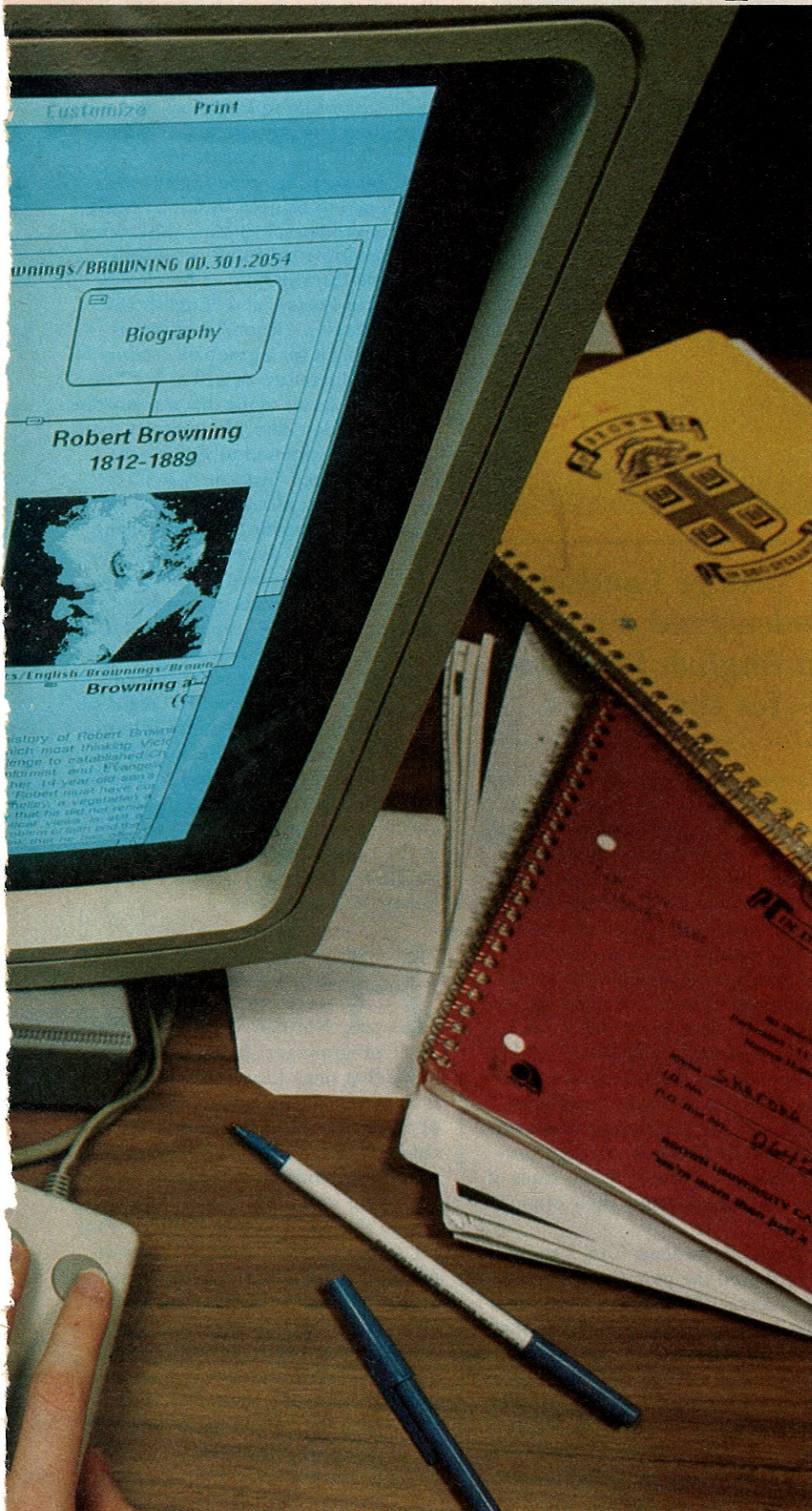


One Giant Step for



Educational Computing



After almost five years of research, 'Intermedia' is now operational

By David Shenk '88

At first, it doesn't seem like much of a story. There are students in the basement of Rhode Island Hall using computers. IBM computers. An Apple printer. A few consultants. It doesn't look like \$2 million, and it certainly doesn't look like the most advanced program in educational computing in the world—which it might be. It's called "Intermedia," an experimental application of advanced computer technology involving the linking of resource materials, and after four-and-a-half years of intensive research and programming, it is operational.

For Norman Meyrowitz '81 and Nicole Yankelovich '83, that word, operational, has a nice ring to it. They are, respectively, the associate director and the project coordinator of the Institute for Research in Information and Scholarship (IRIS), a self-supporting research institution set up by Brown in 1983. Currently, one of their most important projects is Intermedia. It involves about twenty other programmers and consultants, some \$320,000 in hardware (part of a \$15-million grant from IBM), plus an additional \$1.5 million for software development, administration, and project assessment—this money in the form of a grant from the Annenberg Corporation for Public Broadcasting. The project is, by all accounts, an astounding technical achievement, involving software that is really beyond "state of the art." It also could change the way professors approach liberal arts courses. And, as Meyrowitz points out, it is "only the beginning."

The IRIS Intermedia project is based on the advanced notion of

On a screen in the basement of Rhode Island Hall: Elements of George Landow's course in English literature from 1700 to the present.

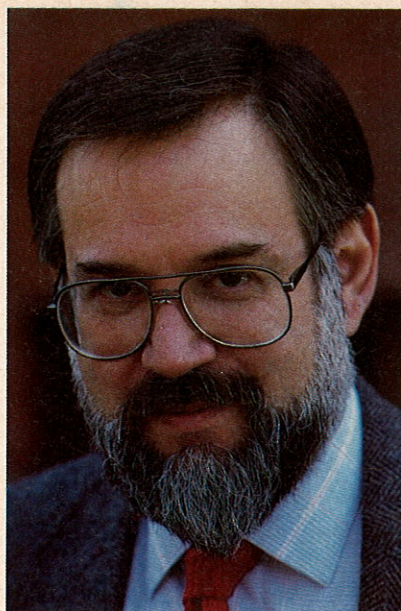
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"hypermedia," a systems model in which a large amount of educational material, including text, graphics, video clips, and music, are linked together on a computer in a non-sequential but orderly manner. As an educational tool, Intermedia is based on the observation that, as Yankelovich puts it, "professors do not tutor students nearly as much as they try to guide them through bodies of material, help them to analyze and synthesize material, and encourage them to make connections."

Intermedia is a practical application of hypermedia, attempting to help scholars make those connections in a way that is much more efficient than conventional teaching or research methods. It is, in a sense, a cross between a powerful, all-purpose research tool and an electronic teaching assistant. "Our first general aim," Meyrowitz writes in a paper on the project, "is to provide software tools that will allow professors to create webs of information and students to follow trails of linked information, annotate texts and illustrations, and communicate with other students and the professor."

Last year, Professors George Landow and Peter Heywood took part in Intermedia's educational debut, applying the technology to an English survey course and an advanced biology course, respectively. Landow completely redesigned his course, "English Literature from 1700 to the Present," around the project. He changed it from a lecture to a discussion format in the hope that the computers would more efficiently provide crucial background information than any one person could in a lecture hall. In Landow's course, background is really foreground. "If this course has one central idea," he explains, "it is that no literary phenomenon—no work, part of a work, or idea about one—can ever be explained by a single fact. All literature is multi-determined, by which we mean that multiple causes impinge on each fact."

The similarity of Landow's course philosophy to the "webs-of-information" strategy behind Intermedia is one of the main reasons his class was chosen as a pilot. The software specific to English 32 consists of an interconnected network of every author and work covered in the course, plus links to historical and cultural material that the vari-



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George Landow redesigned a course in English literature for the project

ous authors dealt with, at least indirectly, during their literary careers. The information is available to any student at the click of a "mouse," and ranges from biographical background to descriptions of the socio-political context in which each author lived and worked.

Theoretically, students assimilate a large and heterogeneous body of historical material in a short time, without having to do library searches or to sort through unnecessary material. Yankelovich points out that, furthermore, students can "continually reorganize the information and juxtapose material in new ways." And in a research situation, they can "quickly follow trails of footnotes without losing their original context."

The sixty students from Landow's course shared the pioneering honors with twenty students from Heywood's course in "Plant Cell Biology." In that course, Intermedia was used less as a reserved-reading room and more as a sophisticated pair of 3-D goggles. With a graphics program called InterSpect, designed by IRIS, the biology students were taught to manipulate advanced

three-dimensional simulations of cells and sub-cellular organelles. Understanding how these structures exist in three dimensions is critical for the students, according to Heywood, and it is something few are able to do without adequate visual demonstrations.

This year, the experiment was broadened to be used by a total of six different courses, including the original two. Landow tried using Intermedia last semester with both of his classes, "Victorian Poetry" and "English and American Non-Fiction," and is currently using it for a graduate seminar in Victorian literature as well as for English 32. "It seems to me that it really did work," Landow says. He indicates that the students exposed to Intermedia have performed "extremely well" on very difficult tests and notes that students using Intermedia spoke during class three times more often than those who took the course in previous years. Two new components of Landow's experiment include keeping the written works of undergraduate and graduate students "on line" for other students to view along with the "webbed" material.

The other courses utilizing Intermedia are Associate Professor of Anthropology William Beeman's "Sounds and Symbols: An Introduction to Linguistic Anthropology," and a seminar in the medical program taught by Associate Professor of Psychiatry Dr. Robert Westlake.

How can you make the delivery of media as rapid on screen as it is on paper?" Norman Meyrowitz and the other programmers have asked themselves that since June 1983. Intermedia is their answer, for now, and its layers of design would be impressive to any computer expert. Its construction is most easily understood in seven levels, beginning with the UNIX 4.2 operating system that IRIS converted to the IBM RT computer soon after IRIS was established. The UNIX system was necessary not just for Intermedia, but for almost all programming done by IRIS.

The next two levels involved converting CadMac and MacApp, generic software designing programs, to the RT. These two programs are what set up the familiar Macintosh-like user interface, and enabled the programmers

to embark on an extremely complicated system with the assurance that any student would be able to use it—that it would be truly “user-friendly.” “Any ten-year-old knows how to use a Macintosh,” Meyrowitz says. “They’ve seen them all over department stores. We didn’t want to experiment with the user interface.”

It was then time for the technical staff to be creative. After installing a powerful database program from the University of California at Berkeley called Ingres, they planned and designed, criticized and redesigned, fought and re-redesigned the various technical links that would fulfill the hypermedia ideal. What they came up with was a series of “editors” for each type of media involved: InterText, InterDraw, InterVal (designed to organize information into time and date sequences), InterPix, and InterSpect. sequences), InterPix, and InterSpect.

The programmers tested the system during the final few months before the workstation laboratory was opened to the two pilot classes in January 1987. The equipment was installed in the basement of Rhode Island Hall, where it still operates. It consisted, and still does, of sixteen IBM RT/PC's (\$20,000 each)—fourteen “clients” and two “servers.” As expected, there were problems in the beginning, but, essentially, Intermedia worked. “Our goal was to get the program working and then to fine tune it,” says Yankelovich.

The one thing that plagued the program throughout the first semester of operation was speed. Students complained that links that should have taken place in split seconds sometimes took thirty seconds or longer. A system that was designed to provide access to broad areas of information at once was not realizing its potential. The delays were of great concern to everyone involved, says Yankelovich. “One of the requirements of this system is that it be fast enough so that there is no noticeable wait. The system, however, is a great deal faster than it was last year, and will get even faster soon. This year, there are no complaints coming from students that we know of.” Yankelovich points out that several improvements in the near future, including a partial switch from the IBM's to Macintosh II's, will further improve the system's

speed.

All the “bugs” aren't out, but Intermedia is operational. The technical work, however, is only half of the project. William Beeman, who is also associate director for programs analysis at IRIS, is heading up the other half: a full-scale anthropological study of how the Intermedia technology will affect every aspect of the college learning environment. And as with the technical side, new ground is being broken.

As important as computing has become on the college campus and in the laboratory in recent years, no one really knows the overall effects computers have on the academic disciplines. “There's a lot of literature on office automation,” Beeman explains, “trying to deal with the question of how computers affect efficiency in an office environment. But there are only about twenty of us in this country studying the academic aspect of computers.” He adds that about ten of those twenty are at Brown, working for IRIS, studying Intermedia as well as other projects.

The programs analysis side of IRIS was started four years ago by William Shipp, director of IRIS, and by Beeman. “IRIS had always been envisioned as having a social-science aspect,” says Beeman. “We were fascinated by the opportunity to take a look at the way a new kind of technology might be having an impact on people, in terms of how they restructure their time, their space, and their social relations.”

When the Annenberg grant was finally approved in 1984, as Meyrowitz and his technicians began adapting and manipulating the software, Beeman's staff made preparations of their own for the introduction of Intermedia. An intensive sociological study of Landow's course began—two years before the computers were used—so that Beeman would have something to compare the results with once the project was underway.

The study, now in its fourth year, consists of observations within the classroom and the laboratory, personal interviews with students, teaching assistants, and faculty, and the journals of a small number of students who are being paid to record carefully how they allot their time. English 32, says Beeman, “will be noted as the most thoroughly observed course in the history

of Brown.” The implications of this study may go far beyond computer usage.

A year after Intermedia began operating, the results are coming in. From the looks of what Beeman and his staff have to say in a recent 150-page report to Annenberg, it could be the beginning of a long and healthy relationship between Brown and Intermedia, and more importantly, between hypermedia systems and the academic world at large. “The development of Intermedia touched many groups and had an impact on the whole of the University,” the report says in its final few paragraphs. “As news of it spreads, it may eventually affect academic life everywhere.”

Professional reaction to Intermedia has been very encouraging, particularly for a project still in the experimental phase. “Multimedia is going to be an increasing trend in the humanities,” says Diane Balestri, assistant dean of the College at Princeton, and a member of Intermedia's External Advisory Committee. “There are some very exciting first returns with this project, and I am anxious to see where it will be [in the near future].”

Brian Hawkins, vice president for computing at Brown, calls Intermedia “the most exciting educational prototype I've ever seen.” His praise is echoed by Apple Computer Technical Advisor Martin Haerberli: “We have been impressed with the effectiveness of the group at IRIS. It may help change, or even revolutionize, the way teaching is done.” For the developers in IRIS, being leaders in hypermedia feels odd. “A lot of people we looked up to and got ideas from are now looking to us for ideas,” says Meyrowitz.

But Bill Shipp points out that this portion of the Intermedia project is only experimental. “Intermedia is not going to be ready for many years, and it may change substantially. What we can do, however,” he continues, “is give to the computer manufacturers, the software developers, the professors, and the students ways to approach problems with a set of tools that are quite different from anything we have ever seen before.”

