furthermore, the candidate in Slavic linguistics is also required to have a sound acquaintance with the main trends and main literary figures of at least one Slavic literature.

The doctoral candidate may satisfy the requirements of proficiency in Russian by passing Russian 171. He may satisfy the requirements in Old Church Slavonic and in the development and structure of modern Russian by passing Slavic 221, 223 and 224.

I. PRIMARILY FOR UNDERGRADUATES

Russian

1-2. *Elementary Russian*

Mr. DRIVER and Ms. CAREY.

Essentials of Russian. Lectures three hours weekly; intensive oral practice in small sections two hours weekly. Course work geared to preparation time; less common basics deferred to first part of second year. No credit for Russian 1 alone, but with written permission, a qualified student may elect Russian 2.

1I-3I, 2I-4I. *Intensive Russian*

Ms. MONAHAN and STAFF.

This course is designed to master two years of Russian in one year and earns double credit. Classes meet 10 hours a week, with equal emphasis given to understanding both the spoken and written language and to achieving facility in reading, writing and speaking. Students can expect about 10 hours a week of outside work.

1R-2R. *Russian for Reading*

Ms. ARANT.

This course is designed to develop reading skills as quickly as possible through a concise introduction to grammar during the first semester. Semester II will be devoted to readings from the life and social sciences as well as the humanities. Special interests and needs of the students will be considered when selecting materials to be read.

3. *Intermediate Russian I*

Mr. LEVITSKY and STAFF.

Training in oral and written expression and in aural and reading comprehension, including optional work in the language laboratory. Grammar review. Prerequisite: Russian 2 or placement by examination. Four hours per week.

4. *Intermediate Russian II*

Mr. LEVITSKY and STAFF.

Readings and discussion of Russian texts related to significant aspects of Russian literature and culture. Prerequisite: Russian 3, or placement by examination. Four hours per week.

19. *Writing and Speaking Russian I*

Ms. MONAHAN.

Geared to the improvement of communicative skills. (Students with a strong preparation in aural-oral skills can take advantage of an informal exchange program with local Soviet emigres to acquire intensive practice in conversation.) Includes conversation on contemporary controversial topics, grammar review as needed with emphasis on verbs of motion, and selected readings in contemporary emigre publications as an aid in developing vocabulary and assimilating Russian syntax.

29. *Russian Literature in English Translation I*

Mr. LEVITSKY and Ms. CHECHELNITSKY.

Survey of major works of Russian Literature of the early and middle nineteenth century. All works will be read in English translation. Three hours a week lectures, plus discussion in smaller sections.

30. *Russian Literature in English Translation II*

Mr. LEVITSKY and Ms. CHECHELNITSKY.

Survey of major works of Russian literature of the late nineteenth and twentieth centuries. All works will be read in English translation. Three hours a week lectures, plus discussion in smaller sections.

51. *Writing and Speaking Russian II*

Ms. MONAHAN.

Continuation of Russian 19. Content depends more on student input than does 19. As in 19, there is opportunity for intensive conversational practice with local emigres.

II. FOR UNDERGRADUATES AND GRADUATES

Russian

101. *Russian Civilization I*

Mr. TERRAS.

Russian civilization before Peter the Great. The Slavic roots of Russia and the role of non-Slavic elements in the formation of the Russian nation. The Byzantine element in Russian culture. The Orthodox Church. Russian folk culture. Folk art, folk music, and folk poetry. Pre-Petrine Russian and her culture.

102. *Russian Civilization II*

Mr. TERRAS.

Russia under the Romanovs. The development of Russian cultural life (education, science and scholarship, the arts and literature) from Peter the Great to the Revolution of 1917. Trends, schools, and ideas, as well as major figures of cultural life will be discussed in a socio-historical context.

103. *Russian Civilization III*

Mr. TERRAS.

Russia after 1917. The Revolution of 1917 and its consequences for Russian culture. Soviet literature and émigré literature. Russian cultural life after the Revolution: achievements, ideological struggles, movements and groupings, as well as major figures of cultural life before and after the death of Stalin. A survey of the contemporary scene.

120. *Russian Fantasy and Science Fiction*

Mr. LEVITSKY.

Survey of various works of Russian nineteenth and twentieth century literature (ranging from fairy tales and dream sequences to modern science-fiction) in which the depiction of altered states of reality forms the core of their rhetorical departures. All readings are in English. Russian majors and graduate students are expected to cover at least one half of the material in Russian. General familiarity with aspects of Russian literary history is expected, and Russian 29 and Russian 30 (or their equivalent) are prerequisites for this course.

131. *Introduction to Russian Poetry.*

Mr. DRIVER.

Basics of Russian versification; survey of Russian poetry; in-class analysis. Offered in alternate years.

132. *Russian Literature from the Symbolists to the Present*

Ms. CAREY.

Readings in the works of Gorky, Blok, Maykovsky, Sholokhov, Pasternak, and others. Literary schools, movements, and personalities of the revolutionary period. The impact upon literature of the Soviet dictatorship. Open also to students from other fields with an interest in comparative literature, who may be permitted to do the reading in translation. Knowledge of Russian is not a prerequisite. Offered in alternate years.

134. *The Russian Novel*

Mr. TERRAS.

The origins, comparative connections, and development of the 19th century Russian novel. Analysis of several representative works by Goncharov, Saltykov-Shchedrin, Leskov, Pisemsky, and others. Knowledge of Russian not a prerequisite. Offered in alternate years.

150. *Approaches to Russian Literature.*

Mr. LEVITSKY.

Reading in Russian of selected poetry and prose by important authors. Lectures in Russian, on literary problems, literary terms, and important aspects of literary history. Designed strictly for concentrators who have passed Russian 19 or equivalent level.

161. *Pushkin*

Mr. DRIVER.

The place of Pushkin in the history of Russian literature, his reflection of the rapidly changing esthetic norms in the first half of the nineteenth century. Critical analysis of the works of the lycee years, *Ruslan and Ljudmila*, the "Southern Tales," *Eugene Onegin* and *The Bronze Horseman*; also important prose works. Offered in alternate years.

170, 171. *Advanced Written and Oral Russian*

Ms. CAREY.

Designed to develop skill and accuracy in oral expression and composition. Prerequisite: Russian 51, or written permission of the instructor.

181. *Tolstoy*

Mr. TERRAS.

An examination of Tolstoy's art with particular emphasis on the formal aspects of his prose: his early prose, followed by a detailed analysis of *War and Peace* and *Anna Karenina*, and concluding with a consideration of the prose and plays written after his so-called conversion. Open also to students from other fields with an interest in comparative literature, who may be permitted to do the reading in translation. Offered in alternate years.

182. *Dostoevsky*

Mr. TERRAS.

An examination of the development of Dostoevsky's art with special emphasis on the evolution of thematic and formal elements. The great novels will be read as well as several of the early works. Open also to students from other fields with an interest in comparative literature, who may be permitted to do the reading in translation. Offered in alternate years.

183. *Gogol*

Mr. TERRAS.

Reading and discussion of the works of Nikolai Gogol. Some knowledge of Russian is highly desirable; however, undergraduate students from other fields with an interest in comparative literature may be permitted to do the reading in translation. Offered in alternate years.

184. *The Women's Movement in Russia*

Ms. CAREY

A study of the development of the women's movement in Russia from its emergence in 1855 to the present day. Through an analysis of literary works, memoirs, and biographies, this course will study the construction of the Russian women's movement in the broad historical context of the European movement of the 1830's and 1840's, its ideological and structural development over many decades, and its relationship to socialism and other intellectual currents.

185. *Turgenev*

Ms. CAREY or Mr. TERRAS.

An examination of I.S. Turgenev's fiction in the contexts of (a) the social, political, and ideological development of mid-century-Russia, (b) nineteenth-century Realism and its aesthetic foundations (with emphasis on Turgenev's ties with other Russian writers of the period). All of Turgenev's major works will be read and their structure discussed. Open also to students from other fields with an interest in comparative literature who may be permitted to do the reading in translation. Offered in alternate years.

186. *Chekhov*

The STAFF.

Chekhov's short stories and plays will be examined from the standpoint of their formal and thematic characteristics and from the perspective of their position within the development of Russian and world literature. Topics will include: Chekhov as a formal innovator in prose and dramaturgy; Chekhov and the state of the theater; Chekhov and Stanislavsky; Chekhov and Tolstoy, Ibsen, Strindberg, and Maupassant. Open also to students from other fields with an interest in comparative literature who may be permitted to do the readings in translation.

187. *Women Poets of Russia*

Ms. CAREY.

The woman poet in Russian literature: a comparative study of major men and women poets of the nineteenth and twentieth centuries. In this course, the theoretical framework for analysis will be based on the critical comparisons developed by Claudine Herrmann and Mary Hiatt. Prerequisites: either Russian 51 or 170. The prerequisites imply a reading knowledge of Russian. Reading mostly in Russian.

198. *Senior Conference*

The STAFF.

Slavic

111. *The Oral Epic and Other Forms of Folklore*

Ms. ARANT.

A study of the meaning and form of oral traditional literature in the Slavic countries. Special attention will be given to the relation of the narrative and non-narrative forms to ritual and myth. Among the narrative forms to be studied will be epic poetry, the ballad, and the folk tale; the study of non-narrative forms will include the lament, ritual and lyric songs, proverbs, and riddles. Open also to students from other fields with an interest in comparative literature who may be permitted to

do the reading of the Slavic material in translation. Offered in alternate years.

175. *Introduction to Russian Folklore* Ms. ARANT.

The types and meaning of oral-traditional narrative literature (epic, folktale, ballad) and non-narrative literature (incantation, lament, lyric and ritual song, proverb and riddle), primarily in Russian, with systematic references to the traditional literatures of other countries. Special attention to the relation of these oral forms to ritual and myth. Open also to students in other fields with an interest in comparative literature, who may do the reading in translation. Offered in alternate years.

198. *Senior Conference* The STAFF.

Special topics in Slavic literatures, linguistics, and civilization. Individual studies of Slavic languages.

III. PRIMARILY FOR GRADUATES

Russian

201. *Eighteenth Century Literature* Ms. ARANT.

The most important literary currents from neo-classicism to sentimentalism. Study of style and genre and the development of the literary language. Offered in alternate years.

202. *Russian Poetry* Mr. DRIVER.

A practical approach to the analysis of Russian poetry, using texts drawn from the early period to the present. Offered in alternate years.

203. *Russian Prose of the Early Twentieth Century* Mr. LEVITSKY.

Selected Russian Prose of the post-Symbolist period. Prerequisite: Russian 51. Offered in alternate years.

204. *Russian Symbolism* Mr. DRIVER.

The origins and character of the Russian Symbolist movement, the poetry of Aleksandr Blok and a brief survey of other Symbolist poets; directions in Russian poetry in the Post-Symbolist period. Offered in alternate years.

205. *Russian Poetry of the Twentieth Century* Mr. TERRAS.

The philosophic and aesthetic premises of Symbolism, Acmeism, Futurism, Imagism, Constructivism and Socialist Realism. Offered in alternate years.

232. *Old Russian Literature* Ms. ARANT.

Russian literature from the Kievan period to the end of the seventeenth century. Offered in alternate years.

241. *Movements and Genres in Russian Literary Culture* Mr. LEVITSKY.

Seminar. Critical reading of selected texts from the Baroque Period through the first half of the Nineteenth Century. The analysis will be based on a study of the infrastructure of each work and the external influences of the period. Course will be given mainly in Russian, with focus on Russian critical terminology and approaches. Open to qualified undergraduates with permission of instructor.

261, 262. *Seminar in Russian Literature* The STAFF.

271, 272. *Seminar in Russian Literature* The STAFF.

277. *Seminar in Russian Literature* The STAFF.

291, 292. *Advanced Reading and Research* The STAFF.

Work with individual students in connection with special readings, problems of research, or preparation of dissertations.

Slavic

221. *Old Church Slavonic* Mr. MATHIESEN.
Introduction to Church Slavonic philology. Structural analysis of Old Church Slavonic. Readings in Old Church Slavonic texts (prose and poetry). Introduction to comparative Slavic phonology and grammar.
222. *Readings in Church Slavonic* Mr. MATHIESEN.
Selected texts from the eleventh century to the twentieth will be read in order to develop facility in reading the language.
223. *History of the Russian Language* Mr. KUCERA or Mr. MATHIESEN.
Outline of the historical development of East Slavic dialects and standard languages, with emphasis on the history of standard Russian. Readings in East Slavic texts. Some acquaintance with Old Church Slavonic is desirable. Offered in alternate years.
224. *Structure of Modern Standard Russian* Mr. KUCERA or Mr. MATHIESEN.
Descriptive analysis of the phonology and morphology of Modern Standard Russian and a survey of Russian dialects. Offered in alternate years.
- 227, 228. *A Comparative Analysis of Czech and Russian* Mr. KUCERA.
A comparative study of the phonology, morphology and syntax of present-day Czech and Russian, emphasizing the structural description of modern standard Czech with some attention to the colloquial language. Reading and analysis of selections from Czech linguistic works as well as from modern Czech literature. Knowledge of Russian is required. Offered in alternate years.
- 229, 230. *A Comparative Analysis of Bulgarian and Russian* Mr. MATHIESEN.
A contrastive study of the phonology, morphology, and syntax of present-day Bulgarian and Russian. The history of the literary languages in Bulgaria and Russia. Reading and analysis of Bulgarian prose. A knowledge of Russian or of one other Slavic language is required. Offered on demand.
232. *Russian Syntax* Mr. MATHIESEN.
The theory of syntax and the syntax of Russian. Approaches to syntax over the centuries. The study of syntagms without and with predication in Russian. Prerequisite: Russian 51 (or equivalent command of the language). Offered on demand.
245. *Linguistic Theory and Models of Language* Mr. KUCERA.
Contemporary issues in linguistics. (Also listed as Linguistics 245).
251. *Seminar* The STAFF.
Topic to be announced.
262. *Topics in Comparative Slavic Linguistics* Mr. MATHIESEN.
Special topics in historical and comparative Slavic phonology, morphology, and syntax.
- 271, 272. *Advanced Czech Studies* Mr. KUCERA.
Aspects of Czech literature (old and modern). Phonology, morphology, and syntax of present day standard and colloquial Czech. History of the Czech language. The historical development of standard Czech. Readings in Old Czech texts. Czech dialects.
273. *Proseminar in Slavic Linguistics* Mr. KUCERA.
Basic concepts of linguistics and their application to language teaching and to the analysis of literary texts. Slavic examples (primarily Russian) and some aspects of the contrastive analysis of Russian and English will serve as the basis of the discussion of several problems in linguistic theory. Recommended for graduate students in Slavic languages and literatures. Undergraduates will be admitted with the permission of the instructor.
275. *The Poetics of Folklore* Ms. ARANT.
This course will study the morphology and meaning of oral traditional narrative and non-narrative literature in the Slavic countries, primarily Russia. Special attention will be given to the relation of oral forms to ritual and myth. Offered in alternate years.

291, 292. *Advanced Reading and Research*

The STAFF.

Work with individual students in connection with special readings, problems of research, or preparation of dissertations.

Social Science Data Center

The Social Science Data Center is an interdepartmental research and training facility for the social sciences at Brown. The Center provides a number of services to the social science departments. Included among these are (1) maintenance of a data archive which currently includes over 200 social science data sets; (2) acquisition of data sets for use by social science departments (the Center is a member of the Inter-University Consortium for Political and Social Research and can acquire data sets at no charge); (3) workshops on computing techniques for the social sciences; (4) availability of consultants to help social science users; (5) development of computer-based systems of social science data management and statistical analysis which offer a wide range of opportunities for maximizing the use of the archives.

Sociology

Professors EVANS,¹ GOLDSCHIEDER, C., GOLDSTEIN, MARSH, MARTEL, MORRIS, RUESCHEMEYER, SPEARE, WESSEN, ZIMMER; Associate Professors GOLDSCHIEDER, F. (Chair), STEPHENS, Assistant Professors ANSPACH, BROWN, CASTERLINE, ELLIOTT, MEYER, MILLMAN, SILVER, Adjunct Professors POTTER, M. RUESCHEMEYER.

The Sociology Program offers many ways of gaining a better understanding of the modern social world. It also offers essential background for many careers and professions. In recent years students have developed special programs in the sociology of administration, arts and literature, communications, the community, crime and deviance, ecology and environment, the family and marriage, health and medicine, knowledge and ideology, law and its enforcement, modernization, organizations, political behavior, population, racial and ethnic relations, social movements, social psychology, sex roles and urbanization. The Department also offers introductory and advanced courses in research methods, demographic techniques, social statistics and computer approaches in social research. Faculty advisers, campus resources and special programs in these and other areas are listed in the detailed Department Guide, available from the departmental secretary.

UNDERGRADUATE PROGRAM

The concentration program in sociology takes into account that students have in the past used it as the core of a broad liberal arts education, as preparation for graduate study in sociology, and as the basis for future professional study in such fields as administration, law, and social services.

Nine courses are required, including Introductory Sociology 1 or 2, 11, 101, 102, 110 and one undergraduate or, with permission, graduate seminar. Two other 100-level Sociology courses are also required and one independent study (Sociology 198 or 199). The independent study serves as an individual integration of the student's concentration and may be extended to two semesters. Concentrators should work out their program with an advisor and submit a concentration plan by the fourth semester.

Honors results from an exceptional commitment to the discipline of sociology, as reflected in the student's program of study. This commitment will be evidenced by excellence in a coherent group of sociology courses and by an honors thesis based on a major research project. A four-year combined BA/MA program can be pursued with special permission.

¹ On leave 1985-86.

GRADUATE PROGRAMS

The Department accepts qualified students for both the Master of Arts and the Doctor of Philosophy degrees in Sociology. On the graduate level, its major objective is the education and development of professional sociologists for academic careers and for nonacademic careers in government and private agencies. To this end, emphasis is placed on the mastery of sociological fundamentals — concepts, theories, and research methods — together with a thorough knowledge of significant substantive fields. The Master's program is available in all major areas of Sociology. At the Doctoral level emphasis is placed on the fields of (1) Population, (2) Social Organization, (3) the Comparative Study of Development, (4) Urban Studies and Ecology and (5) Medical Sociology. Concentration of staff appointments and research programs in these fields permits intensive training for prospective teachers and researchers in these areas of specialization.

The University has established a Population Studies and Training Center which facilitates and strengthens the graduate training and research program in demography. The Center coordinates the population research activities of the Department and those of members of other departments at the University, including economists, historians, biomedical scientists, anthropologists, and mathematicians. It also provides liaison with various health, population, and urban research organizations and action agencies in the community. The Center sponsors a number of sample survey studies in less developed countries; these focus on changing fertility, health, migration, and urbanization patterns. It also maintains a Population Research Laboratory for conducting cross-sectional and longitudinal surveys of the Rhode Island population. These surveys provide graduate students with opportunities for research experience and with data for theses and dissertations.

In 1983, the Center for the Comparative Study of Development was established under the directorship of the Henry R. Luce Professor for the Comparative Study of Development. The Center supports research efforts on the socioeconomic analysis of development by faculty and graduate students from sociology, economics, anthropology, political science, and history. It oversees and supports the undergraduate concentration in Development Studies and facilitates linkages between undergraduate instruction and faculty research. The Center also promotes graduate training relevant to issues of development by strengthening graduate programs in departments providing such training and fostering cooperation among these departments.

The Department offers its own program of research and training in the utilization of electronic computers in sociological, demographic, and health studies. The facilities of the University Computing Center, including an advanced design highspeed computer, are available for statistical work and programming problems. The Department of Sociology also houses Brown University's Social Science Data Center.

Faculty interest, library holdings, and the availability of international and cross-cultural data banks make it possible for students to carry out cross-societal comparative research at Brown, either as a prelude to research abroad or as an end in itself.

Departmental colloquia are held throughout the year for outstanding scholars from other universities and research centers to present and discuss their work. In addition, regular and informal seminars are conducted by the staff and by graduate students in which research and other topics of current interest are discussed. Graduate enrollment is limited to ensure the opportunity for close contact between students and faculty.

MASTER OF ARTS PROGRAM. All candidates for the M.A. or Ph.D. are expected to offer evidence of adequate preparation in general Sociology or in a related field of social science. All candidates for the M.A. or Ph.D. degree are expected to have had previous work in Social Theory (equivalent to Sociology 101) and Elementary Statistics (Sociology 110). Students who have not taken a previous course in Social Theory will be expected to take Sociology 101. Students who have had a previous course in statistics or otherwise feel qualified in statistics will be expected to take an examination covering content equivalent to Sociology 110. Those failing the exam and those without a background in statistics will be expected to take Sociology 110. Entering students are also expected to have had some undergraduate training in research methods, but this is not required.

Each candidate for the degree will arrange a program in consultation with the Department in terms of his or her specific needs and interests. A minimum of eight semester courses must be completed, including six Sociology courses at the 200 level. Although no specific courses are required, the student should have a balanced program in theory, methods, and substantive courses. With the

approval of the Department, two of the eight courses may be in other departments which are related to the student's program of study.

Candidates for the degree of Master of Arts are required to complete a Master's paper related to the program of study and satisfactory to the Department. Students enrolled in the Ph.D. program must complete their Master's paper by the end of their third semester of graduate study.

DOCTOR OF PHILOSOPHY PROGRAM. Three full years of graduate study are required for the Ph.D. degree. The equivalent of up to one full year of credit may be transferred from another institution upon petition to the Graduate Committee and approval by the Dean of the Graduate School. All students are expected to gain proficiency in theory, methods, and statistics by taking Sociology 204 (Classical Theory), Sociology 205 (Contemporary Theory), Sociology 201 (Multivariate Analysis), and Sociology 200 (Research Design and Measurement). Students who have taken advanced courses in methods and theory at other universities may, on submission of syllabi or other summaries of the content of these courses, petition the graduate committee for an exemption from one or more of the required theory and methods courses. Students who have not had sufficient course work to be granted an exemption may be exempted by passing an examination covering the content of the course or courses.

Graduate students are evaluated by the faculty early in their Ph.D. work. This evaluation is based on letter grades and on evaluations by faculty who have had academic contact with the student. A student who is not considered qualified for Ph.D. work after the third semester cannot enroll in Sociology at Brown University beyond the Master's degree.

Special Skills. Students are encouraged to obtain training in foreign languages, computer programming, or methodological areas which are appropriate to their program of study and research. Students are encouraged to take courses inside or outside the department which will provide them with such skills.

Publication: Students are strongly encouraged to prepare at least one paper for publication in a professional journal during their first three years of graduate study. This can be accomplished in several ways; by rewriting the M. A. paper into journal form, by choosing a topic for a seminar paper which has potential for publication, or by working jointly with a faculty member.

Teaching Practicum: Teaching experience is required of all Ph.D. students. This requirement will be satisfied by a year's Teaching Practicum in Sociology (Sociology 250, 251) ordinarily during the second or third years of the graduate program. Each student will normally serve as an apprentice teacher in two undergraduate Sociology courses. During the year the student will assume increasing responsibilities in all phases of course work, including direction of section meetings, giving lectures under supervision, preparing examinations, reading reports and examinations, and participating in a Teaching Proseminar. Students may propose to meet this requirement by teaching a Modes of Thought course, or by being an assistant in the Social Science Data Center.

Research Practicum: Since most Ph.D.'s in Sociology combine careers in teaching with research appointments, they are frequently called upon to initiate, fund, and execute major research projects. In addition, skills necessary for proposing and executing research for a Ph.D. dissertation can be considerably improved by supplementing formal course training with personal participation in an on-going research project. For these several reasons, guided experience in research is considered an important part of the graduate training program in Sociology. This is not a requirement, but each student is encouraged during his or her second or third year to work with faculty engaged in an on-going research project as a researcher assistant or collaborator. Students may participate in this by registering for Sociology 291, 292 in lieu of taking a regular graduate course.

Preliminary Examination: All students are required to pass a preliminary examination in one major and one minor field of specialized inquiry.

The Department offers the following four areas of specialization:

- I. Population, including demographic methods, area studies, manpower, vital processes, migration, population growth, economic development, and family change.
- II. Social Organization, social stratification, complex organizations, medical sociology, the sociology of knowledge, social psychology, or another area selected with approval of the Department.
- III. Urban Studies and Ecology, including general human ecology, ecological methods, community studies, metropolitan development, social and political organization of cities, and urbanization.

IV. Comparative Study of Development including theories of comparative development and modernization, the socio-economic analysis of development, industrialization and political change, the state in the third world and population and economic development.

Students may select their two fields of specialized inquiry from among these four areas, or they may choose one of the above fields and a second specialty which cuts across the four fields or across disciplinary lines. The fields of specialization chosen should complement each other, taking into account the course offerings of the Department and University. Students are expected to take their Preliminary Examination, covering the substantive material and relevant theory and methods in their two areas of specialization, not later than the end of their third year of graduate work. Before taking these examinations, the student must have completed a Master's paper, met the theory, methods and statistics requirements, and have adequately prepared for the examination through course work and/or independent study and reading. The Preliminary Examination may be both written and oral.

A dissertation is required, ordinarily in the student's major substantive field. By the end of the seventh semester, the student must develop a written dissertation proposal and present it orally before faculty and students of the Department. The dissertation is written under the supervision of a three-member dissertation committee. Following acceptance of the dissertation by the committee, a Final Oral Examination is conducted covering the dissertation and related fields.

I. PRIMARILY FOR UNDERGRADUATES

1. *Perspectives on Society*

Mr. RUESCHEMEYER.

An introduction to the discipline of sociology, this course focuses on the social structures that transcend everyday experience and yet shape it. It discusses competing classical as well as modern theoretical perspectives and it examines the emergence and the transformations of capitalism, revolutions and the development of the modern state, contrasting patterns of class and inequality in this country and others, and the role of ideas in social change.

2. *Perspectives on Social Interaction: An Introduction to Social Psychology*

Mr. ELLIOTT.

An introduction to the discipline of sociology, this course examines the individual in social situations. We explore the social development of the person, the development of inter-personal relationships, and the problems of integrating the individual and social system. We will be guided by the realization that there are several distinct perspectives on the human social actor, and that each perspective contributes a unique understanding of the issues.

9. *Jews in Modern Societies* (Judaic Studies 9)

Mr. GOLDSCHIEDER.

11. *Evidence and Inference*

Ms. ANSPACH.

The use of empirical evidence to evaluate theoretical propositions in sociology. The core of the course will revolve around classical and contemporary empirical illustrations of sociological evidence and inference, focusing on the articulation of sociological theory, methods, and data.

13. *The American Heritage: Racism and Democracy*

Mr. MARTEL.

The course will focus on racism and democracy, a central moral dilemma in American life. Based in sociology, the combined approaches of history, philosophy and the social sciences will be used to examine: (1) the changing relations between Euro-Americans and non-Euro Americans in the past; (2) the continuing effects of past oppression on our present attitudes and conduct; (3) the moral dilemmas posed by the conflicts between equalitarianism and racism; and (4) the future prospects of eliminating racism from American life. (Freshman by written permission only.)

15. *Economic Development and Social Change*

Mr. EVANS.

Emphasis will be on trying to understand the interrelations among economic, political and cultural aspects of change in developing countries. The experience of currently developing nations will be contrasted to that of nations which industrialized in the nineteenth century. Will also compare the different developmental strategies which have been adopted by currently developing nations and their consequences for social change.

17. *The Family*

Ms. GOLDSCHIEDER.

An examination of American family patterns by social class and ethnic group, looking at both external influences on the family and internal processes of the family. Contemporary alternatives to the traditional nuclear family will be examined.

20. *Population and Society*

Mr. CASTERLINE.

A treatment of the causes and consequences of major population trends throughout the world; of changes in birth and death rates, and in the mobility and migration of persons. Attention is given to population in relation to socio-economic, religious, and social-psychological factors, to economic development, and to current issues such as teenage pregnancy and the movement out of urban areas.

21. *An Introduction to the City* (Urban Studies 21)

Mr. ZIMMER.

II. FOR UNDERGRADUATES AND GRADUATES

25. *Deviant Behavior*

Ms. ANSPACH.

An introduction to the sociological study of deviant behavior. Primary emphasis is given to a critical evaluation of sociological theories of deviance. Also some time will be devoted to the sociological study of the criminal justice system.

91. *Sociology of American Jews* (Judaic Studies 91)

Mr. GOLDSCHIEDER.

101. *Development of Sociological Theory*

Mr. MARTEL.

Major theoretical approaches to man and society in the Western world since the French Revolution. Emphasis on Saint-Simon, Comte, Spencer, Marx and Engels, Weber, Durkheim, Park, Mead, Simmel and Freud. The course begins with the problem of how to analyze the logical structure and empirical claims of complex theories. Special discussion groups on the works of Marx, Weber, and Freud.

102. *Methods of Social Research*

Mr. ELLIOTT.

The purpose of this course is to gain an appreciation of the power and scope of sociological analysis. Topics include the basic principles of social research, an investigation of the major techniques of data collection (survey research, intensive interviewing, experimentation, observation, and archival research), the preparation of data for analysis, ethical issues, and the implications of empirical research for social theory.

110. *Introductory Statistics for Social Research*

Messrs. ELLIOTT and CASTERLINE.

Introduction to descriptive and inferential statistics: measures of central tendencies and variability, probability, binomial and normal distributions, tests of significance, difference between proportions and means, chi square, correlation and regression, simple analysis of variance, nonparametric methods. Also included is the use of computers in data analysis. Knowledge of elementary algebra is assumed.

112. *Opinion Polls and Surveys in Social Research*

Mr. CASTERLINE.

All phases of surveys are examined: questionnaire design, sample design, interviewing, data processing, and analysis. The main activity is a large sample survey of Rhode Island, designed and conducted jointly by students and faculty. The strengths and weaknesses of the survey approach are assessed. The role of opinion polls, market research, and social surveys in U.S. society is evaluated.

116. *The Modern Corporation and Metropolitan America* (see Urban Studies 116)

Mr. MEYER.

120. *Population Growth and the Environment*

Ms. MILLMAN.

Relationships between the social and physical environment and various aspects of population are investigated. Emphasis is on currently developing countries. Topics include: changing patterns of mortality and illness, nutrition-population connections, agricultural and economic structure changes, and the adoption of fertility control. Policy implications are considered.

123. *Sex Roles and Status in Comparative Perspective*

The STAFF.

Will view sex roles from a sociological perspective. Beginning with biological sex differences and early socialization, the course will follow the life cycle, in order to ascertain how the initial ascription as to sex influences the life courses of women and men.

126. *Demographics and Forecasting for the United States*

Mr. SPEARE.

Analysis of demographic characteristics of the United States population including: components of population growth and decline; aging of the population; employment, occupations and income; families, households, and housing units; regional and metropolitan change; and local area estimates and projections. Weekly one-hour lab sessions will utilize IBM PCXTs in Sociology Dept. for analysis and presentation of data.

127. *Race, Class, and Ethnicity in the Modern World*

Mr. MARTEL.

A sociological look at changes in class, ethnic, "racial", and religious divisions found in the United States and other advanced societies during the past century; at their historical backgrounds; and at their future prospects. Special attention to the newly emerging as well as traditional ethnic groupings. Intensive seminar-sections will focus on the personal meanings of the social patterns depicted.

130. *Urbanization in World Perspective*

Mr. MEYER.

The transition from a rural to an urban society. Changes in the social and ecological organization of rural and urban sectors of modern and modernizing societies. Problems associated with rapid urban growth, rural decline, and rural-urban migration.

132. *Urban Housing and Social Policy* (Urban Studies 132)

The STAFF.

133. *The Metropolitan Community* (Urban Studies 133)

Mr. MEYER.

Study of the internal ecology and dynamics of metropolitan regions in developed and less-developed nations. Topics include residential mobility, change in residential areas, commercial and industrial land use, changes in land use system, and exurban/nonmetropolitan dynamics.

136. *Social Change and Social Policy* (Urban Studies 136)

The STAFF.

140. *Political Sociology* (Urban Studies 140)

Ms. SILVER.

A study of the social bases of political behavior. Social and psychological forces that help to determine political beliefs, political processes in complex organizations, and political participation including voting and other forms of political behavior.

143. *Social Structure and Personal Development*

Mr. ELLIOTT.

The relationship between one's place in the social structure and one's own, individual personal growth. We will be investigating the social aspects of individual growth and change throughout the life cycle. In addition, we will spend some time learning about social factors involved in the failure to develop in a socially compatible way.

150. *Bureaucracy and Society*

Mr. MARSH.

Complex organizations — factories, offices, schools, government agencies, hospitals, research laboratories, etc. — and their role in modern society. Theories of organizations, from Weber's theory of bureaucracy to recent contingency and open systems theories. Organizational goals, technology and task-structure, size, internal structure, decision-making, environment and performance effectiveness. Organizations in the U.S., Japan and elsewhere will be compared.

154. *Human Needs and Social Services* (Urban Studies 154)

Mr. BROWN.

The development of human services provided by societies for their members. A broad range of social welfare institutions are studied, including income maintenance, family policy, housing, and health. The organization of institutions and professions receives particular attention. Issues of class, race, and gender are covered. Alternative models of human services are discussed.

155. *Sociology of Medicine*

Ms. ANSPACH.

The socio-political context within which health, illness, and medical care are defined. Sociological materials used to examine current developments in the health care field. Emphasis on identifying social and political forces which impinge upon the delivery system and tracing their impact on the roles of practitioners and the health of their clients.

158. *The Sociology of Work and Industry, I*

Mr. EVANS.

Focuses on the work process in the modern corporation. The conditions of work and the problems of industrial and clerical workers as determined by technological and organizational factors. Effects on workers and their individual and collective responses. Reforms and alternatives to present structure of work. Relation between the industrial order and social institutions, including the system of social stratification and political institutions.

159. *The Sociology of Work and Industry, II*

Mr. EVANS.

Complements Sociology 158 by providing a sociological analysis of decision making and managerial strategies in the large corporation. Examines how the growth of the modern corporation has affected the relations of firms and the market. Also looks at interorganizational linkages among industrial enterprises and financial institutions and their implications for the functioning of the industrial order as a whole.

160. *Modernization: Comparative Analysis of Developing Nations*

Mr. MARSH.

Theories and research addressing these questions: (1) why have some less developed societies had more rapid rates of economic development than others? (2) why do developing nations differ in their degrees of socio-economic inequality? and (3) why did many, but not all, developing nations abandon democratic constitutions after political independence and adopt military and other forms of authoritarian regimes? The focus is on less developed countries since World War II.

164. *Social Inequality* (Urban Studies 164)

Ms. SILVER and Mr. STEPHENS.

To what extent, and under what conditions, can social inequality be reduced or eliminated? Distinctions between equality of opportunity and equality of rewards will be drawn and their implications explored, in the perspective of sociological theory and research in our own and other advanced industrial societies.

170. *Theories of Imperialism and Colonialism.*

Mr. MORRIS.

Assumptions of theories of imperialism and colonialism and the extent to which historical evidence does or does not support various interpretations. An analysis of theories seeking to explain the expansion of North Atlantic economies into less developed areas and theories of colonialism describing the extent and ways in which imperialist economies have retarded and distorted the development of their colonies.

187. *Undergraduate Seminars*

Open to juniors, seniors, and graduate students with instructor's consent. Note that some 200-level seminars are open to qualified undergraduates and may count for concentration credit.

187B. *Demographics and Development*

Mr. GOLDSTEIN.

Assesses the social and economic determinants and consequences of changes in fertility, mortality, and migration and their impact on the size, distribution, and composition of population in developing societies. The implications of the evolving population structure for private and government planning and policy will be explored. No prerequisite.

187C. *Urban Planning and Public Policy* (Urban Studies 187C)

Mr. MEYER.

187D. *Industrialization, Democracy, and Dictatorship*

Mr. RUESCHEMEYER.

Examines the interrelations between economic development past and present, and political change. Does economic development encourage democratization in today's underdeveloped countries as it did in Western Europe? Does rapid economic change foster revolutionary movements? Does sustained economic growth require authoritarian rule? What is the impact of multinational corporations on political conditions in developing countries?

187E. *Structure and Performance in Economic Organizations*

Mr. EVANS.

Methods of connecting structural variables (e.g. span of control, length of hierarchies, interconnections of multiple hierarchies) with conventional measures of economic performance will be explored in this course. Students will be expected to participate in an empirical research project or to work on the elaboration of a formal model of organizational structure. Prerequisite: Sociology 150 or 158. S/NC.

187F. *Health Policy Seminar*

The STAFF.

Systematic study of current policy developments with respect to health care delivery. Particular attention to trends in medical education, role delineation among health workers, introduction of new types of practitioners, assessment of quality of care, accessibility of services, impact of prepaid group practice and health insurance, public accountability and regulation, occupational health, and patient rights. Prerequisite: Sociology 155 or written permission.

187H. *Selected Issues in Urban Sociology*

Mr. ZIMMER.

The seminar will examine selected urban issues from a sociological perspective. Particular attention will be focused on the theoretical and policy implications of sociological research.

187J. *Social Structure and Social Change in Contemporary Brazil*

Mr. EVANS.

Uses post-1964 Brazil as a case study to test implications of different theoretical approaches to the analysis of socio-economic development. Topics include changes in agrarian structures and the development of agriculture, industrialization and the role of multinational corporations, labor organization and political protests, and ideology and regime stability. Prerequisites: 15 or 160; or Portuguese and Brazilian Studies 160B; or written permission.

190, 191. *Individual Research Project*

The STAFF.

Intensive supervised reading or research. A specific program will be arranged in terms of the student's individual needs and interests. Required of students who are Intensive Concentrators; open to others only by written consent of the Chairman of the Department.

196. *How Social Scientists Study the Jews* (Judaic Studies 198)

Mr. GOLDSCHIEDER.

198, 199. *Concentration Special Project*

The STAFF.

An independent study to deepen, balance or integrate the concentration program. Projects may relate to service as a Teaching or Research Assistant. The project should be selected with a faculty preceptor, and a written proposal must be approved before the semester in which credit is given. Students must write a summary paper which may be submitted as an Honors Thesis. See the new Department Guide for suggestions and resources.

III. PRIMARILY FOR GRADUATES

200. *Research Design and Measurement*

Ms. MILLMAN.

A course for second-year graduate students oriented toward the preparation of research proposals and the methods of collecting data. Covers the logic of social research, goals of research design, problems of reliability and validity, and methods of sampling. The aim is to equip students with sufficient understanding to select and employ the methods most appropriate for a particular research problem. Prerequisites: Sociology 110 and Sociology 201.

201. *Multivariate Analysis*

Mr. SPEARE.

This course is oriented to pragmatic problems of manipulating, exploring, summarizing and displaying data with three or more variables. It includes the general linear model, multiple regression, analysis of variance and path analysis. Emphasis on problems associated with the analysis of sociological data such as measurement error, non-linear relationships, missing data and discrete variables. Prerequisite: Sociology 110.

202. *Sociology of Personality and Mental Disorder*

The STAFF.

A detailed examination of the theoretical and empirical literature in selected areas: language and communication, socialization, desocialization, and resocialization: social types of personality; the sociology of motivation; national character; social psychiatry. Offered in alternate years.

203. *Stratification and Power*

Mr. STEPHENS.

The causes and consequences of socially structured inequality will be the substantive focus. Analysis of theoretical explanations will be combined with the examination of empirical methods for the investigation of inequality. Comparative material, historical or crossnational, will be examined, focusing on first and third world countries. Offered in alternate years.

204. *Sociological Theory I*

Messrs. MARSH and RUESCHEMEYER.

An intensive examination of the sociological theories of Marx, Durkheim and Weber, along with a consideration of theory construction.

205. *Sociological Theory II*

Messrs. MARSH, MARTEL and RUESCHEMEYER.

A systematic survey of current approaches, comparing functionalist, social-behaviorist, neo-Marxian, demographic, ecological, symbolic interactionist and Freudian works. The course will begin with models for the analysis of the logical and empirical structure of complex sociological theories, and will include an introduction to simple mathematical models.

206. *Complex Organizations*

Mr. MARSH.

An analysis of the development, structure and operation of complex organizations. Comparisons of organizations in relation to type (industrial, governmental, educational, military, etc.), and to social, cultural, technological and other settings. Theories of and research methods in bureaucracies. Offered in alternate years.

207. *Theories of Modernization*

Messrs. EVANS, MARSH, and RUESCHEMEYER.

A consideration of various theories of modernization. The extent to which changes in aspects of social, cultural, and personality systems can be systematically related to levels of societal modernization. Empirical analyses of modernizing societies in East and Southeast Asia, and comparison of these with the earlier modernizing Western societies.

209. *Culture and Social Structure*

Mr. RUESCHEMEYER.

An analysis of the interrelations of religious ideas, value patterns and various forms of knowledge on the one hand, societal structures and changes as well as those organizations and roles most immediately concerned with the different aspects of the cultural system on the other hand. Offered in alternate years.

210. *Social and Political Aspects of Community Organization* (Urban Studies 210)

Ms. SILVER.

An analysis of the sociological bases of power, political organization, and decision-making in U. S. cities. Offered in alternate years.

211. *Family Structure in the Third World*

Mr. CASTERLINE.

Changes in family life in contemporary developing societies: the role of children; the family and prevalence of marriage; household living arrangements; childbearing; employment of women outside the family; role of the elderly.

212. *Households and Families*

Ms. GOLDSCHIEDER.

Will review the important sociological, economic, anthropological, and historical research on the impact of demographic change on family structure, and the effect of family processes on demographic behavior. Emphasizes that one must study the family to better understand demographic processes.

213. *Health, Illness, and Medicine in Social Context*

Mr. WESSEN.

A critical examination of the influence of social and economic factors on the development of concepts of health and illness and on patterns of medical intervention. Assessment of the implications of the expanding jurisdiction of medicine; the relationship between work and health, power and disease-labeling; issues in social epidemiology; conflicting claims concerning the effectiveness of modern medicine; and alternative modes of care.

214. *The Metropolitan Community*

Mr. MEYER.

Examination of the major theoretical and empirical literature on ecological structure and dynamics of metropolitan regions in developed and less-developed nations. Particular focus on residential choice and mobility, residential structure and dynamics, and land use dynamics. Offered in Semester I, alternate years.

215. *Socio-Economic Analysis of Development*

Messrs. MORRIS, MARSH, and RUESCHEMEYER.

This course follows Sociology 207. It compares economic and sociological perspectives on the problems of development. Topics include problems of conceptualization and measurement, entrepreneurship, capital accumulation, labor force utilization, income distribution, the role of the state, and the impact of international economic relations on developing countries. Prerequisite: a basic undergraduate micro-macro economics course or consent of the instructors.

216. *Systems of Cities and Development*

Mr. MEYER.

Long term dynamics of systems of cities in developed and less-developed nations. Examination of the role of intermediaries such as financial institutions and corporations in integrating systems of cities. Topics include mercantile/colonial systems, dependency and urban systems, and urban-regional development policy. Offered in Semester I, alternate years.

217. *Topics in Societal Analysis*

The STAFF.

Offered irregularly, topics vary with instructor.

218. *Population Growth and Economic Development*

Mr. GOLDSCHIEDER.

The relation between population growth, natural resources, and economic change both in developed and in underdeveloped countries; the problems of economic and social development including optimum rural-urban growth and manpower utilization. Offered in alternate years.

219. *World Urbanization*

Mr. GOLDSTEIN.

Attention is given to the rapid rate of urban growth in the developing countries and the factors responsible for this. The social and economic consequences of urbanization and rural development are considered. Comparisons are drawn between the experience of the developing countries and the earlier experiences of the industrialized world. Offered in alternate years.

221. *Field Research in Community and Organizational Settings*

Ms. ANSPACH.

Methods of field research in community and organizational settings. Operationalization of theoretical constructs in field settings and identification of sociological questions underlying practical concerns. Students will engage themselves with the formulation of research problems within the context of community and organizational settings, especially those related to the delivery of health services. Offered in alternate years.

222. *Advanced Quantitative Methods of Sociological Analysis*

Mr. ELLIOTT.

The course primarily covers statistical methods not included in Sociology 200 and 201. The emphasis of the course will be on the analysis of discrete data, including two-way contingency table analysis, measures of association, loglinear models for analysis of higher order contingency tables, methods of estimation of parameters, handling of incomplete tables (such as social mobility tables), and square tables. Prerequisite 201.

223. *Techniques of Demographic Analysis*

Mr. GOLDSTEIN.

Procedures and techniques for the collection, evaluation, and analysis of demographic data; census and vital registration systems; measures of population composition and of fertility, mortality, and migration; construction of life tables, population estimates and projections.

226. *Selected Topics in Sociological Statistics*

The STAFF.

Offered irregularly.

226A. *Advanced Computer Programming in Sociology.*

The STAFF.

Prerequisite: Sociology 242 or consent of the instructor.

226B. *Stable Population Theory*

The STAFF.

226D. *Epidemiology*

Mr. WESSEN.

226E. *Analysis of Deficient Demographic Data*

The STAFF.

226F. *Ethnicity*

Mr. GOLDSCHIEDER.

226H. *Comparative Analysis of Health Care Systems*

Mr. WESSEN.

A comparative analysis of the similarities and differences in the ways various social systems respond to a common human need—the maintenance of health. Health care needs and resources in major areas of the world, “traditional” and “modern” health care systems in the Third World, comparative analyses of major types of health care organization: the “free enterprise,” “mixed” and “socialistic” models in developed and developing countries.

228. *Urban Institutions and Organizations*

The STAFF.

The development and structure of urban institutions and organizations (the police, educational, and public welfare groups), in their relationship to social, political, and economic systems. Offered in alternate years.

230. *Social System Theories*

Mr. MARTEL.

An intensive study of the works of Karl Marx and Talcott Parsons and of current sociological works deriving from them. The course will take up current issues between Marxian and functionalist theorists and seek to specify empirical ways of clarifying them. Changing emphasis in works and issues stressed in alternate years.

231. *Health Institutions and Professions*

Mr. BROWN.

Based on concepts developed in Sociology 213, this course focuses on the structure and operation of health professions and institutions. It includes the social-historical development of clinics, hospitals, and other health care locations; the training, socialization, and practice of physicians and nurses; and a study of the social structure of the modern hospital. Offered in alternate years.

232. *Internal Migration*

Mr. SPEARE.

A review of the major patterns and differentials in international and internal migration in a cross-cultural perspective. Particular emphasis is placed on theoretical models of migration. Offered in

alternate years.

233. *Manpower Resources and Labor Force*

Ms. GOLDSCHIEDER and Mr. SPEARE.

Manpower resources and labor force as sociological variables are considered in an international context. Attention is given to the differential manpower resources available in the developing and the developed countries; the occupational and industrial composition of the labor force; and the manner in which these are related to economic development and population growth. Offered in alternate years.

235. *Historical Demography*

The STAFF.

This is a critical study of the major work and the outstanding research questions in historical demography and the most appropriate methods for investigation of these questions. Most examples are drawn from Western Europe, although materials from Russia, Japan, and the former British Empire in Asia will also be considered. Students with a background either in demography or in social history are welcome. Offered in alternate years.

236. *Fertility*

Mr. CASTERLINE.

Comparative analysis of levels and trends in fertility in developed and developing countries with special emphasis on social and economic differentials and on determinants and consequences. Offered in alternate years.

238. *Mortality and Morbidity*

The STAFF.

Analysis of levels and trends of mortality and morbidity with special emphasis on social-demographic and economic differentials. Offered in alternate years.

239. *Population Policy and Control*

Ms. MILLMAN.

An examination of the formal and informal programs and practices which influence the determinants of population size and distribution, i.e., mortality, fertility and migration. Attention will be given to the potential role of technological development and institutional changes in affecting rates of population growth. Offered in alternate years.

240. *Ecological Study of the Community*

Mr. ZIMMER.

An evaluation of the concepts of human ecology and their application to the interrelationships of population, environment, technology and organization in the community setting.

241. *Mental Health Institutions and Providers*

Mr. BROWN.

The social history of mental health concepts, treatment, and the professions provides a foundation for studying sociological analyses of the mental health system. Emphasis on community mental health, deinstitutionalization, public-private service mixes, and other recent policy directions. Various forms of alternate treatment methods and system organization are studied. Offered in alternate years.

246. *The Impact of Metropolitanization: Special Topics*

The STAFF.

An evaluation of the effects of increasing metropolitanization on population distribution and composition. A synthesis of demographic and metropolitan area research and theory. Offered in alternate years.

248. *Biometrics of Human Fertility*

The STAFF.

Construction and application of probability models and computer simulation to the study of human reproduction. Offered in alternate years.

250-251. *Teaching Practicum in Sociology*

The STAFF.

Each student will be assigned to a faculty member to serve as an apprentice teacher in an undergraduate sociology course. During the course of the year the student will assume increasing responsibilities in all phases of course work, including direction of section meetings, giving lectures under supervision, preparing examinations, and reading reports and examinations.

291, 292. *Reading and Research*

The STAFF.

Work with individual students in connection with special reading, research, and preparation of dissertation.

Theatre Arts

Professors BARNHILL,¹ BASS, WILMETH (Chairman); Associate Professors EMIGH; Lecturers, Ms. DONER, Ms. DUNBAR, Ms. HIMMELBERGER, Mr. LUCAS, Ms. STRANDBERG, Ms. TANNENBAUM.

UNDERGRADUATE PROGRAM

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

The Department of Theatre Arts offers a concentration which combines study of dramatic literature, theatre history and studies and studio work in the various theatre arts. The aim of the concentration is to teach students to develop independent perspectives by means of practical, historical, and theoretical studies of dramatic procedures. An essential of the program is the engagement of the student in dramatic performance (acting, directing, stage design, dance, etc.) in order to help him or her to arrive at a total experience of the relationship between theatre and drama. Enrollment in the concentration will be limited to those students distinguished by their seriousness and sense of purpose. The concentration advisor will be assigned to the individual student by Professor Wilmeth, depending on the student's main focus. The concentration draws heavily from course offerings throughout the University, especially courses in dramatic literature, semiotics, and playwriting. The 12 course requirements of the concentration are:

- A. Theatre Arts 123-124 (to be taken prior to semester VII); Theatre Arts 23; Theatre Arts 25.
- B. Four courses in dramatic literature, theory, criticism, or history.
- C. Theatre Arts 152 (to be taken semester VII).
- D. Three additional courses determined in consultation with the assigned advisor on the basis of the student's primary area of emphasis (general theatre study, acting/directing, technical theatre/design, playwriting, dance or theatre/speech).

Honors. The standard pattern above, including Theatre Arts 152. Additionally, candidates will prepare an Honors thesis (Theatre Arts 199), the topic of which should be determined before semester VII. Candidates for the Honors program should apply to the Department by semester VI. The Honors advisor is John Emigh.

GRADUATE PROGRAM

MASTER OF ARTS. For admission to graduate work for the Master's degree in Theatre Arts, a prospective student must present a completed bachelor's degree or equivalent, with a background in dramatic literature and theatre arts. Other desirable foundation subjects include: speech, fine arts, music, philosophy, psychology, history, and literature.

A minimum of eight courses of graduate-level work in residence is required for the degree. (A student admitted provisionally may be required to present more than the minimum eight courses or to make up deficiencies at no degree credit.) Six courses in the area of theatre study and dramatic literature are required. The remaining two courses may be in performance, design, or playwriting, depending on the student's particular area of scholarly or artistic specialization.

Normally the degree requires completion of a Master's thesis. (One course of the eight required for the degree may be a thesis research course.) The thesis normally grows out of research in an advanced course and demonstrates a lucid and responsible piece of scholarship or criticism. In some cases, a student may be allowed to take a degree program without a thesis. The student who does not submit a thesis is required to complete ten courses rather than eight, which may require a third semester of residence.

A candidate for the Master's degree should show reading competence in one modern foreign language (preferably French or German).

Course Requirements for the A.M. degree

The candidate is required to demonstrate an understanding of the basic principles and practices of design and technical theatre, either by satisfactory completion of Theatre Arts 25, taken without credit during the first semester of residence, or by satisfactory performance on an oral or written

¹ Retirement 1986-87.

exam to be taken at entrance to the program. A student whose undergraduate record indicates satisfactory performance in a course equivalent to Theatre Arts 25, or who can present other evidence of adequate expertise and experience, may be exempted from Theatre Arts 25 and the exam.

The student must demonstrate an understanding of the principal theories and methods of acting. This requirement may be fulfilled either by Departmental approval of evidence of study and experience in acting, or by satisfactory completion of Theatre Arts 23, taken without credit during the first semester of residence.

The student will take Theatre Arts 123-124, unless the undergraduate record indicates that he or she has taken two courses or their equivalent in the History of the Theatre.

I. PRIMARILY FOR UNDERGRADUATES

6. *Introduction to Dramatic Writing* (English 6)

Mr. BASS.

The creative process of dramatic writing for beginning playwriting students interested in studying form and structure. Exercises and techniques for the development of craft and critical skills are included in a method of study that will result in the completion of an original play script. Written permission. S/NC.

12. *Advanced Playwriting* (English 12)

Interested students should register for English 12.

14. *Persuasion and Argumentation*

Ms. DUNBAR.

Provides an introduction to rhetorical argumentation and develops students' ability to build, organize and present arguments. Topics covered include: the nature and types of propositions, systems of analysis, the use of evidence, patterns of reasoning, lines of argument, weaknesses or arguments (fallacies), and the use of language in argumentation. Course presumes little or no experience. The course is limited to 16. Attendance is mandatory. Written permission is required. S/NC.

21. *Voice for the Actor*

Ms. TANNENBAUM.

Combines the traditional study of voice and diction (including phonetics) with the Linklater technique for freeing the natural voice. Monologues and speech work will be from Shakespeare. Attendance is mandatory. Permission required. S/NC

22. *Persuasive Communication* (Semiotics 22)

Ms. TANNENBAUM and Ms. DUNBAR.

Provides skills and helps to develop confidence in public speaking through oral presentation of persuasive speeches. Additional topics covered include rhetorical criticism, audience analysis, and attitude change. S/NC. Attendance is mandatory. Permission required.

23, 24. *Acting*

Mr. BARNHILL.

Focus on the elements of dramatic analysis and interpretation as applied to the art of acting. Monologues, scene study, and improvisation are the basis for comment on individual problems. Projects and extensive reading of dramatic literature. Substantial commitment necessary for preparation of class scenes. Eight hours of attendance. In special cases, the course may be repeated. Enrollment limited to 25 with a maximum of 5 freshmen in each section. Written permission required. S/NC.

25, 26. *Technical Production of Plays*

Mr. LUCAS.

Sem. I: Scene Design and Technical Production. A beginning survey of theatrical design considerations coupled with extensive ground work in scenic construction. Emphasis is laid on communication of ideas through scenographic techniques. Lab required. Written permission.

Sem. II: Stage Lighting. A detailed study of materials and methods of lighting design based on technical knowledge of equipment and established procedures. Lab required. Written permission.

31. *Beginning Modern Dance*

Ms. STRANDBERG and STAFF.

One and one-half hours of class, four days a week. Prerequisite: attainment of an intermediate level in any dance technique. Course limited to 40. Written permission required. S/NC.

32. *Dance Composition and Choreography*

Ms. STRANDBERG and STAFF.

Prerequisite: Some experience in dance composition or dance choreography. Written permission required. Course limited to 40. S/NC.

33. *Dance Styles*

The STAFF.

Each semester this course will focus on the style, philosophy, technique and repertory of a major figure in Modern Dance. The students will practice the technique and style of the artist and learn portions of his or her work. Students will also study biographical material, view films, and attend live performances when possible.

66. *Introduction to Cinematic Coding and Narrativity* (Semiotics 66)

Interested students should register for Semiotics 66.

71. *Introduction to Filmmaking* (Semiotics 71)

Interested students should register for Semiotics 71.

91. *Study at RISD*

Eligible for consideration for credit are courses in beginning architecture, apparel design, patterning, water color, and graphics. Specific courses cannot be named until after RISD catalog is issued. A list of courses approved for cross-registration will be posted in the Registrar's Office and the Theatre Arts Office. This credit is only valid for Theatre Arts concentrators. S/NC.

II. FOR UNDERGRADUATES AND GRADUATES

100. *Intermediate Dance and Movement for the Theatre*

Ms. STRANDBERG and Ms. DONER.

Designed to expand the student's knowledge of and proficiency in dance as an art form. Theatre Arts 31 or the equivalent is required. Mainly a studio course, but selected readings, papers, critiques, and field trips are important components of the course. Permission required. S/NC.

102. *English Composition: Drama*

115. *Mass Communication*

Ms. DUNBAR.

Provides an introduction to the study of American broadcasting, with particular emphasis on television. Topics covered include: the history of American broadcasting, the economic framework for broadcasting, regulation and social control, and the social influence of broadcasting through news, advertising, and programming. Written permission is required.

119, 120. *Advanced Acting and Directing*

Mr. EMIGH.

For qualified graduate students and undergraduates who offer Theatre Arts 23, 24 or the equivalent as a prerequisite. Written permission required. Sophomores are discouraged from applying for this course; concentrators and upper-classmen will be given primary consideration. S/NC.

123, 124. *A History of European Theatre* (English 123,124)

Mr. WILMETH.

Sem. I: The theatre and the theatre arts of ancient, Medieval, and early Renaissance Europe (England and Italy). Written permission required. Mr. Wilmeth. Sem II: The European theatre and theatre arts from the Renaissance to the early twentieth century, with special reference to the English theatre. Written permission required.

125. *Non-Western Theatre and Performance* (Semiotics 163G)

Mr. EMIGH.

Selected theatrical traditions and performance idioms of Asia, Africa, and the Americas. By introducing the student to theatrical traditions other than those of Europe and North America, the course aims at adding to the student's knowledge of the variety of forms that theatrical texts and social contexts, and furthering understanding of theatrical performance as a means of expressing thought and feeling within any culture. Interview and permission of instructor required in lieu of prerequisite. S/NC.

126. *Origin and Development of Popular Forms of Entertainment* (Semiotics 163P) Mr. WILMETH.

Major forms of English and American Popular entertainment are included, such as circus, carnival, dime museum, wild west show, medicine show, vaudeville, music hall (English), British pantomime, minstrel show, burlesque, and popular theatre. Interview and permission of instructor required.

127. *The Lyric Stage, 1600 to the Present*

Mr. LUCAS.

An examination and analysis of the history, style, content, and staging of opera, operetta, ballad opera, and musical comedy with an emphasis on the fluctuating relationships between the theatrical and musical aspects of each production. Written permission required.

128. *Topics in Theatre Studies*128A. *Special Topics in Dance*

The STAFF.

128B. *Broadcast Journalism*

Ms. TANNENBAUM.

For students with internship projects approved by the instructor. S/NC.

128C. *Production of New Scripts*

Mr. BASS.

A workshop course in which the students explore the problems, responsibilities, and creative challenges of playwright-director, and dramaturg in the rewriting and staging of original unproduced scripts. Seminar sessions are complemented by stage readings or original student plays.

128D. *The Dramatic Writings of George Bernard Shaw and the 19th Century Theatre*

Mr. WILMETH.

An examination of the plays of Shaw in the context of the 19th century theatre practice and techniques. Contemporaries of Shaw will be discussed as well.

128E. *History of Clothing and its Relationship to Theatrical Costuming*

Ms. HIMMELBERGER.

A survey of the history of clothing with a strong emphasis on the art and artists influencing each major period and historical and cultural events that have influenced clothing and art. Objective is to give the theatre designer an increased knowledge of research approaches and resources. The application of historical materials to stage worthy costumes will be discussed. Written permission. Lab required.

128F. *Costume Design and the Theatre*

Ms. HIMMELBERGER.

Introduction to the various elements of costume design in all performance forms and media. The role of the costume designer in relation to other theatre artists will be examined. Research techniques and their application will be stressed. Written permission.

128G. *Stage Make-Up and Facial Sculpture*

Ms. HIMMELBERGER.

Designed to acquaint the theatre artist with the basic techniques and principles of stage make-up so that creativity of design and execution may materially assist the actor in the development and projection of his character. The course will deal with facial modeling with paint, three-dimensional and prosthetics, facial hair, and hair styling. Written permission.

128H. *Workshop on Creative Writing: Drama* (English 101)

Interested students should register for English 101.

131. *Advanced Modern Dance*

Ms. STRANDBERG.

Designed for dancers who have attained an advanced level in any dance technique. Purpose is to help such dancers come to understand both intellectually and kinesthetically the diversity of one of the few indigenous American art forms: Modern Dance. Written permission required. Course limited to 40. S/NC.

132. *Choreography*

The STAFF.

This course is designed for those who have had some experience in composition and would like to work, under supervision, on making dances. Prerequisite: TA/32 or equivalent and some performing experience.

133. *Dance History: The 20th Century*

The STAFF.

This course is an exploration of the major figures and trends in modern dance and is of particular interest to American historians, art historians, dancers, and theatre majors.

152. *Seminar in Theatre Arts*

Seminar designed primarily for senior theatre arts concentrators, required during Semester VII. Topics will focus on career planning and theatre subjects not dealt with in other courses. S/NC.

163. *Special Topics in Film* (Semiotics 163)

Interested students should register for Semiotics 163.

189. *Independent Reading and Research*

Intensive reading and research on selected topics arranged in terms of special needs and interests of the student. A written proposal must be submitted to the instructor and the chairman of the Theatre Arts Department before the project can be approved. Written permission required. May be repeated for credit. The Staff.

199. *Senior Honors Thesis Preparation*

To be taken by all students accepted into the Theatre Arts Honors Program. Written permission required.

III. PRIMARILY FOR GRADUATES

210. *Seminar in Dramatic Theory* (English 210)

Mr. EMIGH.

Studies in Western and non-Western dramatic art. Theatrical theory from Aristotle to Grotowski. Written permission required. Limited to 20. For graduate and qualified juniors and seniors.

280. *Graduate Level Independent Reading and Research*

A program of intensive reading and research on selected topics arranged in terms of special needs and interest of the student. Written permission required. May be repeated for credit.

285. *Master's Thesis Research*

THESIS PREPARATION

For graduate students who have met the tuition requirement and are paying the Registration Fee to continue active enrollment while preparing for a preliminary examination. Register for code noted below.

PRELIMINARY EXAMINATION PREPARATION

For graduate students who have met the tuition requirement and are paying the Registration Fee to continue active enrollment while preparing for a preliminary examination. Register for code noted below.

Related Courses

Courses in dramatic literature, offered in other departments, in particular English, Comparative Literature, Classics, French, German, and Italian, and Greek can be taken for credit in the concentration and the Masters of Arts degree in Theatre Arts. Courses should be approved by the staff advisors. Other courses related to theatre may receive credit if approved for concentration.

Urban Studies

A major feature of the history of man in modern times has been the radical change in the pattern of settlement, from rural to urban to metropolitan. The ramifications of this trend have been enormous, generating in this country, a sense of crisis in recent decades. But the social scientific study of this phenomenon has lagged far behind the movement of events. In part, this was due to the pace of events, and in part, it was because the study of urbanization and the problems of urban areas did not fit neatly within the boundaries of a single discipline.

At Brown University, interest in urban problems first manifested itself in the late 1960's with the recruitment of urban specialists in a variety of departments. With the introduction of the new curriculum in 1969, many students sought to develop independent programs of study around the theme of urbanization. Interaction among the urban specialists on the faculty and with these students generated a momentum which ultimately led to the appointment of a Committee on Urban Studies by President Hornig in 1971. Since then, the pace has quickened, and a number of significant developments have taken place which reflect a growing commitment on the part of the administration, faculty, and students to Urban Studies. Additional faculty appointments in Urban Studies were authorized in 1974.

A *standard* concentration in Urban Studies was approved by the Educational Policy Committee in the spring of 1973, and a revised concentration program was approved in the spring of 1975 and is now in effect. Several new courses were introduced into the program. A student organization, The Urban Studies Society, has been formed. Two graduate students petitioned the Graduate Council for approval of a Ph.D. in Urban Studies, and their petitions were granted. Urban Studies faculty also participate in the University's Curricular Advising Program through Special Topics 33, *The Liberal Arts: Context for Urban Studies in Urban Planning*.

The Committee on Urban Studies has stimulated the development of new courses, both departmental and extra-departmental, which deal with urban problems and techniques of analysis. The Committee has also been active in sponsoring seminars and lectures by distinguished academics and

practitioners in the urban field. A small working library with materials relevant to research and career guidance has been developed in Lower Maxcy Hall, Room 8. Periodical reports are issued informing interested faculty and students of recent acquisitions.

The Committee also acts as a clearing house for information on intern programs, part-time, summer, and full-time employment as well as information on graduate and undergraduate programs in Urban Studies and related fields at universities throughout the country and abroad. The Committee encourages and facilitates participation in work-study programs off campus as part of an Urban Studies concentration.

Although Urban Studies is now a standard concentration, much of the flexibility offered by the independent concentration has been preserved. The aim of the concentration program is to expose undergraduate students to the study of urban phenomena through the approaches of different disciplines, thus providing an interdisciplinary context in which to focus on urban policy and problems. Urban Studies is not a discipline — it is a subject matter to be studied. To study it properly it is necessary to bring a number of different specialized disciplines together and have each focus on aspects of the problem appropriate for that discipline. At the same time the interdependence of the different approaches to a common problem must be recognized. Only in this way will the student acquire a full and balanced view of the many dimensions of the urban community and urban life. The problem defies disciplinary jurisdictions, particularly if policy issues are involved.

While the program attempts to have sufficient flexibility to allow students to pursue specific interests without being overly bound by requirements, it nonetheless is designed so that there will be a core content to the program of study. The core content of the program will assure a familiarity with major scholarly approaches to the urban (metropolitan) community, while providing a set of common experiences that will create some sense of cohesion among concentrators and faculty. The attention of the Urban Studies Program is focused on undergraduate teaching and on research. The Program has several objectives. First of all it provides a broad liberal arts education in the Brown University tradition. It is designed to satisfy the needs of those students who are interested in urban problems, but who do not feel well served by the existing departmental programs, which traditionally represent a much narrower point of view.

The following members of the faculty are involved in the Urban Studies Program: Professors B. G. ZIMMER, Chair (Sociology); Adjunct Professor M. FELDMAN (Urban Studies); Professors J. V. HENDERSON (Economics); H. CHUDACOFF (History); Assistant Professors J. MORONE (Political Science); D. R. MEYER (Sociology), H. SILVER (Sociology).

UNDERGRADUATE PROGRAMS

STANDARD CONCENTRATION PROGRAM FOR THE BACHELOR OF ARTS DEGREE

The program requires ten courses for a concentration. Urban Studies 21 (Introduction to the City) or Urban Studies 22 (Urban Politics) is required. The remaining courses are selected from four other course groups:

1. *Research Skills* (one course): either Sociology 102 or an approved statistics course, e.g., Applied Mathematics 165, Mathematics 162, Political Science 60, or Sociology 110.
2. *Core Curriculum* (six courses): A) The disciplines (one course from each of three disciplines) selected from among Art 56 and Art 59; Economics 141; History 175 and History 176; Political Science 22 and Political Science 118; Sociology 130, 133, 154 and 164. B) Urban Studies Core Courses (two courses selected from among Urban Studies 23, 101, 102, 116, 132, 135, and 142. C) An Urban Studies Seminar, Urban Studies 18X.
3. *Complementary Curriculum* (two courses): selected from among American Civilization 152, Art 47, Classics 54, Economics 148, Engineering 90, Engineering 194D, Political Science 147, University 111, and University 163. In addition, any course listed in the above two groups, including any research seminar in an urban studies-related discipline (art, economics, history, political science, sociology, e.g., History 197C or Art 159) not used to satisfy any of the requirements of the above two groups may be used to fulfill this requirement.

Honors. Candidates for honors concentration should apply by midterm of the second semester, junior year. Twelve courses are required of an honors concentrator, including one thesis preparation course in the senior year and the second *research skills* course. To receive an honors degree, the candidate's thesis and course record must be of outstanding quality.

I. PRIMARILY FOR UNDERGRADUATES

21. *An Introduction to the City* (Sociology 21) Mr. ZIMMER.
This is an introductory course designed primarily for students planning a concentration in Urban Studies. It will examine the growth of cities and the development of metropolitan areas in the 20th Century. The social, economic, and political consequences of the urbanization process will be emphasized.
22. *City Politics* (Political Science 22) Mr. MORONE.
23. *A Case History of a Social Invention: Urban Renewal* Mr. FELDMAN.
This course examines how the Urban Renewal Program has defined the conditions for the redevelopment and conservation of communities participating in the program. The course examines the Urban Renewal Program's history and current operations by: a) formal lectures; b) a class project; and c) student preparation of a research proposal concerning a renewal-related topic.
56. *Nineteenth-Century Architecture* (Art H85) The STAFF.
European and American developments in architecture contributing to the modern movement.
59. *Twentieth-Century Architecture* (Art H87) The STAFF.
European and American developments in modern architecture to the present.

II. FOR UNDERGRADUATES AND GRADUATES

101. *Fieldwork in the Urban Community* Mr. FELDMAN.
Examination of theoretical and classroom experience in the context of practical situations by working in a community agency or organization. Students must devote a minimum of six (6) hours per week to the community organization and attend weekly seminar meetings with the faculty sponsor. A final, analytical report will be required. Written permission required.
102. *Issues in the Development of a National Urban Policy* Mr. FELDMAN.
The principal topics covered by the course include: the emergence of national urban issues in Post WWII U.S.; the interrelationships of local, state and federal efforts addressed to those issues; an analysis of various kinds of planning approaches ("master", development, project, incremental) as applied to urban issues; and the current status of national urban policy in the United States.
116. *The Modern Corporation and Metropolitan America* Mr. MEYER.
The significant impact of large corporations on metropolitan areas. Special attention given to financial, industrial, and service corporations. Examination of ways corporations link metropolitan areas through their business ties. Effect of corporate decisions on growth and decline of metropolitan areas.
118. *Federalism and Urban Public Policy* (Political Science 118) Mr. MORONE.
130. *Urbanization in World Perspective* Mr. MEYER.
The transition from a rural to an urban society. Changes in the social and ecological organization of rural and urban sectors of modern and modernizing societies. Problems associated with rapid urban growth, rural decline, and rural-urban migration.
132. *Urban Housing in the United States* Mr. FELDMAN.
The course will examine "housing" as a series of institutional practices involving individuals in the design, financing, development, management and control of housing. The context for these institutional practices will be a review of the housing issues which have emerged and the housing programs which have been employed in the United States from the mid-1930's into the 1980's.
133. *The Metropolitan Community* Mr. MEYER.
Study of the internal ecology and dynamics of metropolitan regions in developed and less-developed nations. Topics include residential mobility, change in residential areas, commercial and industrial land use, change in land use system, and exurban/nonmetropolitan dynamics.
136. *Social Change and Social Policy* (Sociology 136) Ms. SILVER.
The various theories of social change together with a consideration of their implications for accurate forecasting and prediction in the service of planning and social problem solution. Special emphasis

on the analysis of recent social trends on both the societal and community levels as a basis for dealing with such contemporary social problems as population growth, race relations, economic welfare, and poverty.

140. *Political Sociology* (Sociology 140)

Ms. SILVER.

141. *Urban Economics* (Economics 141)

Mr. HENDERSON.

An analysis of cities and metropolitan areas with emphasis on the spatial distribution of population and employment within and across such areas. The following urban problems and their associated policy issues are developed in detail: housing, transportation, inter-governmental structure, and the fiscal situations of local governments.

142. *Topics in Urban Economic Policy* (Economics 142)

Mr. HENDERSON.

154. *Human Needs and Social Services* (Sociology 154)

Ms. SILVER

164. *Social Inequality* (Sociology 164)

175, 176. *American Urban History*

Mr. CHUDACOFF.

Course will examine the urban dimension of American history. It is both a survey, covering a period from colonial times to the present, and a specialized focus, placing the city in its historical context and exploring American history from an urban frame of reference. It will divide around 1850 or 1860, the watershed between old "walking" city and modern, mechanized city.

187C. *Urban Planning and Public Policy* (Sociology 187C)

Ms. SILVER.

For juniors and seniors who are pursuing concentration in Urban Studies. The seminar will examine the internal development and the external expansion of cities in terms of public policy. Topics to be discussed include inner city revitalization, zoning, transportation, and the preservation of open space.

187I. *Social Welfare Policy and U. S. Cities*

The STAFF.

For juniors and seniors who are pursuing concentration in the Urban Studies. This seminar will examine social welfare policies at the federal level — e.g., AFDC, Social Security, other cash transfer programs, proposals for income maintenance — and how these relate to the social structure of cities. Topics covered will include welfare reform, guaranteed income versus other income maintenance programs; unemployment, underemployment, and the working poor; income equalization proposals. A research paper will be required.

190, 191. *Independent Reading and Research*

The STAFF.

A specific program of intensive reading and research will be arranged in terms of the special needs and interests of the student. Open primarily to concentrators, but others may be admitted by permission of instructor.

III. PRIMARILY FOR GRADUATES

210. *Social and Political Aspects of Community Organization* (Sociology 210)

Ms. SILVER.

The Wayland Collegium for Liberal Learning

Growing out of a number of existing and earlier activities, the Francis Wayland Collegium for Liberal Learning was established in 1980 as a unique system of support for inquiries focused on significant issues of human life. Such modes of learning, which aim at a synthesis of diverse materials, are often not freely available within departments or programs.

The "fractured atoms" of the contemporary world are the by-product of its rich complexity. But while the break-up of old forms of order can lead to disintegration and cynicism, or to an escape into rigid and simplistic forms of new order, it can also lead to careful reshaping of things seen freshly from new vantage points. The Collegium aims at a coherence of inquiry that respects diversity, and at a connectedness of persons in which freedom of thought is based in a community of intellectual concern. These aims are essential for liberal education, which seeks to develop citizens of the mod-

ern world who combine autonomy with the will and understanding to act responsibly for the social good.

The Collegium's work proceeds in three closely related directions. First, it encourages curricular offerings in integrative studies. Courses may stress a particular mode of thought, expression, or action, and examine its aims, methods, presuppositions and implications; they may consider the place of a particular mode in a broader context of social institutions, ideas, and values; they may study various relations among different modes, and explore the possibilities for an integrative treatment of them; or the courses may focus on fundamental themes of human life or problems of society, and on approaches to them by several disciplines or by modes of thought that may not be found in existing disciplines, the different approaches being treated so as to bring out connections between them. In general, the courses are extra-departmental, but they may be offered in departments or programs, or may be cross-listed in them. The Collegium's second purpose is to furnish a setting in which faculty can discover and develop common interests and mutual support. It seeks to foster faculty growth and renewal in integrative learning by providing opportunities for discussion of significant issues. It also offers opportunity for reaching faculty members whose interests in such topics and methods are only beginning to develop. These activities are intended to further both new research and the improvement of teaching. The Collegium currently sponsors an annual seminar in which a small group of faculty members work together for a year on a particular topic, thereby contributing to both curricular development and growth of new research interests. Thirdly, the Collegium sponsors such activities as lectures, conferences, and workshops in order to broaden its contribution to the consideration of major human concerns by faculty, students, and the public at large.

About fifty members of the faculty who especially share the Collegium's concerns are appointed as Fellows, for renewable periods of three years, and one member is Senior Fellow. The Collegium is directed by an Executive Committee consisting of six fellows, the Senior Fellow, and the Dean of the College. For 1985-86, they are A. Dzidzienyo, P. Heywood, G. Morgan, L. Newman, B. Shepp, W. Crossgrove (Senior Fellow), H. Sheridan (Dean of The College).

The Collegium is located in Room 101 of Rhode Island Hall, and interested faculty members and students are encouraged to drop in to find out more about its work.

Women's Studies

The courses listed below focus on questions pertaining to women, gender, or sexual difference. For course descriptions, see departmental listings. Contact the Pembroke Center for additional information on related courses.

Afro-American Studies

102E. *Black Women in the Americas*

Ms. BROWN-COLLINS.

American Civilization

163, 164. *History of American Women* (History 163-164)

Ms. BUHLE.

190E. *Formula and Fantasy: Women and Popular Culture*

Ms. JOYRICH.

Anthropology

194A. *Cross-Cultural Approaches to Studies of Gender*

Ms. LAMPHERE.

Biology & Medicine

34. *Bio/Co Health and Human Reproduction*

Ms. NEWMAN.

36. *Biology of Gender*

Ms. FAUSTO-STERLING.

390. *Human Sexuality*

Ms. WEIHS and Ms. MCINTYRE.

English

146. <i>Women Poets in English</i>	Ms. WOODS.
149. <i>British and American Women Writers</i>	Ms. ROONEY.
260. <i>Jane Austin</i>	Mr. BLOOM.
288. <i>Contemporary Feminist Theory</i>	Ms. ROONEY.

French Studies

131B. <i>Représentations de la femme au XIX^e siècle</i>	Ms. SCHOR.
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History

197. <i>Women and American Radicalism</i>	Ms. BUHLE.
198. <i>Feminism and Psychoanalysis in the U.S. 1909 to Present</i>	Ms. BUHLE.

Psychology

23. <i>Gender Issues in Psychology</i>	Ms. BLOUGH.
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Religious Studies

138. <i>Freudian Texts in the Light of Women's Issues</i>	Mr. MILHAVEN.
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Sociology

123. <i>Sex Roles and Status in Comparative Perspective</i>	The STAFF.
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Women's Studies

197-198. *Directed Research and Thesis*
Independent study under the direction of a faculty member, leading to a major paper. Required of honors candidates.

199. *Senior Seminar* (English 288) Ms. ROONEY.
For Women's Studies and semiotics concentrators, graduate students in English, and other advanced students with related interests. The seminar will deal with issues of feminist theory and method as defined in a number of disciplines. The major focus will be on research and writing by seminar participants. Required of Women's Studies concentrators. Written permission.

Special Themes and Topics

64. <i>Women and Health Care</i>	Ms. BARKER and Ms. WILD.
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Related Courses

Comparative Literature

252. <i>The Ideology of Form: The Renaissance</i>	Ms. NEWMAN.
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English

S75. <i>Introduction to Literary Theory</i>	Ms. ROONEY.
287. <i>Theories of Textuality</i>	Ms. DOANE.

Environmental Studies

151. <i>Environmental Theory and Philosophy</i>	Mr. BURTON.
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Religious Studies

132. <i>Anger</i>	Mr. MILHAVEN.
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Sociology

3. <i>American Society</i>	Mr. MARTEL.
127. <i>Race, Class and Ethnicity</i>	Mr. MARTEL.

Theatre Arts

128D. *The Dramatic Writings of George Bernard Shaw and the 19th-Century Theatre*

Mr. WILMETH.

*Extra-departmental Courses*SPECIAL THEMES AND TOPICS¹

In recognition of the fact that in an intellectually creative atmosphere unforeseeable ideas for new kinds of courses may and should arise, the category "Special Themes and Topics" is specifically designed for course offerings that do not fit within any other existing category. Courses originate with individual instructors and are retained in the curriculum only so long as these instructors wish to teach them.

23. *Language Diversity: The Social Function of Variation and Correctness in Human Language*

Mr. MESKILL.

The function of language is to convey information. However, in the context of a work-a-day interaction, language also communicates social status and role-function, formality and intimacy, regional and educational background, and often ethnicity. Major questions to be addressed are: How and why?

31. *Parables and Paradoxes: The Limits of Language and the Redescription of the Self* (see Religious Studies 88A)

Mr. STOWERS.

36. *The Hospital, Perspectives on a Social Institution*
(see Biology CO36)

Ms. MONTEIRO.

37. *The Biology of Gender* (see Biomed 36)

Ms. FAUSTO-STERLING

38. *Women, Work and Family* (see Anthropology 14)

Ms. LAMPHERE.

39, 40. *Studies in World Interdependence*

Mr. BARNES and STAFF.

Directed to all undergraduates, this course provides ground-work for later studies in world problems. It offers in conjunction with various members of the faculty a wide range of topics to be discussed, including: non-Western art, agriculture, global economic problems, international environmental difficulties, language and communication, ethnocultural friction, the rich and the poor, search for human unity, population predicament, and others.

43. *The Far Side of the Old World: Perspectives on Chinese Culture*
(see Comparative Literature 71B)

Ms. LEVY.

49. *Under the Double Eagle: The Culture of Hapsburg Europe*

Mr. SCHNERR.

A multi-medial study of the Central European culture that evolved as a common heritage of the Hapsburg empire, which in the nineteenth century included twelve nationalities. Elements of this cultural heritage persist long after the end of the monarchy. Emphasis on history, ideologies, literature, architecture, painting, theatre, music. Presentation by readings, lecture, audio-visual media.

53. *The Image of the Shtetl in Yiddish Literature*

Mr. WARNOCK.

The *shtetl* — the Eastern European Jewish or partly Jewish small town — was the subject of passionate and vastly divergent portrayals in Yiddish literature of the nineteenth and twentieth centuries. At the one extreme it was sentimentalized for memories of years in the *kheder*, warmth of the family and preparations for the holidays, as a haven in a largely hostile gentile world; at the other it was ridiculed for its poverty, ignorance and the narrowness of spirit that it was felt to engender. Course work will involve the rapid reading of prose writings by a number of Yiddish authors. We will examine these for their varying views of shtetl life and, through some non-fictional readings, try to understand the changing historical and social conditions that account for them. Authors to be treated include: Sholem Asch, Mendele Mocher Sforim, I.L. Peretz, Sholom Aleichem, Isaac Joel Linetski, I.M. Dik, I.M. Weissenberg, David Bergelson, S. Ansky, Joseph Opatoshu and Isaac Bashevis Singer. All readings can be done in English and there is no foreign language requirement. If any students should have adequate knowledge of Yiddish, they are encouraged to read at least some of

¹ See also Special Themes and Topics/Seminar Courses (page 371) and Special Themes and Topics/Foundation Courses (page 372).

the works in the original language, and additional regular meetings can be arranged to discuss specifically linguistic and stylistic problems.

64. *Women and Health Care*

Ms. BARKER and Ms. WILD.

Women have many health care problems not shared by men. The goals of the course are to give an overview of the needs of women in the medical care system, during all phases of the life cycle, and promote personal responsibility for health care management. Emphasis is on differentiating between hard facts and soft data, as well as reviewing the most current information.

68. *Genetics, You and Society* (Biomed 8).

Mr. HAGY.

Genetics is a particularly exciting, relevant area of modern biology. The goal of this course is to learn basic principles of genetics which give the foundation for understanding how recent advances in genetics have an effect on individuals and on society. Topics will include gene-chromosome relationships, modern concepts of gene structure and function, experiments with recombinant-DNA, cloning and genetic engineering, genetic counseling, prenatal diagnosis, and genetic screening programs.

72. *In Search of the Melting Pot: A Global Perspective on Multi-Ethnic Societies*
(Portuguese and Brazilian Studies 72)

Ms. BECKER.

Using a cross cultural approach, this course studies minority/majority relations in the U.S. and other multi-ethnic societies. Concepts of ethnicity, as they relate to racism, politics, women's roles, education and economic policy in the U. S. and various Third World nations, are explored. Students are expected to combine research and original thinking for a presentation and paper on an aspect of the inter-ethnic dynamic.

84. *Beyond 1984: Freedom and Tyranny in English Literature*

Ms. WOODS.

This course examines English attitudes toward freedom and tyranny as reflected in English literature from the Renaissance to George Orwell's post-World War II statement in *1984*. Since English pride in love of freedom and abhorrence of tyranny is the basis not only of the American revolution, but also of the ideas embodied in the American Constitution and Bill of Rights, the English experience has a direct and continuing relevance for Americans. Limited to 20. Written permission.

86. *The Making Choices: England in the Eighteenth Century*

Ms. RABB.

This is an interdisciplinary course in which literature is studied in conjunction with history, science, philosophy and the visual arts. The theme of "the choice" will organize examples from Swift, Defoe, Locke, Johnson, Hogarth, Blake and others. Students will be encouraged to use primary material, such as rare books, original engravings, local examples of eighteenth-century architecture and the like.

II. FOR UNDERGRADUATES AND GRADUATES

102. *History of Biology and Medicine*

Messrs. Beck and Erikson will examine a series of major figures and events in the history of biology and medicine. Intended for, but not limited to, upper classmen and graduate students with some background in history and biology. Applicants should arrange for an interview through the Division of Biology and Medicine (Room 102, Biomedical Center, telephone 863-3355). Offered in alternate years.

103. *Agricultural Development in the Third World*

Mr. JAY.

How land is farmed in Third World countries today has become big political and economic business. The most visible signs of the process are the globalization of world food resources and the increasingly unequal distribution of food and therefore of surfeit and hunger. The course examines the process from three Third World areas: Southeast Asia, Africa and Latin America,

105. *Culture and Health* (Community Health BI/CO23)

Ms. NEWMAN.

This undergraduate course is about definitions of health and illness and their cultural contexts. The first part, biosocial perspectives, includes evolutionary, epidemiological and ecological perspectives. The second part, cultural perspectives, includes cross-cultural comparisons of health behavior, folk medicine, holistic health, and past and present formal medical systems. No prerequisites.

106. *Japanese Culture and Society* (see Anthropology 118)

110. *Introduction to the Study of Medieval Texts*

Mr. MATHIESEN.

A practical introduction to the methods of scholarly work with medieval texts (paleography, codicology, diplomatics and textual criticism), through classwork and through supervised individual work on medieval materials at Brown. (The methods are equally applicable to texts of other periods, such as Antiquity or the Renaissance.) Prerequisite: some knowledge of a medieval language, or of Classical Latin or Greek.

114. *Insiders and Outsiders*

Ms. GOLOPENTIA-ERETESCU.

A highly interdisciplinary course, semiotic in methodology, considering distinctions we make between *insiders* and *outsiders*, the kinds of changes that convert an I into an O, an O into an I, how we deal with these changes, means for bringing them about, and varieties of I-O interactions. Reading from literature, folklore, anthropology, linguistics, sociology, and history.

121. *Land-Use, Culture, and Civilization in Northern Europe and the New World*
(see German 163)

Mr. CROSSGROVE.

This course will explore changing views of the rights and duties of Northern European landowners and their successors in the New World from the Middle Ages to the present, attitudes of people towards the land as reflected in literature and art, and changes in the actual use of the land. Particular attention will be devoted to examining how the lives and social status of the peasants and farmers who work the land have changed in the transition from agrarian to industrial societies. Prerequisite: basic courses in one of the social sciences; or written permission.

124. *Space: Geometry, Cosmology and Cognition*

Ms. RICHARDS.

Changing interpretations of human nature and human knowledge have always been intimately bound up with changes in scientific theory. This course will focus on this interaction by looking at the interplay among psychological, mathematical, and physical definitions of space, in the ancient world, the early modern period and twentieth century. The specific study of space will be used to highlight the ways in which our scientific concepts are intertwined with and immediately affect our views of ourselves in the natural world. Although there are no specific prerequisites, the course will consistently span psychological, physical and mathematical issues, and students must be willing to give serious attention to each of these areas. Enrollment limited to 20. Written permission.

UNIVERSITY COURSES

University courses address themselves to major themes and problems requiring a different perspective than generally governs departmental offerings. They provide students with the opportunity to integrate their understanding of major areas of learning and explore relationships among diverse forms of human experience; or to relate one or more disciplines to a broader context; or to focus on large and fundamental problems that need to be approached through several disciplines or by ways not found in existing disciplines.

University courses are not attached to departments. They originate with individual instructors and are retained in the curriculum only so long as these instructors wish to teach them. They are intended as important educational experiences for students in every area of learning; in addition, they may have special importance for students pursuing extradepartmental programs. University courses are taught by seminars, lectures, or other suitable methods. They are not open to first year undergraduates. Enrollment may be limited and may require the instructor's permission.

I. PRIMARILY FOR UNDERGRADUATES

42. *The Many Perceptions of Mental Illness*

Mr. P. BROWN.

This course will study various perceptions of mental illness, including some which don't usually receive attention in academic courses. There will be four major parts:

1. Mental illness as a central aspect of life—will include general clinical models, Laing's existen-

tial—phenomenological approach, Ken Kesey's fiction, and other material which situates mental illness in a full social context.

2. Sociological perspectives—includes study of the medical model and social structure of the mental hospital.

3. Mental illness in the arts.

4. Public attitudes, patient perspectives, and patients rights.

Lectures, class discussion, and discussion sections will be complemented by guest speakers, slides, audio tapes and films.

53. *Language, Thought and Reality* (see Linguistics 53)

The STAFF.

104. *The Written Word* (see Linguistics 104)

Ms. BARON.

107. *The Burden of Disease in Developing Countries*

Mr. ARONSON.

Course will define and weigh the role which infectious and nutritional diseases exert upon the health of certain developing countries of Asia, Africa and the Caribbean. By epidemiologic methods, inquiry will be made into risk factors which selectively predispose these populations to certain diseases. Attention will be directed to the effects of malnutrition upon attack rates of certain communicable infections, disease sequels, mortality rates, industrial or agrarian productivities and maternal fertility rates. Open to juniors, seniors and graduate students with permission of the instructor. Enrollment limited to 30.

II. FOR UNDERGRADUATES AND GRADUATES

111. *Possibilities for Social Reconstruction*

Mr. MORGAN.

The quality of people's lives is interwoven with the major practices and institutions of their society. Despite the many achievements of modern Western society, the quality of life it fosters is widely deplored. In this course we will pursue a twofold aim. We will try to identify and critically examine basic assumptions and characteristics of practices and institutions in advanced industrial society, and we will consider alternatives which seem more conducive to human needs and fulfillment. The study of some writings which share this aim will initiate the course. Following this, members will pursue studies of their own choice. Each study will be presented to the class in ways which will enable all participants to engage in common exploration. Studies may focus on some general feature of social practices or one particular practice. An important aim of these studies will be to bring out interrelations of various issues and areas. Conducted as seminar. Written permission required.

112. *The Threat of Nuclear War — Looking for Creative Responses*

Mr. MORGAN.

The topic will be examined from a wide range of perspectives, including factors generally in the forefront of attention to nuclear arms and war, as well as underlying dimensions of human existence that bear upon them. The instructor hopes that the study will lead to participants' greater understanding of the matters discussed and, at the same time, to their greater ability to prepare themselves for thoughtful action aimed at diminishing the likelihood of nuclear war.

1. The threat of nuclear war; 2. Attitudes toward the threat; 3. Security doctrines; 4. Some forces behind the US nuclear arms build-up; 5. Language, reason, and nuclear war; 6. Moral issues; 7. Our relation to the "other"; 8. Nuclear weapons in our life; 9. Diminishing the likelihood of nuclear war.

Conducted as seminar. Each student will choose one of the major topics for special study and, together with others working on the same topic, will be responsible for selecting a significant portion of the common readings. Written permission.

114. *Anthropological Issues in World Population*

Ms. NEWMAN.

World Population is influenced by broad biological and cultural forces. The course will be concerned with the following perspectives: the cultural context of reproductive behavior; symbolism of reproduction and of the life cycle; interpersonal aspects of fertility regulation; cross cultural perspectives on family and couple communication; procreative aspects of gender identity; biosocial mechanism of population regulation; pronatalist policies and the roles of women; ethical issues in international population policies; and technology and "artificial" reproduction. Open to upper level students. Offered in alternate years.

118. *Human Relationship*

Mr. MORGAN.

The course will begin with the writings of Martin Buber. These are intended to provide common ground for all members of the class. A deepening and refinement of understanding will be sought through comparison of Buber with some other authors, for example, Sartre and Ortega y Gasset. Following this, members of the class will pursue studies of their own choice. Each study will be presented to the class in ways which will enable all participants to engage in a common exploration. Examples of such studies are: basic problems of the nature, difficulty, and realization of the inter-human; kinds of relations (marriage, parent and child, physician and patient, friendship, sex, love, relationship in the public sphere); dimensions of relationship (communication, responsibility, solitude, personal identity, social roles, community). Conducted as seminar. Written permission required.

123. *Changing Conceptions of Infancy and Childhood*

Mr. LIPSITT.

Our conceptions of the infantile, childhood, and adolescent stages of development are markedly affected by social custom, historical trends, transgenerational changes, and the political and economic climate. This course will explore the shifting sands on which childhood stands. We will draw upon psychological knowledge and the contributions of other disciplines for an understanding of how it is that in different cultures and at different times children can be imbued with such diverse characteristics and are required to behave so differently. Open to juniors and seniors. Enrollment limited. Written permission.

124. *The Breakdown of Democratic Regimes: A Comparative Study of European and Latin American Cases*

Mr. STEPHENS.

Citizens of the developed democracies of the West now tend to take their form of government for granted. Yet, only half a century ago, regimes in six different European countries sent sixteen million people to death in concentration camps and unleashed a war that caused the death of many millions more. We will analyze the breakdown of democratic regimes in Europe and Latin America in comparative and historical perspective, in order to gain a better scientific understanding of the causes of such phenomena. The European section will focus on four cases: Germany, Austria, Spain and Italy. An in-depth study of three cases, Chile (1973) and Brazil (1964), and Argentina will follow. The focus of the case studies will be on the micro and macro level dynamics of the seizure of power.

125. *Virtues and Vices: (see Religious Studies 125)*

Mr. TWISS.

126. *Energy, Man, and Environment*

Mr. SEIDEL.

This course will discuss the nature of the U.S. and world energy problem. The factors responsible for this problem — the exponential increase in the use of energy by man, the depletion of natural resources, the restraints imposed by a deepening concern over the deterioration of the environment, the influence of international politics, and domestic policy decisions — will be considered in terms of science, economics, and politics. No previous training in science is required, but a willingness to study the physical principles underlying the problems of the use of energy by man is essential.

128. *The History and Philosophical Context of Economic Thought (see Economics 128)*

Mr. PUTTERMAN.

129, 130. *Understanding the Brain*

Messrs. ELBAUM and ANDERSON.

In Semester I, we will analyze the visual system and introduce simple mathematical models for learning and memory. Some important results from experimental and cognitive psychology, which a satisfactory model for brain organization and function should explain, will be discussed. We will continually try to relate psychological function on one level with the underlying neural circuitry on another. In Semester II, the basic features of communication processes are examined with emphasis on the physical and chemical mechanisms of information storage and transmission involved in living systems. A detailed analysis of a few simple cases will be made. We will then study several models of distributed memory, learning and association. The validity of comparisons with the functioning of 'inanimate' systems will be discussed. Prerequisites: Some mathematical background, first year calculus or better, is expected. Biological background desirable but not essential. Graduate students are welcome and encouraged to register.

133. *Religion and the Good Society* (see Religious Studies 127)

Mr. REEDER.

135. *Alcohol, Health, and Culture*

Mr. HEATH.

An introduction to alcohol as it relates to health and cultures. A variety of perspectives will be offered, including: historical and geographical perspectives on alcohol use, sociological and anthropological viewpoints on the range of beliefs and behavior associated with alcohol, biochemical and physiological data on the metabolism and effects of ethanol, epidemiological and medical data on alcohol consumption and its outcomes, legal and forensic implications of alcohol and alcoholism, a review of approaches to treatment of alcoholism, and other selected topics.

143. *Caught in the Web: or the Form and Fate of Folklore*

Ms. ARANT.

Oral traditional narrative and lyric genres have played a vital role in the life of man. These genres (in particular incantation, riddle, proverb, ritual and lyric song, lament, epic, folktale and ballad) will be studied from the point of view of their poetics, their effect on written literature for both children and adults, and their relation to ritual and myth. The course is open to undergraduates and graduates.

146. *Marx and the Poets*

Mr. AHEARN.

A contrastive and integrative study of the range of Marx's writings and selected novels and poetry by some of the following: Blake, Dickens, Balzac, Flaubert, Baudelaire, Rimbaud, Dostoyevsky, James. The larger goal will be to illuminate, for students of literature, philosophy, social sciences and others, the complex connections between forms of social life and works of literature arising within them. Prerequisite: at least one semester of 100-level course work in at least one of the following: literature, modern history, philosophy, political science, economics, sociology; or permission of the instructor.

152. *The Shaping of World Views*

Mr. ALMEIDA.

By attempting to shed light on the process of formation and transformation of world views and their nature, students will recognize that they function within a frame of reference in which facts and values are still tied, and that they are on a daily basis, consciously or unconsciously, making choices on matters of value, which have their serious implications. The course will look at the diversity of various explanations for such diversity (from psycholinguistics and anthropology to psychology, sociology and religion). Conclusion stresses the moral implication of one's necessarily functioning within a world view. Enrollment limited to 30. Written permission required.

156, 157. *Historical Evolution of Modernist Culture in the Nineteenth and Twentieth Centuries*

Ms. GLUCK.

The seminar examines the emergence of modernist culture in the 19th and 20th centuries by focusing on four distinct phases in its evolution: romanticism, aestheticism, avant-gardism and post-modernism. Students will be asked to read both works of history and literary criticism as well as original texts by such thinkers as Coleridge, Schiller, Mathew Arnold, Nietzsche, Kandinsky and others.

163. *The City and the Arts*

Mr. WEINSTEIN.

The focus will be double: (1) to shed light on the experiential dimension of city-dwelling by studying a variety of artistic forms — literature, painting, architecture, photography and film; and (2) to better understand how the City can be the stimulus and subject matter for artistic expression. Emphasis largely on 4 cities — London, Paris, St. Petersburg and New York — over three centuries. The course should promote a fuller, more nuanced and distinctive sense of how the arts and how the social sciences teach us about human experience, as well as a richer overview of the possibilities of urban life.

Seminar Courses for Freshmen and Sophomores

MODES OF THOUGHT COURSES

Because the first college years are so significant in the formulation of a student's educational objectives, the Faculty in May, 1969, established a special program, Modes of Thought, designed to

provide freshmen and sophomores with opportunities to participate actively with a professor and a small group of students in courses in a variety of academic areas. To accomplish this, it was agreed to start offering in 1969-70, special Modes of Thought courses. These courses, as their name implies, investigate the types of questioning and methods of investigation which underlie areas of academic inquiry. These seminar courses, which are limited to twenty freshmen and sophomores, are designed to maximize student participation. Some Modes of Thought courses deal with issues not covered in the regular curriculum, while others approach the same issues from cross-disciplinary perspectives. Because they depend on individual initiative and excitement for design and implementation, course subject matter or a course itself is not propagated from one year to the next; rather, a course is offered only as long as an instructor is willing to teach it and a sufficient number of students choose to enroll in it.

Modes of Thought
Courses Offered in 1984-85

- MT 3. *Classical Conceptions of Art and the Artist*. Ms. BASSI.
- MT 4. *Women's Dilemmas*. Ms. BLOUGH.
- MT 11. *Nature and Nurture in Psychology*. Mr. KLING.
- MT 15. *Japanese Music in Context*. Ms. HERD.
- MT 19. *The Scientific Way of Thinking*. Ms. RICHARDS.
- MT 20. *Behavior and Survival*. Ms. SORRENTINO.
- MT 21. *Women and Philosophy*. Ms. SPANG.
- MT 25. *Health Problems in World Perspective*. Messrs. WARTMAN and WESSEN.
- MT 29. *Our "Unacknowledged Legislators": Political Poetry in America*. Ms. SMITH.
- MT 31. *Comedy in Theory and Practice*. Ms. MYLONAS.
- MT 34. *Biological Timekeeping*. Mr. HOLOWINSKY.

Courses to be Offered in 1985-86
Modes of Thought

- MT 6. *How Science Destroyed Religion: The Literary Evidence*. Mr. EVERETT.
- MT 9. *Greek Tragedy and its Modern Transformations*. Mr. FLOWER.
- MT 12. *Nature and Nurture in Psychology*. Mr. KLING.
- MT 22. *Behavior and Survival*. Ms. SORRENTINO.
- MT 28. *Health Problems in World Perspective*. Messrs. WESSEN and WARTMAN.

In the spring of 1976, the Educational Policy Committee was presented a Preliminary Report of its Subcommittee on the Curriculum of the First Two Years. In part, the Report recommended the development of a seminar program designed primarily for freshmen and sophomores, which would both retain the strengths and goals of the Modes of Thought courses and, also, broaden the program by providing for the addition of new seminar courses which, although perhaps not meeting strict guidelines established for MOT courses, would still provide opportunities for both students and faculty members in small classes to explore issues and works of particular interest. In 1976-1977, the new Special Themes and Topics Seminar Program was initiated. These courses are designed to permit a limited number of students, generally under 30, to explore a single question or theme that normally falls outside the purview of a regular department. Like MOT courses, they are especially designed for freshmen and sophomores. The difference between MOT courses and STT Seminars is that while MOT courses specifically attempt to examine questions that underlie inquiry in a particu-

lar area, STT Seminars need not.

Special Themes and Topics/Seminars

- ST/S 1. *Feminist Frameworks*. Ms. ALCOFF.
- ST/S 3. *The Logic and Ethics of Nuclear Deterrence*. Mr. BRINGSJORD.
- ST/S 5. *The American South: A Picture in its Literature*. Ms. CAMACHO.
- ST/S 8. *The Liberal Arts: Context for Urban Studies and Urban Planning*. Mr. FELDMAN.
- ST/S 9. *Health Care Technology: Benefits and Costs*. Mr. DANIELS.
- ST/S 10. *The Evolution of Human Behavior*. Mr. GOULD.
- ST/S 16. *Utopia: Visions and Constructions*. Mr. HICKS.
- ST/S 18. *Concepts and Issues in Afro-American Anthropology*. Ms. MORAN.
- ST/S 22. *Mirrors and Shadows: The Double in Literature and Psychology*. Ms. SWEENEY.
- ST/S 23. *The Literature of Detection: Theme and Variations*. Ms. SWEENEY.
- ST/S 25. *The Anthropology of Refugees*. Ms. SYMONDS.
- ST/S 27. *Nordic Legacy: Isben, Strindberg, Munch and Bergman*. Mr. WEINSTEIN.
- ST/S 28. *Evolution*. Ms. ROTHSCILD.
- ST/S 33. *The Liberal Arts: Context for Urban Studies and Urban Planning*. Mr. FELDMAN.
- ST/S 46. *The Crisis of Liberalism in Modern America*. Mr. GILLON.
- ST/S 48. *The Conquest of Contagion in Western Europe*. Mr. ARONSON.

Another report of the 1976 Subcommittee of the Educational Committee recommended that a new category of courses be established, to be known as Foundations courses. These Foundations courses provide an opportunity for exposure to fundamental conceptual questions presented in a vigorous and coherent manner. The courses explore the foundations of academic inquiry and attempt to reveal and challenge basic assumptions underlying such inquiry, with the expectation that students exposed to sustained inquiry into such topics will profitably apply their new awareness to subsequent endeavors. Although Foundations Courses are generally open to students in all classes, freshmen and sophomores may find them particularly attractive; enrollment may sometimes be limited.

Foundations Courses

- F1. *Face of the Earth*. Mr. YUND.
- F5. *Dynamics of Living Systems*. Messrs. BIGGINS and HEYWOOD.
- F11. *Hard Choices*. Mr. BEISER.
- F12. *Foundations of Western Art*. Mr. WINKES.
- F16. *Environmental Issues*. Mr. WARD.
- F31, 32. *Beginning Astronomy*.
- F36. *Medieval Perspectives*. Messrs. SCHAFFER, CROSSGROVE, and other members of the committee on Medieval Studies.
- F53. *Ethics of War, Defense and Deterrence*. Mr. LADD.
- F98. *Philosophy of Education*. Mr. ARCHAMBAULT.

In 1982-83, the Dean of The College initiated the Curricular Advising Program (CAP) in which freshmen in The College were to receive both instruction and academic advice from a member of the faculty within the context of one of their first year courses. This program was initiated with a series of twelve tutorials which accommodated 240 freshmen. By 1984-85, 90 courses accommodated over 1000 freshmen. This program which does not require the development of new course incorporates three models. In some instances a faculty member teaches a small class of up to 20 students who are also that faculty member's advisees. In other instances the professor who lectures in a large course adopts a discussion section or laboratory group comprised of his or her student-advisees. In the least

common format, faculty members have as advisees a subset of students in a large lecture course which has no discussion or laboratory sections. Another facet of the program involves the participation of upperclassmen as undergraduate assistants, CAP Fellows, who help with advising and other teaching and research activities in which the faculty member is involved. In many of these courses faculty are assisted by undergraduate Writing Fellows.

Foundations Courses

Foundations Courses are intended to provide freshmen and sophomores with an opportunity for exposure to fundamental conceptual questions presented in a vigorous and coherent manner. The courses explore the foundations of academic inquiry and attempt to reveal and challenge basic assumptions underlying such inquiry, with the expectation that students exposed to sustained inquiry into such topics would profitably apply their new awareness to subsequent academic endeavors. The Educational Policy Committee approved Foundations Courses under the established category of Special Themes and Topics.

ST/FI. *Face of the Earth* (see Geological Sciences 1) Mr. YUND.

ST/F5. *Dynamics of Living Systems* (see Biomed 5) Messrs. BIGGINS and HEYWOOD.

ST/F11. *Hard Choices* Mr. BEISER.

An analysis of central issues in political and ethical theory, as reflected in contemporary America. The course is designed to stimulate the rigorous consideration of issues which are central to education at Brown. Limited to 120 freshmen. ;(also Associate Dean of Medicine)

ST/F12. *Foundations of Western Art in Antiquity* Ms. BONDE and Mr. WINKES.
(see Art H1.)

ST/F13. *Ancient World I* Mr. BOEGEHOLD and OTHERS.
An introduction to the civilization of antiquity. After considering the origins of western culture in Mesopotamia and Egypt, with some attention to ancient India and Israel, the course focuses on early Greece, the rise of the city-state, and the cultural and political achievements of the classical age. Most of the reading is of original sources in translation.

ST/F14. *Ancient World II* Mr. BOEGEHOLD and others.
Beginning with the conquests of Alexander and their consequences, the course traces the spread of Greek culture to non-Greek peoples as far as India in the east and Spain in the west, to the rise of Rome, the establishment of its empire, and the world of late antiquity. Rather than being a chronological survey, the course concentrates on topics of lasting historical significance (e.g. Hellenization, Roman law, the background of Christianity).

ST/F16. *Environmental Issues* (see Environmental Studies 11)

ST/F18. *Foundations of the Theory of Signs* Ms. DOANE and Ms. ROONEY.
(see Semiotics 12)

ST/F22. *The Ethics of Professionalism* Mr. LADD.

ST/F31, 32. *Beginning Astronomy* (see Physics 21, 22) The STAFF.

ST/F36. *Medieval Perspectives* Ms. SCHAFFER and members of the Medieval Studies Committee.

Taught by a team of faculty from several departments, the course is intended to provide an introduction to the study of Medieval civilizations and cultures, an overview of them, and an examination in some depth of a few of their more interesting features as reflected in literature, drama, music, art, and institutions. Each faculty member will explore a single perspective on the Middle Ages, and each of these will be treated as an independent unit, with its own assigned readings (primary texts in English translation, secondary sources and critical analyses), discussion questions, and brief written or oral exercises. Students are encouraged to look beyond these self-contained units for fundamental concepts and methods of inquiry which underlie several or all of them.

ST/F 43. *The Far side of the Old World: Perspectives on Chinese Culture* Ms. D. LEVY.
A survey of traditional Chinese culture focusing on the major literary and artistic achievements of six major periods in Chinese history, including philosophical texts, poetry, various forms of the fine arts, and vernacular fiction and drama. A broad range of primary materials will give the student greater insight and appreciation of Chinese culture in general and also provide a foundation for further study of East Asia in other disciplines.

ST/F50. *Foundations of Political Analysis* (see Political Science 50) Mr. ZUCKERMAN.

ST/74. *Women and Minorities in Science* Ms. FAUSTO-STERLING.

This course contrasts and compares the roles played in scientific learning and research in the 19th and 20th century United States by Afro-American men and women with those of Caucasian women. The first part of the course involves a process of historical recovery in which we learn about scientists long neglected by the history books. The second part of the course examines the institutional structures of science, while the third part peers into a science of the future in which women and minorities are fully represented as practitioners and teachers of science. S/NC Will be taught in 1987.

ST/F90. *Development and Modernization in a Colonial Society: Origins of the Third World in Brazil* (History 90) Mr. PADDEN.

This course examines in a disciplined way the impact upon pre-literate societies in America of European development and modernization programs that were conceived and carried out some 200 years before the Industrial Revolution. By semester's end students can expect to have confronted the major theoretical problems of knowing the Third World and to have acquired an extensive interdisciplinary foundation for future thought about the Third World and its problems.

ST/F98. *Philosophy of Education* (see Education 156) Mr. ARCHAMBAULT.

Independent Study Plans

INDEPENDENT STUDY PROJECT (Including Internship)

Any student may register for an *Independent Study* course or courses for any semester. Each such course must have the approval of a faculty sponsor who shall be responsible for the scrutiny of the proposal, the evaluation of the work done, and the assignment of a grade. The faculty sponsor is not expected to give regular tutorial instruction.

Proposals for Independent Study must be submitted in accordance with guidelines established by the Educational Policy Committee on a form provided by the Registrar. The proposals will be reviewed by the Educational Policy Committee to assure the academic quality of the proposed course and to avoid undue duplication. Proposals for the fall semester are due by September 1 and for the spring semester by January 15. Proposals submitted after these dates, but not later than the first day of classes of the pertinent semester, will be considered only upon clear justification to the Educational Policy Committee of the late submittal.

GROUP STUDY PROJECT

Group Studies are cooperative inquiries in which participating students bear major responsibility for both planning and conduct of the work. They provide an opportunity for academic pursuits which might not be available in regular courses. They carry course credit.

Each Group Study is sponsored by an instructor who holds a teaching appointment in Brown University and whose central functions are to assess the proposed study, to provide advice during the work, and to be responsible for the evaluation of each student's work. Group Studies permit instructors to interact with more students than independent studies can realistically permit. A Teaching Assistant or Teaching Associate may sponsor a Group Study if the department chairman recommends that he or she be permitted to do so.

Proposals for Group Studies should be made on a form provided by the Registrar. They will be reviewed by the Educational Policy Committee to assure the academic quality of the proposed study and to avoid undue duplication. Proposals for the fall semester should be turned in by June 1 of the

preceding spring semester; proposals for the spring semester are due December 1st of the fall semester. Proposals received after these dates and no later than the first day of classes of the next semester, will be considered only upon clear justification of the late submittal.

At the end of each Group Study, a joint student-faculty evaluation report of the accomplishments of the project must be submitted by the faculty sponsor to the Educational Policy Committee. NOTE: Students and instructors interested in setting up a Group Study should consult the document, "Guidelines for Group Study," which is available in the Registrar's Office.

Academic Facilities

Libraries

University Library

The Brown University Library contains more than 3,900,000 items, including bound volumes, periodicals, maps, microforms, videotapes, data bases, sheet music, phonograph records, and manuscripts. Currently the Brown University Library is the fifth largest academic library in New England and ranks 54th in size among the 105 academic members of the Association of Research Libraries (1983/84 Association of Research Libraries Statistics). Expenditures for acquisitions in 1984-85 totaled over \$2 million. There are five libraries within the University Library System. The John Carter Brown Library is an independent research library also on campus.

The John D. Rockefeller Jr. Library

The Rockefeller Library, otherwise known as "the Rock," houses the collections in the social sciences and humanities. On the first floor are the Circulation Department, the Reference Department, the Periodicals Reading Room, Interlibrary Loan, the Government Documents Department, the Administrative Offices, and Technical Services (Acquisitions and Cataloging). The main collection of newspapers is housed in the Periodicals Reading Room on Level 1. The Gardner Collection on Level 3 is a collection of mostly historical Chinese material from the Ch'ing Dynasty (1644-1912). Books and bound periodicals are shelved together in open stacks arranged by Library of Congress call numbers. The Rock card catalog in Reference is a union catalog and it contains information about most of the books in the libraries at Brown.

Sciences Library

A distinctive high-rise building, the Sciences Library is the location for library resources in the physical, biological, and medical sciences. Reserve books and circulation services are located in the lobby of the main floor. Level A, which is the floor below the lobby, contains the card catalog, reference services, the current periodicals collection, interlibrary loan, and a microforms center. Books and bound periodicals are shelved together by Library of Congress call numbers. There is an extensive map collection including United States Geological Survey depository maps on Level 8.

Pembroke Library

The Pembroke Library offers a quiet and attractive alternative to the larger and more complex Rockefeller and Sciences Libraries. One of the most important functions of Pembroke is to provide study space for the Brown community, particularly for those located near the Pembroke campus. Within Pembroke is a varied collection of books and periodicals, with the primary emphasis on current interest and extra-curricular materials. Especially noteworthy is the "New Book" collection of recently acquired popular fiction and non-fiction, including many best-sellers. Pembroke also houses the only circulating phonograph record collection on campus.

John Hay Library

The John Hay Library is the location for most of the University's rare books, manuscripts, special collections and archives. Among the notable materials in "the Hay" are the renowned Harris Collection of American Poetry and Plays, the Sheet Music Collection, the McLellan Lincoln Collection, the Anne S.K. Brown Military Collection, the Lownes History of Science Collection, and the papers and works of H.P. Lovecraft. Exhibitions of materials from the collections are mounted year-round. The University Archives, dating from 1763, contain copies of the official publications of the University and the papers of many of its departments, officers, and affiliated groups. The library's stacks are not open to patrons, so all materials must be paged at the Reader Services Desk.

for use in the reading room, which is also available for general study. Materials in the library do not circulate outside the building.

Annmary Brown Memorial

The Annmary Brown Memorial houses a world-famous collection of books printed before the 16th Century which are valuable in the study of Renaissance and Medieval culture. The use of materials in the Annmary Brown Memorial is handled by the collection curator.

John Carter Brown Library

The John Carter Brown Library, a separately administered library operating under its own policies and procedures, is one of the outstanding libraries of the world in the field of Americana. Among the some 40,000 volumes are numerous books and pamphlets describing the growth of the European colonies in the New World and the impact of the discovery and exploration of the New World upon Europe. The Library also has an extensive collection of maps dating from 1477 to the mid-19th Century. While the resources of the John Carter Brown Library are available to anyone who needs to use them, the Library is designed to serve those engaged in scholarly research. Use of the reading room is restricted to those making use of the collections. The Library regularly mounts exhibitions open to the general public. The John Carter Brown is a closed stack library, and all materials must be paged by the staff.

Services

ACCESS TO LIBRARY BUILDINGS

The primary goal of the libraries at Brown University is to support the instructional and research needs of the Brown academic community. The libraries are open a total of 101 hours per week during school semesters with additional hours available during reading and exam periods. A university identification card or other proof of Brown affiliation is necessary to gain access to the Rockefeller and Sciences Libraries. Following is a brief listing and description of some of the library services. There are service points throughout the libraries where staff can give more complete information and assistance.

LOCATING MATERIALS

The card catalog in the Rockefeller Library has author, title, and subject information for most of the books in the Rockefeller, Sciences, John Hay, and Pembroke Libraries, and for many of the books in the John Carter Brown Library and the Annmary Brown Memorial. All periodicals and serials are represented in the main card catalog at the Rockefeller Library. In addition, each library has a card catalog of its own holdings. The stacks of the Rock, Sciences, and Pembroke libraries are open and allow users access to the collections for browsing purposes.

CIRCULATION

The library has a computerized circulation system which requires a validated Brown University identification card to charge out library materials. The loan period for most books is generally four weeks for undergraduates, eight weeks for graduate students, and a semester for faculty and exempt staff. Generally periodicals do not circulate.

RESERVE LOANS

The reserve collections contain required reading materials requested by faculty members for use by students in their classes. The Reserve service desks are located on Level 2 of the Rockefeller Library and in the lobby level of the Sciences Library. Some reserve materials may also be located at the John Hay Library. All reserve material is in closed stacks and must be requested from a staff member at the Reserve Desk.

COPYING FACILITIES

The Library has self-service, coin operated copy machines in several locations in the Rockefeller, Sciences, and Pembroke Libraries including copying service centers located on Level B of the Rockefeller Library and Level A of the Sciences Library. In addition, there is a staff operated photocopy machine in the John Hay Library. There is also a credit card system available for users who prefer that option.

REFERENCE SERVICE

Reference staff are available during the majority of library hours to assist users with questions concerning their course and research needs. The Reference collection contains encyclopedias, directories, almanacs, statistical sources, abstracts and indexes to periodical literature and bibliographies in all subjects. Librarians are available for orientation sessions, classroom presentations, or individual bibliographic consultations.

COMPUTER-ASSISTED LITERATURE SEARCHES

Computerized literature searches in the sciences, social sciences and humanities are offered by the reference staff. To supplement printed indexes and bibliographies, the Rockefeller and Sciences Libraries have access to over 150 machine readable data bases, and new ones are added frequently. For a fee and with the aid of a trained searcher, any student or faculty member can request a customized bibliography that is often more timely and comprehensive than would be possible by traditional manual searching.

GOVERNMENT DOCUMENTS

Brown University is a selective depository for United States government documents and United Nations publications. In addition, it is a comprehensive depository for U.S. Geological Survey maps, which are housed in the Sciences Library. The Library also receives publications of foreign, state and municipal government agencies.

MICROFORMS

The Library's microform collections, together with appropriate readers and reader/printers, are located in the Periodicals Reading Room and on Level 2 of the Rockefeller Library, on Level A of the Sciences Library, and in the John Hay Library. The Brown University Library has a number of major microform collections, including the *Library of American Civilization*, *Early English Books, 1475-1640* (Pollard and Redgrave), *Early English Books, 1641-1700* (Wing), *Early American Imprints*, *Non-Depository Government Documents*, and the *American Poetry Series*. In addition, the Library acquires microform editions of heavily used periodicals and newspapers.

COLLECTION DEVELOPMENT

The Library aims to acquire the materials needed to support instruction and research needs on campus. Purchase decisions are made by the collection development librarians in accordance with a formal collection development policy statement. Any library user may request that a title not in the Brown collections be ordered. Purchase recommendations are evaluated in terms of the appropriateness to the Brown instructional and research programs and the funds available.

ACCESS TO OTHER LIBRARIES

Brown's membership in the Research Libraries Group (RLG) entitles Brown students and faculty to use the libraries at Yale, Dartmouth, Cornell, Columbia, NYU, Princeton, Berkeley, the University of Pennsylvania, the University of Michigan, and the other twenty-five RLG member institutions upon presentation of a Brown University identification card. Special resource sharing agreements have also been established with the Massachusetts Institute of Technology, the Rhode Island School of Design, and all academic libraries in Rhode Island to permit Brown students and faculty on-site access to these facilities, as well as borrowing privileges for faculty at those institutions which are members of the Consortium of Rhode Island Academic and Research Libraries (CRIARL). Letters of referral can be arranged at the Reference Desks to gain access to other libraries for serious research purposes.

INTERLIBRARY LOAN SERVICES

No research library can aspire to collect all of the material required for the research of all of its users. Shared Resources agreements allow libraries to assist each other by borrowing and lending needed materials. Brown has the collections of the libraries mentioned above as well as the Center for Research Libraries at the disposal of its users. Arrangements for borrowing materials unavailable in the Brown University Library may be made by placing an interlibrary loan request at the reference desk of either the Rockefeller or Sciences Library.

SERVICES TO THE HANDICAPPED

The main entrance to the Rockefeller and Sciences Libraries have been designed to provide access to individuals in wheelchairs. The John Hay Library is also accessible via an entrance at the rear of the building, where a phone is available to gain admittance by calling the staff at the Reader

Services Desk.

The circulation desks in Rockefeller, Sciences, and the Hay can arrange to have materials retrieved from the stacks and provide other special services as required for patrons with physical disabilities. Books from Pembroke Library, which is not accessible to the handicapped, can be requested at the circulation desk of Rockefeller Library.

Museums

Gardner House

Gardner House, located at 106 George Street, is the guest house of the University and an historic house museum, furnished with period pieces by Dr. and Mrs. George Warren Gardner during their occupancy and deeded to the University in 1932.

Haffenreffer Museum of Anthropology

The Haffenreffer Museum of Anthropology on Mount Hope Grant is located seventeen miles south of Providence, in Bristol, Rhode Island. The Museum buildings and over 500 acres of woodland overlooking Mount Hope Bay were a gift to Brown University in 1955 from the Rudolf F. Haffenreffer family and foundation. The Museum was originally erected to house the extensive collection of North American Indian art and artifacts owned by Mr. Haffenreffer. Since becoming a part of the University, the Museum has increased its scope to that of a museum of general anthropology.

The main gallery of the Museum is devoted to exhibits concerned with the Indians of North America. Archaeological, historical and contemporary Native American cultures are represented by materials from the Eastern Woodlands, Plains, Southwest, Far West and Northwest Pacific Coast regions. An adjacent section of the gallery contains exhibits based upon collections made by Museum expeditions to Alaska. Here, displays are devoted to the recent Eskimo as well as to the Museum's outstanding collections of Alaskan archaeological material, some of which dates back over 10,000 years. Another room contains Pre-columbian and ethnographic objects from Middle and South America. Other regions of the world are represented in exhibits in the large Tribal Arts gallery where displays of African, Asian and Pacific Islands objects are on view. Unseen by public visitors are storage areas, workrooms and laboratories utilized by Brown students for anthropological and archeological research and training in museology.

The Education Division of the Museum has headquarters in a large renovated barn next to the Museum. Its staff carries out an active program of instruction in anthropology for local school groups both in the Museum and, by means of a travelling van, in classrooms throughout the state and nearby areas. This aspect of the Museum's community and school involvement has been made possible through the generosity of the Haffenreffer Family Foundation.

The Museum is open every afternoon except Monday from June through August. It is open on weekends March-May, September-December, and closed January and February.

The woodlands and fields surrounding the Museum are of interest to students of zoology, botany, geology and history as well as to anthropologists. The area was the homeground of the Wampanoag Indians of the Colonial era and was the location of decisive events during King Philip's War in the late 1670's. Near the Museum are beaches and the University's Recreation Building which can be reserved for picnics.

Laboratories

The University provides extensive, modern laboratory facilities designed for undergraduate instruction, graduate instruction, and research. The major laboratory facilities include the following:

Physical Sciences

Barus and Holley Building — a seven story building housing both the Division of Engineering and the Physics Department. In addition to classrooms and faculty offices, the building contains over fifty laboratory rooms. These rooms are equipped with the latest scientific apparatus permitting research in fields such as: physical acoustics, low-temperature physics and super-conductivity, optical resonance studies, surface physics, radio-frequency and microwave spectroscopy, solid-state physics, magnetic properties of solids, non-linear optics, low-energy nuclear physics, high-energy and elementary particle physics, atomic physics, laser systems, microwaves, servo-mechanisms, instrumentation, solid state electronics, micro-electronics, creep and fatigue of materials, materials preparation, field ion microscopy, transmission and scanning electron microscopy and electron microprobe analysis, soil mechanics, dislocation dynamics, dynamic in-elasticity, binocular vision, coal gasification, speech recognition; robotics, image processing and computer systems.

Prince Engineering Laboratory — a modern laboratory building adjoining the Barus and Holley Building. Apparatus presently installed includes: subsonic, and supersonic wind tunnels; two shock tubes capable of producing an air flow of twenty times the speed of sound and temperatures up to ten thousand degrees Kelvin, a Soil Mechanics Laboratory and two Chemical Engineering Laboratories; an X-ray Facility; a Van de Graff accelerator; a Millimeter Wave Laboratory; a Thin Film Facility; several internal combustion engines, gas turbines, the Geothermal Testing Facility, the Mechanical Testing Facility, electronic data acquisition systems, high speed cameras; a well-equipped machine shop, and stockroom.

Chemical Laboratories — Most of the instructional laboratories and classrooms are in the Metcalf Chemical Laboratory. The research programs in inorganic, organic, physical, and biochemistry as well as the offices of the Department are housed across the street in the new Geology-Chemistry building. Facilities include a machine shop, a glass working shop, and an electronics shop as well as the latest modern instruments for research in chemistry.

Geo/Chem Building and Lincoln Field Building — these buildings house the Department of Geological Sciences. In addition to classrooms and faculty and graduate student offices, the buildings contain fully equipped laboratory space for research in geochemistry, geophysics, micropaleontology, petrology, Pleistocene climatology, sedimentology, and structural geology. Special facilities include: mass spectrometer laboratories with four mass spectrometers and related equipment; electron microprobe; x-ray diffractometer, pole figure goniometer, and fluorescence units; high temperature and pressure rock deformation apparatus; atomic absorption analyzer; comprehensive collection of photographs and maps from planetary exploration missions; numerous mineral synthesis and experimentation systems, both hydrothermal and low pressure; central facility access to transmission electron microscope, and ion microprobe.

Life Sciences

Arnold Biological Laboratory — the original laboratory built in 1915 for biology. It now houses the administrative offices of the Division of Biology and Medicine (Program in Biology and Program in Medicine), the Office of Health Careers, as well as the Department of Community Health and the Center for Alcohol Studies.

J. Walter Wilson Laboratory — a five-story building first occupied in 1962. In addition to seminar rooms and teaching laboratories, the building houses seventeen faculty laboratories devoted to research in the areas of biochemistry, cell biology, developmental biology, genetics and molecular biology of animal, plant, and microbial cells. It includes environmental chambers, cold, warm and dark rooms, glass washing and sterilization facilities, instrument rooms, a machine shop and a stockroom. The Sol Koffler wing, completed in 1983, houses faculty offices as well as two lecture rooms and a teaching laboratory facility.

Medical Research Laboratory — a four-story structure linking the Metcalf Chemistry Laboratory and the Arnold Biological Laboratory, completed in 1965. It has facilities for research in the areas of neurobiology (neuroanatomy, neurophysiology and neuropharmacology), ecology, ecological paleontology and cell biology. It includes animal rooms and a glass washing facility.

Biomedical Center — a complex of three buildings, completed and dedicated in 1969, and to which

a major addition, the Center for Health Care Studies, was made in 1982. The two underground floors house the Multidisciplinary Teaching Laboratory, which is designed for undergraduate and medical students, and include conference rooms, preparation areas for microbiology and biochemistry; instrument rooms equipped for studies with radio-isotopes, chromatography, electrophoresis and ultra-centrifugation equipment; cold rooms, warm rooms, and dark rooms, computing facilities linked with the Computing Laboratory; and a teaching laboratory for mammalian physiology. A facility for teaching, demonstrations, and research in human anatomy is also located here, as are the research laboratories for radiation biology. The terrace level features a large lecture room for medical classes, several conference rooms, a study lounge for medical students, a mailroom and the research facilities of the Center for Health Care Studies (including the Gerontology Center and the Center for Health Care Research. The four-story research tower is devoted to research in the areas of physiology; biophysics and bioengineering; developmental biology; biochemical pharmacology; molecular and cellular pathology; microbiology; virology and immunology. In addition to about twenty-five independent suites, this building includes conference rooms, warm and cold rooms, dark rooms, instrument rooms, operating rooms and glass washing facilities. The six-story Animal Care Facility, under the direction of the University veterinarian, houses animal colonies for teaching and research purposes.

Partridge Hall — a building housing faculty and graduate students in the area of cellular biology and ecology. Facilities include two electron microscopes used primarily for cell biology and cancer-related research.

Walter Hall — this building provides facilities for research in genetics, ecology, and population biology.

The Brown University Herbarium — located in Arnold Biological Laboratory along with other botanical laboratory facilities for teaching and research in biosystematics, ecology, and mycology. The Herbarium of about 100,000 specimens includes a wide representation of vascular plants especially from Rhode Island and New England but also from North America and Europe. It is listed in the Index Herbariorum, an international listing that facilitates exchange privileges with other institutions.

Plant Environment Laboratory and Greenhouses — the greenhouses embrace about 6,000 square feet of growing space for plants involved in research in plant physiology, ecology, and genetics. The growth chambers in the associated laboratory permit studies of the environmental controlling factors of light, temperature, and humidity in plant population development.

Hunter Psychological Laboratory—a four-story modern building equipped for instruction and research. Its facilities include specially designed rooms for laboratory work in elementary psychology and advanced experimental courses at the undergraduate level; computers for on-line control, stimulus generation and data reduction; a child psychology laboratory; and numerous areas devoted to electronic recording of sensory and neuromuscular phenomena. There is also a Primate Behavior Laboratory, and additional facilities for the study of a variety of species. The Human Information Processing Laboratory with facilities for the study of human learning, language, and cognition is situated nearby. Laboratories also are maintained near special subject populations (e.g., public elementary schools, Women and Infants Hospital of Rhode Island, etc.).

Computing Resources

Computing and Information Services (CIS) is the central support organization on the campus for computing. CIS operates the central computing, communications, and information systems on the campus, supports the academic and administrative departments in the effective and efficient use of these technologies, encourages the development of skills to use these technologies effectively, and promotes an understanding of current technologies and the incentives to use new technologies. CIS is composed of four sections:

Computer Store

The Computer Store, located in the basement of Rhode Island Hall, offers substantial discounts on Apple and IBM personal computers, peripherals, supplies, and related software to full-time faculty, staff, students, and the associated faculty in the Program in Medicine. Because of the nature of the contracts with the manufacturers, these items cannot be offered to alumni or the general public. The store opened in October, 1983. Store staff members provide information about microcomputers and their software. Store personnel provide maintenance service for some microcomputers and terminals.

Office of Network Operations

The Office of Network Operations (ONO) installs, maintains, operates, and extends the Brown University Network (BRUNET) - a cable television system supporting several communications services. The system, which has been in use since August, 1981, carries all terminal to mainframe data traffic, is used by energy management and security systems, and carries television signals. The phone system is connected to BRUNET at the modem pool, providing both dial-in and dial-out service. Most academic and administrative departments already have network service. Wiring of the dormitories and residence halls is underway, and should be completed by March, 1986.

Network Operations also provides support to the Computer Store and Computer Center, maintains and repairs T-boxes (network modems), cabling, and network equipment. Members of the Brown community can consult with Network Operations staff about their communications needs.

Computer Center

The Computer Center operates the campus central computing facility, public terminal and micro-computer centers, and provides training, consulting, documentation, and software support to the community. The central facility, located at 180 George St., operates seven days a week, twenty-four hours per day. The main processor, currently an IBM 3081, provides both batch and timesharing service, and supports a wide variety of software packages. The Center also houses a STAR ST-100 array processor for scientific processing, and a Xerox 9700 laser printer as the primary printing device. The Center is a member of BITNET, an international network of university and research institute computer systems. The Center also houses a DEC PDP-11/70, dedicated to running Word-11. Many academic and administrative departments use this word processing system.

There are four public terminal centers around the campus, housing a total of about seventy terminals. Each center is staffed by student consultants who answer questions and maintain waiting lists. The centers are located in the basement of the Computer Center (180 George St.), the Rockefeller Library, Prince Engineering Laboratory, and the basement of Champlin Hall (a dormitory). Thirty-five Macintosh computers are available in a cluster located adjacent to the Champlin terminal center.

A variety of user support programs aim to help people use computers effectively. A Training Center, equipped with IBM PC's and Apple Macintosh's, opened in January, 1985. Noncredit courses are offered there to students, faculty, and staff on topics ranging from how to logon to the computer to using spreadsheets to advanced typesetting. Consulting services provides assistance to users on a broad range of applications software problems, and helps people to select the hardware and software which best meets their needs. Basic help is provided at every terminal center by student consultants; assistance with more difficult problems is available at the Computer Center. Vendor manuals for the operating systems, editors, compilers, and applications packages are available, as well as locally written guides describing facilities specific to Brown.

Management Information Services

Management Information Services (MIS) is responsible for the creation, maintenance, and support of the University's major administrative information systems and for helping administrative offices to use computing technologies effectively. The major systems use the central computing facility, and provide users with access to institutional data using pre-programmed updates and enquiries written by MIS. MIS' goals are to bring the major institutional systems online, to give

users access to their information in a form which users can understand, and to provide the tools with which users can manipulate that information in a productive and independent manner. The major administrative areas supported by MIS systems include Financial systems, Student systems, and Personnel/payroll systems. Services offered by MIS include consulting, development of new systems, data entry, scheduling of production work, and sponsorship of several User Groups.

In the fall of 1984, the administration approved a major MIS initiative to replace the current data base system with Adabas. The conversion is underway, and should be completed by the summer of 1986. This change will signal a significant shift toward decentralizing the authority and responsibility for maintaining the data, and should greatly simplify the process of providing online access to all the data.

Institute for Research in Information and Scholarship (IRIS)

In June 1983, Brown University established IRIS as a financially self-supporting research organization sponsored by the University. IRIS is charged with two responsibilities. The first is to conduct and encourage experimentation in the development and innovative use of technology in education and scholarship. The second responsibility is to administer and manage the *Scholar's Workstation Project*, a campus-wide effort directed at developing a network of powerful graphics-based personal computers, which will provide to the University community the tools and environment resulting from the research at IRIS.

IRIS directs its work toward the achievement of three objectives. First, the development of integrated methods for manipulating and disseminating information; second, the development of tools and processes that facilitate the daily work of scholars; last, the enhancement of group interaction and communication leading to more shared work and greater joint exploration.

Although IRIS is financially self-supporting, it functions as an integral part of Brown, and its operational procedures coincide with those of the University at large. IRIS is authorized to work in collaboration with non-University agencies, such as foundations and industrial concerns. To date, IBM and Apple Computer Inc. are its largest supporters.

IRIS is presently comprised of four operational groups. These groups conduct activities that range from basic research and development to the design of pilot programs and analysis of user needs. The Systems Research Group is working with the base hardware and software technologies which make the other projects possible. The Scholar's Workstation Group adds layers of general-purpose application software designed to meet the needs of the educational and research environment. The Support Group develops smooth and efficient mechanisms to transfer the technology developed by the first two groups into the community. The Office of Program Analysis is pursuing an intensive program of research and evaluation of the educational and social impact of the Brown workstation-based environment.

Other Resources

In addition to the central facilities, there are a number of significant stand-alone systems on campus. Alumni/Development Information Services (ADIS) uses a Data General computer to support a database describing alumni and friends of the University. Computer Science uses sixty Apollo workstations in the Foxboro Auditorium to teach many of their courses. (This facility is also used by several other departments.) Several departments (Computer Science, Engineering, Physics, Cognitive Science, Laboratory for Engineering man/Machine Systems (LEMS), and Geology) use DEC VAX computers to support computing related to their research efforts. Many departments support clusters of workstations (Apollo's, IBM PC's, Apple Macintoshes) for their faculty, graduate students, and staff. Brown is a member of the Princeton Supercomputer Consortium (funded by the National Science Foundation). A high-speed link is being installed from Brown to the extremely fast scientific computers at the von Neumann Computer Center in Princeton. Groups such as the Social Science Data Center and the Center for Scientific Computing help faculty in specific areas to effectively use computing technologies.

Current Projects and Trends

The computing environment, traditionally based on timeshared use of large machines, is moving rapidly towards powerful, graphics-based workstations linked to each other and to large file, print, and computation servers via a high speed intra-campus network. There are already close to two thousand personal computers on the campus, and the number is growing rapidly. Plans call for the initial deployment during 1985-86 of workstations which will serve as the basis for the "Scholar's Workstation". This decentralization of computing is expected to occur rapidly, and require departments to take a more active role in choosing the technology which is most appropriate to their needs.

Specific projects which are currently underway include computerization of the card catalog in the library, the installation of a new data base environment (ADABAS) for administrative systems (allowing much greater flexibility in the control and sharing of data), and the development of a high speed INTERNET (which will use BRUNET to interconnect departmental networks).

Arrangements with Other Institutions

RHODE ISLAND SCHOOL OF DESIGN

As a result of a cooperative arrangement, students of Brown University may elect certain courses at the Rhode Island School of Design. Students register for such work under Brown course numbers.

AMERICAN SCHOOL OF CLASSICAL STUDIES AT ATHENS

The establishment at the American School of Classical Studies of a fund of \$10,000, known as "The Albert Harkness Fund for the Benefit of Brown University," secures the privilege of reduced tuition in the School for all adequately prepared graduates and, in exceptional cases, undergraduates of the University. Information concerning the School may be obtained from the chairman of the Department of Classics.

With the extensive Gennadius collection of works on Greek art, literature, and history, including Byzantine and more recent history of the Near East, the American School also offers exceptional advantages to students of Byzantine history, archaeology, and literature.

During the summer the School also operates a six-week archaeological study tour of Athens and other sites of interest in Greece. This Session is open to advanced undergraduate and graduate students.

AMERICAN ACADEMY IN ROME

Free tuition in the School of Classical Studies in the Academy is available to qualified graduates, and occasionally to qualified undergraduates, of Brown University who are admitted to the Academy. For further information consult the Chairman of the Department of Classics or communicate directly with the Executive Secretary, American Academy in Rome, 41 East 65th Street, New York, New York 10021.

AMERICAN SCHOOLS OF ORIENTAL RESEARCH

As a charter corporate member of the American Schools of Oriental Research, Brown participates in the sponsorship of archaeologically related study and research in ASOR programs in Jerusalem, Baghdad, Amman, and Nicosia. The programs of the ASOR institutes are centered in Near Eastern and Mediterranean studies. Information concerning ASOR may be obtained from the Department of Religious Studies and the Program in Judaic Studies.

INTERCOLLEGIATE CENTER FOR CLASSICAL STUDIES

Brown University is a member of the Intercollegiate Center for Classical Studies in Rome. Qualified undergraduates may apply to study during their junior year at the Center, which is maintained and staffed by classical scholars from cooperating institutions. For further information consult the Chairman of the Department of Classics.

THE BROWN UNIVERSITY — TOUGALOO COLLEGE COOPERATIVE PROGRAM

Tougaloo College is a historically Black, liberal arts institution in Tougaloo, Mississippi, with about 800 students. In 1963 the Tougaloo Board of Trustees invited Brown University to discuss ways and means by which Tougaloo might improve its academic program to help its students take advantage of broadening career opportunities. Initial contacts between the College and the University proved encouraging and resulted, during the 1963-64 academic year, in the inauguration of a Cooperative Program.

Evidence of strong interest in the cooperative effort comes from students, faculty, administrators, and Trustees of both institutions. Members of the faculties exchange visits for purposes of consultation and teaching. Undergraduates occasionally spend summers or a semester on the Tougaloo or

Brown campus. Trustee committees work together on policy studies and development opportunities. Members of the administrations share information and offer consultative services. Currently, joint academic programs exist between the Tougaloo Pre-Health Program and the Brown Medical Program, and the Tougaloo Pre-Engineering Program and Brown's Division of Engineering.

Students, faculty, and others having an interest in the Cooperative Program and wishing additional information should address inquiries to Chaplain Baldwin.

Student Services

Adviser to Foreign Students and Faculty

The Adviser to Foreign Students and Faculty, Dean John Eng-Wong, is available to counsel and assist students and faculty members from other countries on personal and academic problems and on matters relating to immigration, social activities, and relationships with the community. The Foreign Student and Faculty Office is located at 2 Stimson Avenue.

The Foreign Student Adviser issues all immigration documentation for foreign undergraduates. Immigration documentation for graduate students is handled by Mrs. Margaret Reid of the Graduate School. Immigration matters for faculty and research staff are administered by Ms. Leah Niederman in the Office of the Provost.

Career Planning Services

Career Planning Services provides many resources to enhance life and career decision-making for Brown's undergraduates, graduate students, and alumni/ae. Specific counselors are available to undergraduates, seniors, graduate students, and alumni for individual consultations regarding choice of concentration, self-assessment, career direction, the employment search, and further educational options.

Many types of workshops and programs are presented throughout the academic year. These include summer and full-time job-hunting and resume-writing workshops, interviewing preparation. Career Forums with alumni panelists co-sponsored with SARC, company informational presentations, and outreach services to freshmen, fraternities, and other organized groups on campus. Audio or video-tapes of many of these programs are also available.

The Career Resource Library houses current occupational information, fellowship and scholarship resources, graduate and professional school catalogs, general job-hunting and career-planning literature, and organizational directories representing social services, the environment, the media, non-profit sector, business, government, law, engineering, to name a few. In addition, there are materials describing over 1,000 companies, and an audio-tape library and listening room. Current job listings for entry-level and experienced personnel are also located in the library.

Employment interviews for seniors and graduate students are arranged by the office with representatives of business, education, non-profit organizations, and the government. Representatives from graduate school programs also visit the campus to provide information and interview students. Applications for the GRE'S, LSAT'S, GMAT'S, and MCAT'S are available in the office and a dossier service for graduate and professional school applications and for educational employment is also available through Career Planning Services.

A bi-monthly newsletter sent to all students announces programs, employment opportunities, and career-related information.

The Office of the Chaplain

The Office of the Chaplain of the University is located on the second floor of Faunce House. The chaplains are regularly available to students and may be reached through the Faunce House Office.

Brown seeks to provide occasions for worship for the major religious groups through the Office of the Chaplain. The present schedule is as follows:

University Church (Episcopal and Protestant)

11:30 a.m. — Sunday

Manning Chapel

Afro Caucus

1:30 p.m. — Sunday

Manning Chapel

Roman Catholic Masses

12 noon — Mon.-Fri.

5:10 p.m. — Tues., Thurs., and Sat.

10:00 a.m. — Sunday

Manning Chapel

Jewish Sabbath Services

Friday, 6:30 p.m. — Reform, Conservative, Orthodox

Saturday, 9:30 a.m. — Orthodox, Egalitarian

Hillel House — 80 Brown Street

The Chapel is available for use by the various campus religious groups. It is available to incumbents of the University community for weddings, funerals, and other ceremonies.

At special times each year University Services are held to mark religious holidays or particular events in the life of the University.

Faunce House Student Center

Faunce House was dedicated in 1904 as Rockefeller Hall. It was built and equipped by a generous gift of Mr. John D. Rockefeller, Jr., of the class of 1897. In 1931 the East Wing was added, and at the request of Mr. Rockefeller, was named in memory of the late Dr. William Herbert Perry Faunce, President of Brown University. In 1981 the Corporation approved a plan proposed by the Undergraduate Activities Board and the Student Center Committee to restore Faunce as a Student Center to meet the present and future needs of students.

Food Services

Undergraduate students receive a current brochure and other information during the summer to assist in board contract selection for the following academic year. Graduate students should request this information directly. All inquiries should be directed to the office of the Director of Food Services, Sharpe Refectory, Box 1936, Providence, R. I. 02912 — phone, (401)-863-3343.

Health Service

The University has a strong commitment to programs designed to achieve and maintain an optimum level of health in the Brown Community with special emphasis on the student component. Counseling on stress coping, exercise, nutrition, disease prevention as well as treatment are available. Students requiring surgery or major medical care will be transferred to a well qualified community hospital. The health center is located in Andrews House at 13 Brown Street (corner of Brown and Charlesfield Sts.) where out-patient as well as in-patient intermediate care facilities are maintained for all students. The center is open 24 hours a day when the University is officially in session. When the University is in recess (Thanksgiving, Christmas, Spring and Summer Recesses) the center operates as an out-patient facility daily from 8:30 to 3:30 p.m. Monday through Friday. Since the Health Fee is applicable only to the academic year there will be a proportionate additional fee during the summer for those wishing to use the Health Service.

Health Insurance is not included in the Health Services fee. Students who are not covered under a parental or private plan are required to purchase the insurance offered by the University. The University has no funds and assumes no responsibility for any medical care above and beyond that as described at University Health Services.

Physical Education — Men and Women

A diverse program in instructional physical education is available to all students at Brown University — undergraduate and graduate. This program is voluntary, non-credit. Most activities are co-educational and are available on a seasonal basis. There are four seasonal programs each year. Schedules may be obtained from the Director of Physical Education. The program provides periods of sequential instruction and regular supervised practice hours so that each student may progress to the highest level of skill. The purpose of the program is to provide recreational skills for worthy use of leisure time and rigorous activity for physical fitness and efficiency.

Intramurals

Both men and women have the opportunity for a competitive experience on an informal basis through club, fraternity, and dormitory league play in a variety of activities. This program is available to undergraduate and graduate students, and schedules are available from the Director of Intramurals.

Recreational Programs

Athletic facilities are available at specified times for recreational use by all members of the University Community. These include the Olney-Margolis Indoor Athletic Center and Marvel and Sayles Gyms, Meehan Skating Rink, Brown Natatorium, weight rooms, tennis and squash courts, and numerous fields. Group reservations may be made for some of these.

Intercollegiate Athletics — Men and Women

An intensive intercollegiate athletic program is available to men and women undergraduate students.

Brown women participate in varsity and JV competition in the following sports: crew, field hockey, soccer, tennis, volleyball, gymnastics, ice hockey, squash, swimming, lacrosse, softball, cross-country and track.

Brown women compete with the Ivy League group, the Seven Sister Colleges, and other colleges and universities. Competition occurs in regional and national tournaments.

Brown men compete on the varsity and freshman level in football and crew. Varsity and junior varsity opportunities are offered in basketball, track, cross-country, hockey, soccer, lacrosse, and tennis. Varsity squads are also maintained in baseball, swimming, water polo, wrestling, and golf.

There are also active, less formal, squads in rugby, skiing, rifle, sailing, scuba diving, squash, cycling, fencing, and Frisbee.

The colleges and universities with which Brown is associated in Ivy League intercollegiate athletic agreements are Columbia, Cornell, Dartmouth, Harvard, Pennsylvania, Princeton, and Yale.

Psychological Services

Staff members of the Psychological Services see undergraduate and graduate students when personal distress levels reach the point beyond which they can be expected to be managed alone. Such students may be self-referred or referred by others. Clinical services include assessments, crisis intervention, short-term and group psychotherapy, consultation and referral.

The services are available daily when the University is in session. The offices of the Psychological Services are located on the second floor of Rhode Island Hall. Appointments may be made in person from 8:30 A.M. to 4:30 P.M., weekdays, or by telephoning the Coordinating Secretary. Students can also be seen on an emergency basis, and provision has been made for coverage after-hours and on the weekends. Because of a philosophy that students' emotional problems are usually part of the difficulties of normal development, the department makes a major commitment to the development of programs designed to teach and encourage constructive approaches to living.

Resource Center

The Resource Center is a center of information and support on curricular options, community service, and leave-taking opportunities. It is located on the first floor of Rhode Island Hall. The Resource Center was started in 1976 by a group of students concerned with student-initiated learning projects, and involvement with the larger Rhode Island community. The Center is a good source of information about events and issues on campus and in the community. Bulletin boards and notebooks list events in the local community and organizations looking for volunteers. The Center houses extensive resources on independent and innovative curricular offerings such as Group Independent Study Projects (GISPs), academic internships and independent concentrations. Students interested in taking a leave of absence will find information about the Starr Fellowship Pro-

gram, the College Venture Program and copies of the Venture job bank, an extensive listing of jobs for students who take time off. The Staff of the Center includes the Dean for Curricular Resources, a full-time coordinator, work-study students and student volunteers.

The Resource Center sponsors ongoing programs and workshops, often in collaboration with other offices on campus. Past programs include a lecture and discussion series on the intellectual dimensions of racism, sexism and religious bigotry, and a series of lectures by Brown faculty members entitled "Walls and Windows: Exploring Cultural Differences." Other ongoing programs include: GISP and collaborative learning workshops, leave-taking forums, meetings on community issues and alternative vocations, and discussions about community life at Brown. The Resource Center provides counseling for students wishing to set up an internship for credit in the community and for students considering a leave of absence. Students can stop by the Resource Center to browse through the variety of resources and publications or to talk with a staffer.

Sarah Doyle Women's Center

The Sarah Doyle Center has been unique among academic women's centers in its concern for integrating academic, social, cultural, and political interests. It provides a variety of programs and services for all people interested in the changing roles of women and men in our society. Speakers in the Friday Forum and Sarah Doyle lecture series address topics ranging from new developments in women's studies, to political issues, to career choices for women. Other activities include support groups, study groups, concerts, poetry readings, and social events. The Center has a library, extensive resource and referral information, an art gallery, and meeting space for groups and individuals.

Student Residences

With the exception of Resumed Education Program students, married students and local students living with their parents, all undergraduate students are required to live in University residences unless excused by the Director of Residential Life. Residence options include several dormitory buildings, eleven residential fraternities, two residential sororities, and a variety of special interest houses. *Room assignments are made by Brown University without regard to race, creed, color, or national origin.* Individual compatibility and preferences within rooms will be respected.

Accommodations are of four types — apartments of four, suites for three, double rooms and singles. Each student is provided with a bed, including mattress and pillow, a chest of drawers, a desk, a desk chair, and a bookcase. The apartments include a complete kitchen, living room furniture, and wall-to-wall carpet throughout. Blankets, desk lamps, and curtains are not provided by the University. Each student is responsible for damages to room and furnishings beyond ordinary wear. Sub-rental of rooms is not permitted.

The University cannot assume responsibility for personal property of students. Adequate insurance coverage is advised for each individual. Many parents have personal property insurance which can be extended to cover losses experienced by students in the University.

Information relative to room contracts and charges is located in the Financial Section of the Catalogue.

The Graduate School — Student Residences

The Graduate Center at Brown University is composed of four six-story residential towers which are connected to a centrally located Commons building. The Commons building contains the Center's recreational and meeting facilities and the Graduate School offices. Housing accommodations and rooming assignments in the Graduate Center are under the direction of the Director of Residential Life who effects policies and practices determined by the Dean of the Graduate School. *Room assignments are made without regard to race, creed, color, or national origin.*

All rooms are designed for single occupancy and are arranged in units of from four to six. Each room is furnished with a desk, bookcase, two chests of drawers, a study lamp, a chair, and windows are provided with draw drapes. Residents must provide their own linen and blankets. Each student is responsible for damage to his/her room and furnishings beyond ordinary wear. Sub-rental of

rooms is not permitted. The University cannot assume responsibility for personal property of students. Each student should consider the purchase of insurance to cover his property. Many parents have personal property insurance which can be extended to cover losses experienced by students in the University.

The University does not have housing accommodations for married students, but apartment-style housing is generally available in the immediate area.

A card file of houses and apartments currently available may be consulted at the Residential Life desk located in E Building of the Graduate Center.

More specific information relative to housing both at the Graduate Center and in the local community may be gained by addressing inquiries to the Office of Residential Life, P. O. Box 1864, Brown University, Providence, Rhode Island 02912.

Third World Center

The Third World Center sponsors programs ranging from political forums and academic support services to activities celebrating the cultural and ethnic diversity of Brown's community. It helps to create an atmosphere at the University in which minority students can feel comfortable, and thereby contribute constructively to the University both as individuals and as a community. The Third World Center is part of the commitment that Brown has made towards allowing its students to shape their own educational and cultural experience.

Undergraduate Student Organizations

Special interest houses, fraternities, dormitory, and student organizations, and extra-curricular student activities are under the general supervision of the Office of the Dean of Student Life. The undergraduate student government organization, the Undergraduate Council of Students, determines minimum eligibility requirements for membership in the more than one hundred student organizations as well as the status of both existing and proposed student organizations.

Prizes, Premiums, and Honors

Complete details concerning endowed funds from which prizes and premiums are paid and special conditions which must be taken into consideration in making awards may be obtained from Dean Perry Ashley, Chair of the Committee on Prizes and Premiums.

The University reserves the right to withhold any award for any reason it deems valid.

Prizes for Excellence in Preparatory Studies

Prizes for excellence in certain preparatory studies are awarded each year during the first semester to members of the entering classes on the basis of special examinations as described below. Examinations separately judged with separate awards but covering the same material are conducted simultaneously for both men and women.

The competitions in Greek, Latin, and Mathematics are each open to all freshmen. However, those in the French, German and Spanish languages, respectively, are open only to those freshmen whose knowledge of the language concerned has been gained through secondary school studies rather than from family or community contacts.

THE PRESIDENT FRANCIS WAYLAND PRIZES, derived from the income of a fund presented in 1843 by President Wayland, and later increased, are awarded each year to those members of the freshman class who upon examination are found to excel in preparatory Greek and Latin.

THE HARTSHORN PRIZES IN MATHEMATICS, derived from the income of a fund presented to the University in 1872 by Joseph Charles Hartshorn of the class of 1841, are awarded each year to the two members of the freshman class who are found to excel in an examination on elementary algebra (through quadratic equations and the binomial theorem) and plane geometry.

THE HYPATIA PRIZES IN MATHEMATICS, derived from the income of a fund named for Hypatia of Alexandria, and presented anonymously in 1951, parallel for women freshmen the Hartshorn prizes for men.

THE ALBERT BUSHNELL JOHNSON PRIZES IN FRENCH are derived from part of the income of the Albert Bushnell Johnson Fund bequeathed to the University in 1949 by Edward K. Aldrich, Jr. and are awarded each year to the two members of the freshman class who are found to excel in preparatory French.

THE CAESAR MISCH PRIZES IN GERMAN, established in 1913 by a gift of Mrs. Marion L. Misch, are awarded to the two members of the freshman class who are found to excel in preparatory German.

THE ASA CLINTON CROWELL PRIZES IN GERMAN, derived from the income of a fund established in 1928 by alumnae of the University, are awarded to the two women members of the freshman class who are found to excel in preparatory German.

THE LOPE DE VEGA PRIZES IN SPANISH, established in 1962 by anonymous gift, are awarded to two men of the freshman class who are found to excel in preparatory work in Spanish.

THE GABRIELA MISTRAL PRIZES IN SPANISH, ESTABLISHED IN 1962 BY anonymous gift, are awarded to two women of the freshman class who are found to excel in preparatory work in Spanish.

Prizes and Premiums for Excellence in Undergraduate Studies

THE KIM ANN ARSTARK MEMORIAL AWARD IN POETRY is derived from a fund established in 1971 by Mr. and Mrs. Lester D. Arstark in memory of their daughter. It is awarded annually for a poem or poems "in celebration of life."

THE ALBERT ARNOLD BENNETT, CLASS OF 1872, AWARD FUND was established by an anonymous donor through several gifts made between 1941 and 1949. The fund is in memory of the Reverend Albert A. Bennett, D.D., pioneer missionary to Japan, and is available annually for award purposes, but not continuously for any one object.

THE PHILO SHERMAN BENNETT PRIZE was established in 1904 by Philo Sherman Bennett for the "best essay discussing the principles of free government."

THE HONORABLE THOMAS WILLIAMS BICKNELL MEMORIAL AWARD was established in 1963 by the National Society of Sons and Daughters of the Pilgrims as a memorial to Thomas Williams Bicknell. The prize is awarded for an essay in American history.

THE BRAND MUSICAL PREMIUM is derived from a fund established in 1960 by William C. H. Brand as a memorial to William and Mina R. Brand and is divided equally between two seniors of Brown University, one man and one woman, on the basis of merit.

THE TRISTAM BURGESS PREMIUM IN ENGLISH, instituted in 1953, is given at the end of the junior year to the woman student "with the highest standing in rhetoric, English composition, and public speaking."

THE BUXTEHUDE PREMIUM FOR MUSICAL EXCELLENCE was established by a gift from an anonymous donor to provide annual premiums for one or more undergraduates in the junior year.

THE THOMAS CARPENTER PRIZES FOR ELOCUTION, derived from the income of a fund established in 1867 by Thomas Carpenter, are awarded each year to the three students to whom are assigned the first, the second, and the third rank of excellence in elocution.

THE THOMAS CARPENTER AND LYDIA CARPENTER PREMIUMS were established in 1869 by Lydia Carpenter, on behalf of her late brother. They are assigned at the end of the academic year to the two members of the senior class who, "already on scholarships, shall, in the judgment of the Faculty, unite in the highest degree the three most important elements of success in life — ability, character, and attainment."

THE HOPE CHATTERTON PRIZE IN MUSIC, to memorialize Hope Chatterton, was instituted in 1946, by anonymous donation. A prize is given in the spring to a woman student who in public audition is deemed to excel in piano performance.

LEALLYN B. CLAPP PRIZE for an outstanding undergraduate thesis in chemistry. The prize honors Professor Clapp, who retired in 1983 after a long and distinguished career in the Brown Chemistry Department.

THE CLASS OF 1873 PRIZES are derived from the income of a fund presented in 1877 by the class of 1873 and are awarded each year to seniors for essays on such topic(s) as the "faculty may, from time to time, deem most expedient."

THE CLASS OF 1906 MEMORIAL PREMIUM was established in 1956 by the will of Harry Knowles, Brown 1906. Currently the premium is awarded to a student who has completed with highest distinction the Honors Program in Russian Studies.

THE CLASS OF 1952 PREMIUM is derived from the income of a fund established in 1952 by the Class of 1952, at The College. It is awarded annually to an outstanding student at the end of his or her junior year, on the basis of excellence in scholastic achievement and extracurricular activity.

THE CLARKSON ABEL COLLINS JR., PRIZE IN AMERICAN MARINE HISTORY is derived from the income of a fund given to Brown University in 1941 by Letta I. Collins in memory of her son. An annual prize is offered for the best paper on any approved topic dealing with the American Merchant Marine or Navy. Competition is restricted to men in the junior or senior class.

THE RUTH ELECTA COLLINS PREMIUM IN FRENCH is derived from the income of a fund established in 1936 by Mrs. Clarkson Abel Collins in memory of her daughter Ruth Electa Collins. It is awarded annually to a male senior, distinguished for outstanding work in French.

THE CURT JOHN DUCASSE PREMIUM IN METAPHYSICS is paid from income of a fund established anonymously in 1958. The premium is awarded to a freshman, sophomore, or junior who excels in Metaphysics and related subjects.

THE ROBINSON POTTER DUNN PREMIUM. The income of a premium scholarship fund presented to

the University in 1872 by pupils and friends of Professor Robinson Potter Dunn is given, at the end of the junior year, to the student "with the highest standing in rhetoric, English composition, and public speaking."

THE ADOLPH CONRAD ELY PREMIUM IN GERMAN is derived from a fund bequeathed in 1941 to Brown University by Adolph Conrad Ely, teacher, of the class of 1894. A premium is awarded annually to the senior with highest standing in Germanic languages and literature.

THE BETH LISA FELDMAN PRIZE IN ENGLISH COMPOSITION is derived from a fund established in 1966 by Mr. and Mrs. Robert Feldman. This competition is open to all students of the University. Preference is given to the writing of stories for children.

THE WILLIAM LEOPOLD FICHTER PREMIUM IN SPANISH was established in 1962 by anonymous gift. The premium is awarded to a member of the junior class who has the highest standing in courses in Spanish language and literature.

THE IRVING LYSANDER FOSTER PREMIUM IN FRENCH is awarded from the income of a fund established in 1940 by Warren Woden Foster and Hatie Foster Moore in memory of their father, Irving Lysander Foster, of the class of 1893. The premium is awarded at the end of the academic year to that freshman who excels in French.

THE LAFAYETTE SABINE FOSTER PRIZE IN GREEK is derived from the income of a fund bequeathed in 1880 by the Hon. Lafayette Sabine Foster, of the class of 1828. This income is to be paid annually "to that scholar of the institution who passes the best examination in the Greek language, the examination to be made in the first, third, sixth, and twenty-fourth books of Homer's *Illiad*, or in the *Oration on the Crown* by Demosthenes.

THE GASPEE CHAPTER DAUGHTERS OF THE AMERICAN REVOLUTION PRIZE. This prize, instituted in 1895, is now paid from the income of a fund presented to Brown University in 1899. The prize is awarded annually to that woman student who presents the best paper written as a class assignment in an American history course.

THE WILLIAM GASTON PREMIUM SCHOLARSHIP is provided by the income of a fund established in 1899 by the widow and the children of the Hon. William Gaston, LL.D., of the class of 1840. The scholarship is awarded to a member of the senior class solely upon scholarly merit.

THE WILLIAM GASTON PRIZE FOR EXCELLENCE IN ORATORY. From the income of a fund established in 1894 as a memorial to the Hon. William Gaston, LL.D., of the class of 1840, a prize is awarded annually to the member of the graduating class who presents the best original address.

THE PRESTON GURNEY LITERARY PRIZES are derived from the income of a fund bequeathed in 1928 to Brown University by Preston Gurney, of the class of 1866. From the income of the endowment two prizes are awarded annually to members of the senior class for the best essays on approved literary topics.

THE FRANCES MASON HARRIS '26 PRIZE established in 1983, is awarded annually to a woman undergraduate or graduate student for a book-length manuscript of poetry or prose-fiction.

THE MARION HASSENFELD PREMIUM IN MUSIC is paid from a fund bequeathed in 1960 by Marion Hassenfeld. It is an annual award to a woman student who "excels in music or music appreciation."

THE MINNIE HELEN HICKS PREMIUM IN ENGLISH is awarded at the end of the senior year to the woman student who has "the highest standing in the courses in English literature and language."

THE MINNIE HELEN HICKS PRIZES IN ART are awarded from income of the Minnie Helen Hicks Fund, for creative work in Art by women students.

THE MINNIE HELEN HICKS PRIZES IN CLASSICAL APPRECIATION, instituted in 1953 from income of the Minnie Helen Hicks Prize Fund, is currently awarded to the woman undergraduate who presents the best paper in the course in Greek art and archaeology or in Greek and Roman history, these being offered in alternate years.

THE MINNIE HELEN HICKS PRIZES FOR ELOCUTION parallel, for women students, the Thomas Carpenter Prizes for Elocution established in 1867 for men students.

THE RATCLIFFE HICKS PREMIUM IN ENGLISH, established in 1915, from income from the Ratcliffe

Hicks Fund of 1907, is awarded at the end of the senior year to the male student who has "the highest standing in the courses in English literature and language."

THE RATCLIFFE HICKS PRIZES AND PREMIUMS FOR EXCELLENCE IN DEBATE, established in 1891 by the Hon. Ratcliffe Hicks, of the class of 1864, and by bequest in 1907, are awarded annually for intercollegiate debates and interclass debates.

THE DAVID HOWELL PREMIUM is awarded from income of a premium scholarship fund presented to the University in 1866 by Gamaliel Lyman Dwight in honor of his grandfather, David Howell. The premium is given at the close of the first semester of the senior year to the student who, "having a good record of deportment, has the highest rank in Mathematics and Natural Philosophy."

THE DOMENICO A. IONATA FUND, established by gifts of the family of Domenico A. Ionata, Class of 1926, provides for a premium to be awarded annually to that senior concentrating in Engineering who demonstrates an unusual degree of creativity and imagination in an independent study project.

THE PROFESSOR I. J. KAPSTEIN FUND, established by friends, students, and colleagues of Professor Kapstein, provides a premium for that undergraduate who has done the best work in the areas of literature, creative writing, or theater arts.

THE SAMUEL C. LAMPORT PRIZES IN INTERNATIONAL UNDERSTANDING, first offered in 1943 by annual gift of the Trustees of the Samuel C. and Miriam D. Lamport Foundation, are now awarded from the income of a fund donated to Brown University in 1952 by these trustees. The prizes are offered to undergraduate students for papers on international understanding, with emphasis on cooperation and tolerance.

THE LUCIUS LYON PRIZES IN LATIN are derived from the income of a fund presented in 1893 by Mrs. Caroline L. Lyon, in memory of her husband, Lucius Lyon, of the class of 1844. The prizes are awarded on the basis of a special examination relating to any or all of the following subjects: the Latin language, Latin literature, Roman history.

THE GEORGE H. MAIN '45 FUND, established by gifts of the family and friends of George H. Main, class of 1945, provides for a premium to be awarded annually to that senior in Engineering who is distinguished by his diligence and devotion to studies rather than for high grades and who holds promise of success in his field.

THE MURIEL HASSENFELD MANN PREMIUM IN MUSIC is paid from a fund bequeathed to the University in 1960. An annual award is made to a woman student who excels in music, music appreciation, or both.

THE HENRY PARKER MANNING MATHEMATICAL PRIZES, instituted in 1936 by annual gift, as the "Calculus Prizes," are now paid out of the annual income of a fund established anonymously in 1949, on the ninetieth birthday of Henry Parker Manning, Brown 1883, mathematician and scholar of ancient languages. Competition is restricted to juniors.

THE BISHOP MCVICKAR PRIZES were instituted in 1909 by the Rt. Rev. William Neilson McVickar, Bishop of the Protestant Episcopal Diocese of Rhode Island, 1898-1910, and are now awarded from the income of a fund established in 1923 in his memory by his sister, Miss E. C. McVickar. The prizes are awarded for the best papers submitted under conditions designated by the Department of Religious Studies.

THE ALEXANDER MEIKLEJOHN PREMIUM IN LOGIC is paid from income of a fund established anonymously in 1951. The premium is awarded to a freshman, sophomore, or junior who excels in Logic and related subjects.

THE EVA A. MOOAR PREMIUM is derived from a fund established in 1967 by the gift of Mrs. Edward M. Kanzler (Lydia W. Mason '31) honoring Eva A. Mooar, Pembroke Dean of Admissions 1926-54. It is awarded annually to that woman student of the senior class "whose achievement over her college years gives evidence of the greatest mental growth and who has contributed to the college and to the community."

THE WALTER JOSEPH NELSON MEMORIAL PREMIUM FOR EXCELLENCE IN MUSIC, instituted in 1957, is paid from an expendable fund given to the University by friends of the late Dr. Walter J.

Nelson, Brown 1934.

THE JAMES ALDRICH PIRCE PRIZE is awarded from the income of a fund established in 1927 by Miss Florence Pirce in memory of her brother, a member of the class of 1892. The prize is currently awarded to the male undergraduate who presents the best paper in the course in Greek art and archaeology or in Greek and Roman history, these being offered in alternate years.

THE ROSE LOW ROME MEMORIAL PRIZE IN POETRY, paid by gift by Mrs. Peter H. Ten Ecyk (Arlene B. Rome, Pembroke '43), is awarded annually for the best poem or poems submitted to the English Department by an undergraduate or graduate student.

THE SUSAN COLVER ROSENBERGER PRIZES were established in 1919 by Jesse L. Rosenberger, as a memorial to his wife, who was the daughter of Charles K. Colver, of the class of 1842. The awards are to be made under conditions to be laid down by the University.

THE ROSTROPOVICH PRIZE IN MUSIC is awarded to the outstanding graduating string musician in the Brown Orchestra.

THE HAROLD SCHLOSBERG MEMORIAL PREMIUM IN PSYCHOLOGY is derived from income of a fund established in 1964 by the colleagues, former students, and friends of Harold Schlosberg, Professor of Psychology and Chairman of the Department, 1954-1964. It is awarded annually to an outstanding senior concentrating in Psychology.

THE MURIEL FAIN SHER MEMORIAL PREMIUM IN PSYCHOLOGY is derived from the income of a fund established in 1952 by the friends of Muriel Fain Sher. It is awarded annually to the most outstanding woman student in the senior class "showing the greatest promise in the field of Psychology."

THE SUSAN ROSS STEINFIELD MEMORIAL FUND was established in 1984 by the family and friends of Susan Ross Steinfield, class of 1961. Awards from this fund are made to seniors who have contributed significantly to the performing arts during their undergraduate years.

THE GILBERT STUART PRIZES IN ART have been awarded since 1965, from income of the Gilbert Stuart Prize Fund, established in 1955-56 by friends of Brown University and of the Art Department, and named in honor of the renowned painter, a native of Rhode Island, for creative work in Art.

THE ROHN TRUELL PREMIUM IN APPLIED MATHEMATICS is derived from income of a fund established in 1968 by friends of Rohn Truell, former Professor and Chairman of the Division of Applied Mathematics. It is awarded annually to a member or members of the senior class concentrating in Applied Mathematics, who during their studies at Brown have achieved high distinction.

THE MARJORIE HARRIS WEISS MEMORIAL PREMIUM IN HISTORY is awarded annually to the outstanding undergraduate woman student majoring in History.

THE ROSAMOND WINSLOW WOODWIND PRIZE established by Mr. and Mrs. Marcellus D. Lemaire and friends of Miss Rosamond W. Lemaire, Pembroke 1961, is given on the basis of a public audition.

Advanced Awards

THE SAMUEL T. ARNOLD FELLOWSHIPS were established in 1964 by Thomas J. Watson, Jr., '37, in memory of Samuel T. Arnold, class of 1913, who was dean at Brown from 1929 to 1949 and later provost of the University. The fellowships provide unusually promising seniors with a year of foreign travel and independent study following graduation.

THE HARVEY A. BAKER FELLOWSHIPS were established in memory of Harvey A. Baker, class of 1903, by his wife. These fellowships support the first year of graduate or professional study for students who "have high scholastic standings, have participated in college activities, and have shown qualities of leadership" at Brown.

THE ANNE CROSBY EMERY ALUMNAE FELLOWSHIP provides financial assistance to a woman in the graduating class who continues her education in professional or graduate school. The fellowship

was established in 1914 by the Alumnae Association to honor Anne Crosby Emery, the second dean of the Women's College of Brown University.

THE BERNARD ROY POLLOCK MEMORIAL PRIZE established in 1984 to honor the memory of Bernard Roy Pollock of the class of 1948, is awarded to a graduating senior, accepted at an accredited law school, who "best exemplifies the personal and professional characteristics which made Bernie Pollock an outstanding member of the communities in which he lived and worked."

THE WILLIAM ROBERT POTTER, 1877, PREMIUM IN CHEMISTRY, was established in 1942 from income of a fund bequeathed by William R. Potter. The premium is awarded "on the basis of a thesis of highest merit submitted by a postgraduate student specializing in Chemistry."

THE BARRY JAY ROSEN PREMIUM IN MOLECULAR BIOLOGY WAS ESTABLISHED in 1966 by friends and associates of Barry Jay Rosen, a graduate student at Brown from 1962-1965, who was awarded the Ph.D. degree posthumously in 1966. The premium is awarded to a graduate student for high achievement in the field of molecular biology.

THE BROWN CHAPTER OF SIGMA XI AWARD FUND was given to Brown University in 1954 by the Brown Chapter of Sigma Xi for an award toward the encouragement of science, whether for research, teaching, or otherwise.

Honorary Societies

Phi Beta Kappa

The Rhode Island Alpha of the Phi Beta Kappa Society was established at Brown University in 1830. The women's section was organized in 1900. The two sections now elect as one body.

In the language of its venerable by-laws, Phi Beta Kappa seeks to reward "acquisition of liberal culture; command of cultivated expression in speech and writing; intellectual honesty and tolerance; breadth of intellectual interest; understanding not merely knowledge". In terms of present day concerns and curricular structures, this is interpreted to mean that Phi Beta Kappa seeks to recognize, and thus to encourage, intellectual distinction among undergraduates, as attested by substantial formal evidence of outstanding academic accomplishment in the course of a broad educational experience. Excessively narrow preoccupation with any discipline or field of study, to the exclusion of others, works against this purpose, and may constitute grounds for disqualification even in cases of unquestionably superior academic performance. At least 40% of a candidate's course work must be in the humanities and/or social sciences.

The chapter annually elects to membership a certain number of the leading scholars of the senior and junior class, candidates for the degrees of Bachelor of Arts and Bachelor of Science. Not more than one-sixth of the candidates for these degrees may be elected; not more than one-third of the members of each class are elected in the junior year. Ordinarily, two elections are held each year, one after mid-year and one in April. Juniors are elected at mid-year, the seniors in April.

Sigma Xi

The Society of the Sigma Xi was founded in 1886 for the encouragement of original investigation in science, pure and applied. The Brown University Chapter, established in 1900, sponsors lectures in a variety of scientific disciplines during the academic year.

Nominations for membership are made by representatives of the various science departments. From the list of nominees the Board of Electors, meeting in February each year, elects those deemed eligible. This Board consists of the Chapter President, who acts *ex-officio* as Chairman, and a repre-

sentative from each of the following departments: Applied Mathematics, Biology and Medicine, Chemistry, Computer Sciences, Engineering, Geological Sciences, Mathematics, Physics, and Psychology.

Tau Beta Pi

The Tau Beta Pi Association, national engineering honor society, was founded at Lehigh University in 1885 to mark in a fitting manner those who have conferred honor upon their Alma Mater by distinguished scholarship and exemplary character as undergraduates in engineering, or by their attainments as alumni in the field of engineering, and to foster a spirit of liberal culture in the engineering colleges of America. Each chapter has full control of its individual affairs, the control being vested primarily in the undergraduate members. An alumni advisory board may act in an advisory and judiciary capacity.

To be eligible for election to membership as an undergraduate, the student must be in either the junior or senior year. To be eligible as a junior, scholastic records must fall within the top eighth of the class and as a senior the top fifth. Distinguished scholarship, while the primary requisite for admission, is not considered the sole criterion. After the scholarship requirements have been fulfilled, the selection is based on integrity, breadth of interest both inside and outside of engineering, adaptability, and unselfish activity. An alumnus, either of Brown University or other accredited engineering schools, may be elected to membership if he has a proven record of character, ability, and integrity, the election still being made by the undergraduate chapter.

The Rhode Island Alpha Chapter was installed at Brown University on February 12, 1954. At the time of the installation of the chapter, in addition to the charter members, 128 alumni members were initiated, mostly alumni who would have been eligible for membership in the society had the chapter existed prior to their graduation.

Rosenberger Medal

The Susan Colver Rosenberger Medal of Honor is awarded by designation of the Faculty. Provision for the medal was made in 1919 by Jesse L. Rosenberger as a memorial to his wife, with the stipulation that it be used to recognize "specially notable or beneficial achievement in scholarship, in authorship, in public life of any kind, or relating to the advancement of the public welfare, or for whatever it may be thought best thus to honor and commemorate..." The recipients and years of past awards are:

WILLIAM WILLIAMS KEEN	1925	ROWLAND ROBERTS HUGHES	1955
CHARLES EVANS HUGHES	1928	THEODORE FRANCIS GREEN	1956
JOHN DAVISON ROCKEFELLER, JR.	1931	ALEXANDER MEIKLEJOHN	1959
CHARLES VALUE CHAPIN	1935	WALDO GIFFORD LELAND	1965
MARY EMMA WOOLLEY	1937	THOMAS JOHN WATSON, JR.	1968
FRED TARBELL FIELD	1940	HENRY MERRITT WRISTON	1976
HENRY DEXTER SHARPE	1944	RICHARD SALOMON	1982
ZECHARIAH CHAFEE, JR.	1947	CHARLES CARPENTER TILLINGHAST, JR.	1982
WARREN RANDOLPH BURGESS	1953	HOWARD ROBERT SWEARER	1983

Summary of Degrees

As of June 1985, there were enrolled the names of 66,307 graduates, both men and women. Of this number 52,507 had received the Bachelor's degree; 11,723 had received advanced degrees; 775 had received the degree of Doctor of Medicine; 1,327 had received honorary degrees.

Honorary Degrees Conferred by the University

HONORARY DEGREES CONFERRED DURING THE ACADEMIC YEAR 1983-84

BETTINO CRAXI, *Doctor of Laws*

GEORGE FROST KENNAN, *Doctor of Laws*

MARILYN HORNE, *Doctor of Music*

CANDIDATES FOR HONORARY DEGREES, COMMENCEMENT MAY 28, 1984

MAYA ANGELOU, *Doctor of Humane Letters*

FREDERICK WALTER BARNES, *Doctor of Medical Science*

DANIEL CHARLES DRUCKER, *Doctor of Science*

WILLIAM ALLAN DYER, JR. '24, *Doctor of Laws*

VARTAN GREGORIAN, *Doctor of Humane Letters*

JAMES CHARLES LEHRER, *Doctor of Humane Letters*

ROBERT BRECKENRIDGE WARE McNEIL, *Doctor of Humane Letters*

HONORARY DEGREES CONFERRED DURING THE ACADEMIC YEAR 1984-85

EUGÈNE IONESCO, *Doctor of Letters*

NICOLAAS HENDRIK KUIPER, *Doctor of Science*

MICHAEL JAMES LIGHTHILL, *Doctor of Science*

JONAS EDWARD SALK, *Doctor of Science*

ROBERT MOTHERWELL, *Doctor of Fine Arts*

CANDIDATES FOR HONORARY DEGREES, COMMENCEMENT MAY 27, 1985

ESTER BOSERUP, *Doctor of Humane Letters*

WILLIAM H. COSBY, JR., *Doctor of Humane Letters*

FRED W. FRIENDLY, *Doctor of Humane Letters*

ERNEST J. GAINES, *Doctor of Letters*

ARTEMIS W. JOUKOWSKY, JR. '55, *Doctor of Laws*

MARTHA SHARP JOUKOWSKY '58, *Doctor of Humane Letters*

JAMES LAUGHLIN, *Doctor of Letters*

THOMAS R. PETERSON, *Doctor of Laws*

FERNAND JOSEPH ST. GERMAIN, *Doctor of Laws*

AN WANG, *Doctor of Science*

The Associated Alumni of Brown University

Officers and Executive Committee 1985-86

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Summary of Enrollment

THE COLLEGE

SEPTEMBER, 1984¹

	Men	Women	Total
Freshmen	734	658	1392
Sophomores.....	737	756	1493
Juniors	721	719	1440
Seniors.....	609	553	1162
Special Students	49	52	101
Total	2850	2738	5588

SEPTEMBER, 1985²

	Men	Women	Total
Freshmen	736	718	1454
Sophomores.....	733	677	1410
Juniors	765	749	1514
Seniors.....	679	562	1241
Special Students	64	70	134
Total	2977	2776	5753

GRADUATE SCHOOL

SEPTEMBER, 1984

	Men	Women	Total
Full time	665	466	1131
Part time	35	42	77
Total	700	508	1208

SEPTEMBER, 1985

	Men	Women	Total
Full Time	711	495	1206
Part Time	34	26	60
Total	745	521	1266

PROGRAM IN MEDICINE

SEPTEMBER, 1984

	Men	Women	Total
Full time	173	123	296

SEPTEMBER, 1985

	Men	Women	Total
Full time	167	123	290

¹ Figures do not include 17 seniors who were enrolled in the Medical Education Program.

² Figures do not include 11 seniors who were enrolled in the Medical Education Program.

GENERAL SUMMARY

SEPTEMBER, 1984

	Men	Women	Total
The College	2850	2738	5588
Graduate School.....	700	508	1208
Program in Medicine	173	123	296
Total	3723	3369	7092

SEPTEMBER, 1985

The College	2977	2776	5753
Graduate School.....	745	521	1266
Program in Medicine	167	123	290
Total	3889	3420	7309

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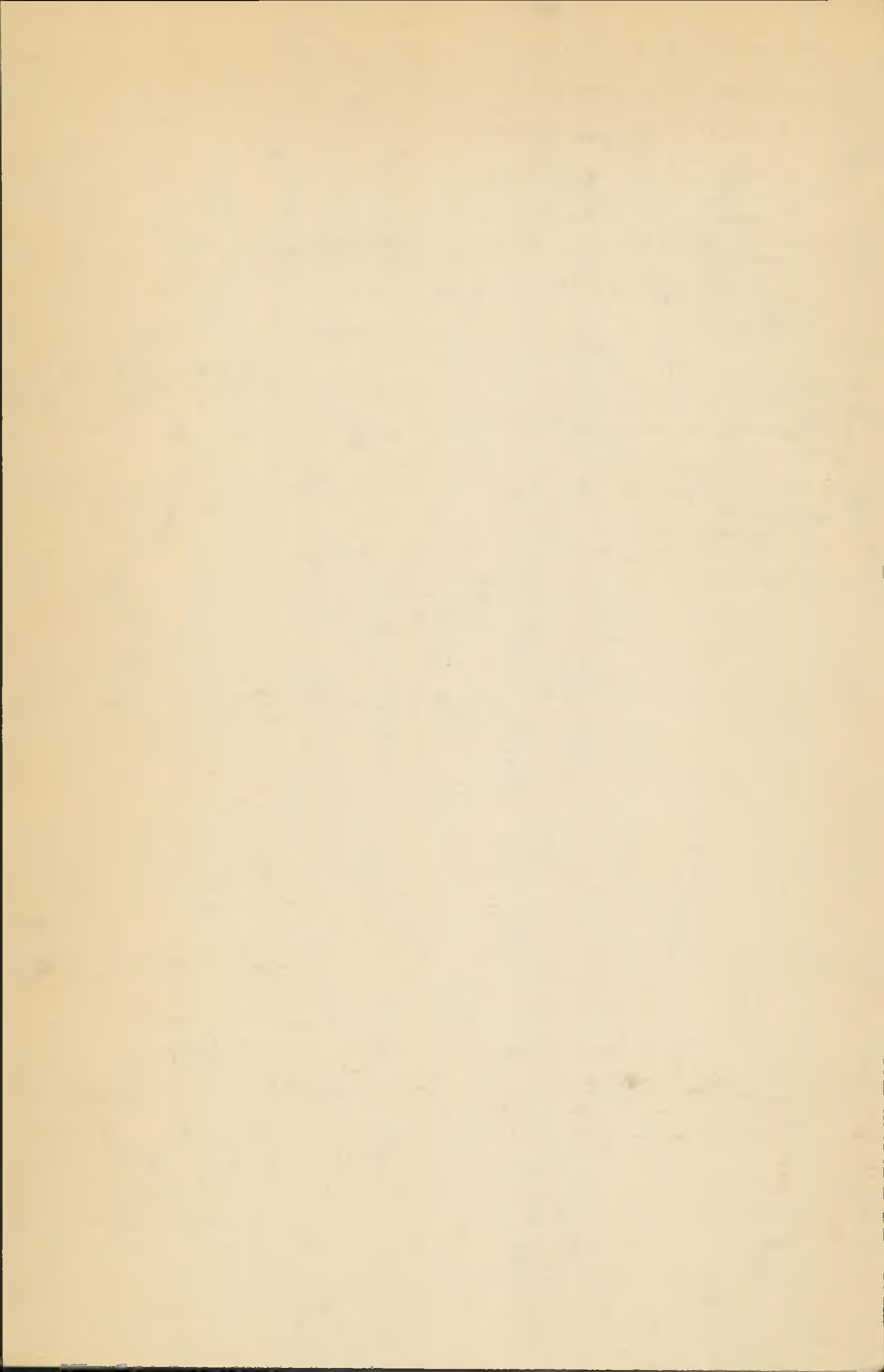
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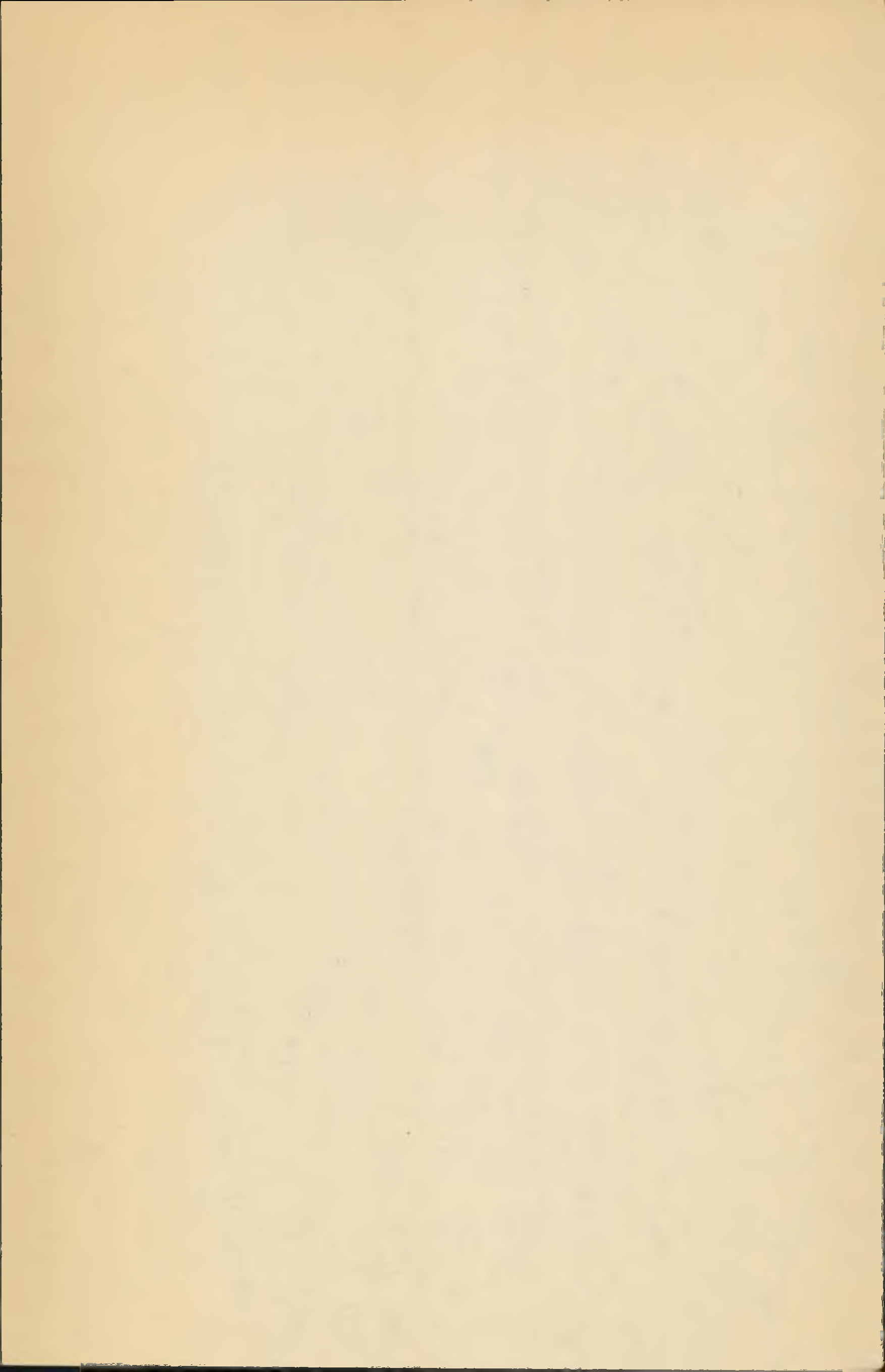
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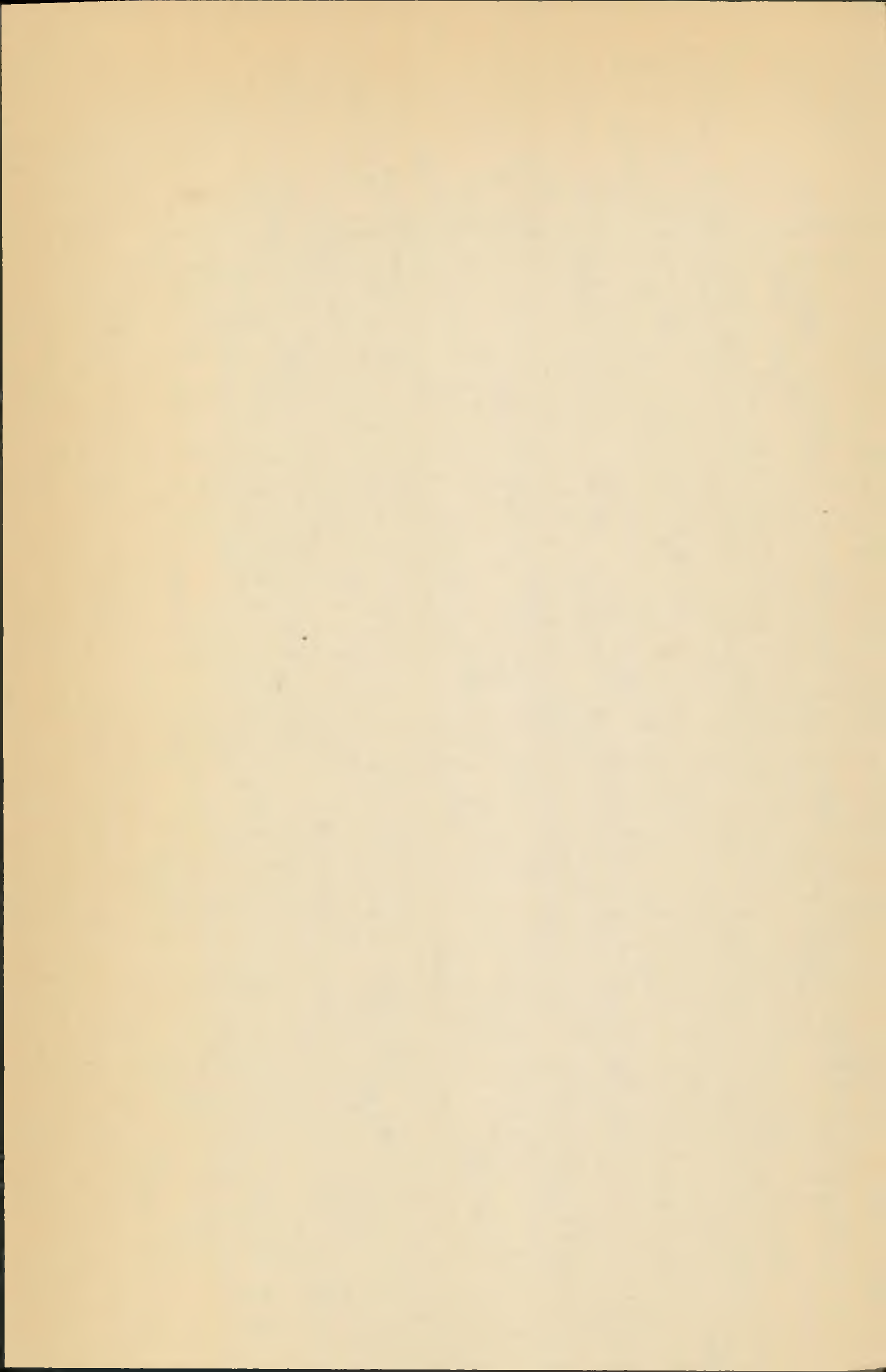
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