THE COMPUTER THE ACADEMY AND THE WORLD

A SYMPOSIUM
ON THE
OCCASION OF
ANDY VAN DAM'S
60TH BIRTHDAY

BROWN UNIVERSITY
MAY 27-28, 1999

Department of Computer Science
Box 1910 Brown University
Providence, RI 02912

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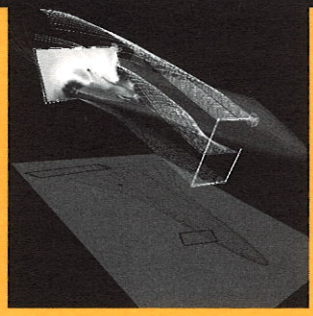
ANDRIES VAN DAM

Andries van Dam was awarded the second U.S. Ph.D. in Computer Science in 1966. Since then, through his deep commitment to education and his boundless energy, his impact on the emerging world of computers has been enormous. He has broken new ground in the use of computers in education, educated a whole generation of experts in computer graphics (not to mention co-founding ACM SIGGRAPH, whose annual conference draws more than 30,000 attendees), helped with countless startup companies, and served on the advisory boards of many small and large companies, including Microsoft Research. He has also mentored a steady stream of undergraduates, many of them current or former chairs of the top-ranked departments in the country.

Among his awards are the ACM SIGGRAPH Steven A. Coons Award (1991), the ACM Karl V. Karlstrom Outstanding Educator Award (1994), and the IEEE James H. Mulligan, Jr. Education Medal (1999). In 1994 he also became an IEEE Fellow and an ACM Fellow. He has honorary Ph.D.s from Darmstadt Technical University in Germany (1995) and Swarthmore College (1996). In 1996 he was inducted into the National Academy of Engineering.



3D widgets for visualization of airflow over the space shuttle

SCHEDULE OF EVENTS

THURSDAY

9:30 Welcome

9:45 Ed Lazowska, *"Andy van Dam's Legacy: A Mid-Career Review"*

10:30 Coffee break

11:00 Raj Reddy, *"Technologies for Learning"*

12:00 Lunch, demos

1:30 Henry Fuchs, *"The Office of the Future"*

2:30 Ronen Barzel, *"Blending Art and Engineering to Make Movies"*

3:30 Coffee break/undergraduate poster session

4:30 Alan Kay, *"The Computer Revolution Hasn't Happened Yet"*

6:30 Banquet at the top of the Biltmore Hotel, overlooking Providence and the East Side. Space at the banquet is limited, so sign up early.

FRIDAY

10:00 Ingrid Carlbom, *"Telepresence – the Next Communications Paradigm"*

10:45 Coffee break

11:30 Steve DeRose, *"The World-wide Web and the Past and Future of Hypertext"*

12:15 Lunch (outdoor); demos at Computer Graphics and AI labs

1:30 Group Photo

1:45 Video Review

2:30 David Salesin, *"Beyond Realism: Aesthetics in Image Synthesis"*

ACCOMMODATIONS

We have reserved 120 rooms for Thursday night, May 27, at the Biltmore Hotel, 1 800 294-7709. When you call, say that you are a part of *The Brown University Computer Science Group*. Reserve by April 26.

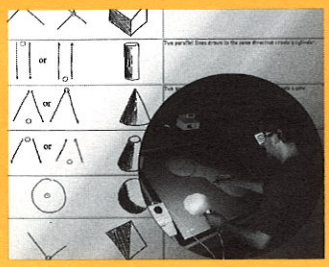
For alumni who will be staying for reunion weekend, a *very* few rooms on campus have been set aside. Contact Meredith Eddy either by e-mail (Meredith_Eddy@postoffice.brown.edu) or by phone at 401 863-2337. The cost is $32 per bed per night and there is a two-night minimum (single $64, double $128).

OTHER INFORMATION

During the breaks, there will be ample opportunity to meet with the speakers and other attendees and to visit the Brown Computer Science Department. There will also be an undergraduate poster session showcasing recent research in the Computer Science department.

For further information on the symposium, please visit our Web site: http://www.cs.brown.edu/~andyfest

The NEH poetry experiment with FRESS, 1976.



A staff member uses ErgoSketch, a sketch-based system for designing mechanical parts.

REGISTRATION FORM

NAME _____

STREET ADDRESS _____

CITY _____ STATE _____ ZIP _____ COUNTRY _____

E-MAIL ADDRESS _____

(If you like, peel off the mailing sticker from the front and paste it above)

Number attending symposium _____
(registration is $75, which includes banquet)

Additional banquet guests _____ ($50 each)

TOTAL $_____

Please send a check made out to Brown University to
Andyfest
c/o Trina Avery
Box 1910 Brown University
Providence, RI 02912

THE SPEAKERS

RONEN BARZEL joined Pixar in 1993 to work on *Toy Story*. He has since worked on R & D of modeling, lighting and animation tools. Other stints include Lucasfilm (in the pre-Pixar days) and SGI (design team for Inventor 2.0), and the University of Washington (visiting faculty, teaching computer animation). He has an Sc.B. in Math/Physics & Sc.M. in Computer Science from Brown, and a Ph.D. in Computer Science from Caltech, where he worked on dynamic constraints and physically based modeling. He is the editor-in-chief of the *Journal of Graphics Tools*.

INGRID CARLBOM is Head of the Visual Communications Research Department in the Multimedia Communications Research Laboratory at Bell Labs. Dr. Carlbom received a Ph.D. in Computer Science from Brown University, a M.S. in Computer Science from Cornell University, and a Fil.Kand. from the University of Stockholm, Sweden. She was a director of SIGGRAPH from 1982 to 1986 and the chair of the SIGGRAPH Advisory Board from 1986 to 1988.

STEVEN J. DEROSE received his Ph.D. in Computational Linguistics from Brown University in 1989. He was a co-founder of Electronic Book Technologies, which was recently acquired by Inso Corporation. He is now Chief Scientist at Inso Electronic Publishing Systems and Visiting Chief Scientist at the Scholarly Technology Group at Brown University.

HENRY FUCHS is Federico Gil Professor of Computer Science and Adjunct Professor of Radiation Oncology at the University of North Carolina. He received his Ph.D. in Computer Science in 1975 at the University of Utah. His work in high-performance computer architectures has led the development of hardware for computer graphics for almost 20 years. He was the winner of ACM SIGGRAPH's 1992 Computer Graphics Achievement Award.

DR. ALAN KAY, Disney Fellow and Vice President of Research and Development, The Walt Disney Company, is best known for the idea of personal computing, the conception of the intimate laptop computer, and the inventions of the now ubiquitous overlapping-window interface and modern object-oriented programming.

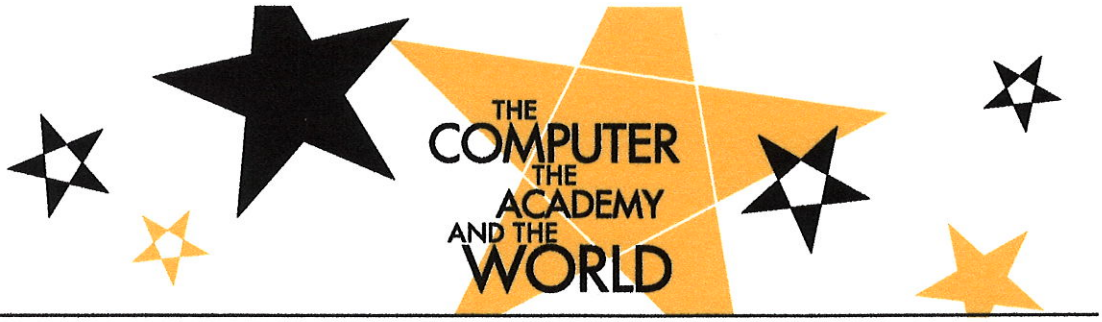
Dr. Kay has received numerous honors, including the ACM Software Systems Award and the J-D Warnier Prix d'Informatique. He has been elected a Fellow of the American Academy of Arts and Sciences, the National Academy of Engineering, and the Royal Society of Arts.

ED LAZOWSKA is Professor and Chair of the Department of Computer Science & Engineering at the University of Washington. He received his A.B. from Brown University in 1972 and his Ph.D. from the University of Toronto in 1977. Lazowska is Chair of the Board of Directors of the Computing Research Association and Chair of the NSF Advisory Committee for Computer and Information Science and Engineering, and is a member of ACM's Turing Award selection committee.

RAJ REDDY is Dean of the School of Computer Science at Carnegie Mellon University and the Herbert A. Simon University Professor of Computer Science and Robotics. He is a member of the National Academy of Engineering and the American Academy of Arts and Sciences. He was president of the American Association for Artificial Intelligence from 1987 to 1989. Dr. Reddy was awarded the Legion of Honor by President Mitterrand of France in 1984, and received the ACM Turing Award in 1995.

DAVID SALESIN is a Senior Researcher at Microsoft Research and an Associate Professor in the Department of Computer Science and Engineering at the University of Washington. His research interests include non-photorealistic rendering, image-based rendering, realistic facial animation, and color reproduction.

Dr. Salesin holds an Sc.B. from Brown University and a Ph.D. from Stanford. Prior to his graduate degree, he worked at Lucasfilm and Pixar, where he contributed computer animation for the Academy Award-winning short film, *Tin Toy*, and the feature-length film *Young Sherlock Holmes*.



Final Schedule and Notes

Thursday 27 May

9:30	Welcome
9:45	*Ed Lazowska,* "Andy van Dam's Legacy: A Mid-Career Review"
10:30	Coffee Break
11:00	*Raj Reddy,* "Technologies for Learning"
12:00	Lunch, Andrews Dining Hall; demos: Cave (180 George) and Graphics Lab (CIT 4th Floor)
1:30	*Henry Fuchs,* "The Office of the Future"
2:30	*David Salesin,* "Beyond Realism: Aesthetics in Image Synthesis"
3:30	Coffee break/undergraduate poster session
4:30	*Alan Kay,* brief presentation via video
4:45	*Norm Meyrowitz,* slide show
6:30	Banquet in the Biltmore Hotel Grand Ballroom

Friday 28 May

10:00	*Ingrid Carlbom,* "Telepresence - the Next Communications Paradigm"
10:45	Coffee break/undergraduate poster session
11:30	*Steve DeRose,* "The World-wide Web and the Past and Future of Hypertext"
12:15	Group Photo, CIT steps
12:30	Lunch, Pembroke Field; demos - Cave (180 George) and Graphics Lab (CIT 4th Floor)
1:45	Video Review
2:30	*Ronen Barzel,* "Blending Art and Engineering to Make Movies"

Notes: Your badge is your ticket to the events, please be sure to wear it so that the student volunteers know that you should be admitted.

Alan Kay will be unable to attend because of an illness in the family; he's sending a brief video presentation, and Norm Meyrowitz has kindly volunteered to provide a slide show in the remaining time.

The web-address for Bob Munck's web site was missing a "www"; it should have been

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http://www.mill-creek-systems.com/AndyFest/
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If you'd like write rather than type something for it, do so and place it in the box on the registration desk, and we'll be sure to get it typed in for you.

Craig J. Mathias

From: John F. Hughes <jfh@cs.brown.edu>
To: <farpoint@ultranet.com>
Sent: Wednesday, May 19, 1999 5:11 PM
Subject: Andyfest: final (?) mailing

Dear Andyfest attendee:

I hope that this will be the last email you get from me before you come to Brown on May 27 for the Symposium on the Occasion of Andy van Dam's 60th birthday. It contains some important information, and two questions. (If you've recently informed me that you're not attending, you're getting this because that information has not yet been recorded in our database, and I wanted to get this message out as soon as possible.)

QUESTIONS

If you're attending with someone else and signed up for both, would you please send me the name of the person you're bringing, so that we can make nametags for everyone?

Many invitees/attendees have indicated that they'd like to know the contact information for all the attendees. Will you please let me know if you object to my circulating this information to that restricted group?

INFORMATION, in the order that you'll probably need it

Before you arrive:

At the banquet on Thursday evening, there'll be an opportunity for people to tell "Andy stories" (and other related stories, ones that help recall the culture of the students who've worked with Andy, for example). There are a million such stories, and if we tell them all, it'll be a long, long night. But if you have something brief and funny, that would be great. Ed Lazowska will be emcee-ing the event, and limiting these stories to about 2 hours (overall, not EACH!).

Just to get you thinking, I'll mention that yesterday Steve Carmody was talking about his trip to the CIA with Andy in the early 70s, and that Steve Feiner asked if I would be reactivating SSTARC for the event (I won't):

> SSTARC (Simple? S? Three? Address? Relay Computer) was a simple computer assembled from a large number of relay breadboards that were originally created for individual use in the logic lab of some course that Andy designed umpteen years ago. We also used them to do a logic lab in CS 100 (I think). They were traditionally bolted together with C clamps at the front of the room towards the end of CS 100 and used to run a single program that slowly and loudly clacked down from 3. When it reached 0, it set off a very loud alarm bell, and, if memory serves, detonated a gunpowder blast.

Bob Munck has set up a wonderful Web site for bios/remembrances of

attendees (which I'll also mention to the non-attending invitees); please visit http://mill-creek-systems.com/AndyFest and give your friends a chance to find out what you've been up to.

When you arrive:

If you're flying to Providence, consider using cabs rather than renting a car. Parking's at a premium, and all events are in easy walking distance of one another.

If you happen to arrive early enough on Wednesday, there's a dedication of Brown's new Technology Center for Advanced Scientific Computing and Visualization. The ceremony and formal program begin at 2:00 p.m. in the C.V. Starr Auditorium of W. Duncan MacMillan 53 Hall, on 167 Thayer Street. If you plan to attend, please RSVP to Carol O'Malley in Corporate and Foundation Relations at 401 863-1682 or Carol_O'Malley@Brown.edu, by May 21.

Thursday morning:

Parking near campus is almost unavailable, because it's graduation weekend. If you're staying at the Biltmore, it's a short cab ride or about a 15-minute, fairly leisurely walk (albeit uphill) to the campus -- probably best to walk rather than drive.

If you do drive, there's parking in Lot 90, whose entrance is on Lloyd Avenue, opposite the Moses Brown School, behind the athletic center. (The nearest cross-street is Hope.) There's also parking in Lot 87 at the side of the Smith Swim Center; the entrance is from Hope Street.

In both places, look for signs with the yellow-and-black-and-white stars motif that we'll be using throughout the conference. (Visit http://www.cs.brown.edu/~andyfest to see this motif; a map indicating the parking lots and other sites will be posted there shortly.)

The symposium talks are all in the Starr Auditorium of MacMillan Hall, at 167 Thayer Street (between Waterman and George Street; some Brown alums will remember this as "where the Math department used to be"). The symposium events begin at 9:30 sharp; you'll want to show up to pick up your badge and brochure before then. There'll be people at a registration desk by 8:30 AM. IF YOU HAVE NOT YET PAID, please send your check immediately. In a pinch, you can pay at registration by CASH or CHECK -- we cannot accept credit cards -- but this is awkward for us. If you arrive with a check pre-made-out to Brown University for the correct amount ($75 for full symposium, including one banquet seat, $50 for additional banquet guests) it will help enormously.

Thursday evening:

The banquet Thursday evening is in the Grand Ballroom of the Biltmore Hotel in downtown Providence. Hors d'oeuvres begin at 6:30. A few people have asked me about dress for the banquet. I'll probably wear a suit; I hope most men will wear jackets and ties, and women will wear skirts/dresses.

By the way, the wonderful jazz pianist Dave McKenna will be playing during the banquet. Come prepared to hear some great music!

Friday:

The final talk is from 2:30 to 3:30 Friday; even if things run a little over, we should be wrapped up by 3:45, so those of you wanting to get away for Memorial Day Weekend can get going before the real rush hour in Providence.

I'm looking forward to seeing you next week.

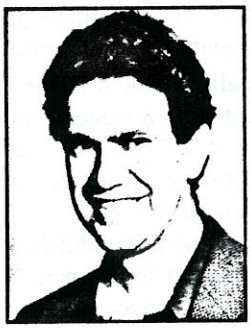
John Hughes

Conduit!

Spring 1995

Computers in the CS Museum

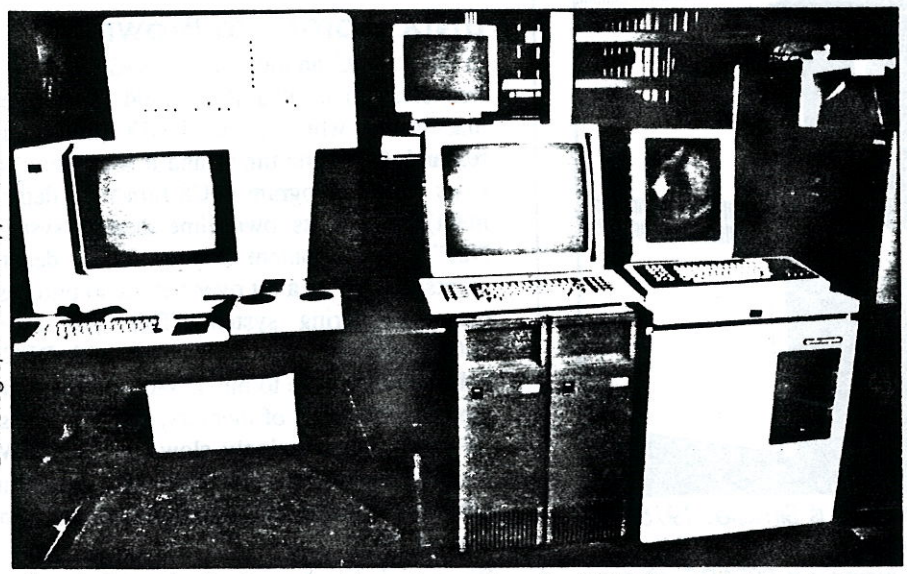
COMPUTERS IN THE CS MUSEUM



Tom Doeppner

Summary

The faculty members who in 1979 became the CS department had been involved with computers at Brown for well over a decade. Andy van Dam's early work with undergraduates on hypertext, producing first the *Hypertext Editing System* and then *FRESS*, ran on the university's IBM mainframe—a 360 Model 67 owned by the university for an incredibly long time (from the late '60s till the late '70s). Our first significant computer system was *BUGS*, the Brown University Graphics System, and our first general-purpose computer was a VAX-11/780 (named *Nancy* when "the VAX" no longer sufficed to identify it) that arrived in early '79. General-purpose time sharing prospered here with the addition of another VAX-11/780 in 1982 (*Sluggo*) and finally a 12-processor Encore Multimax in 1987 (*Zaphod*). Another VAX, a 750 (*Skyler*), was acquired in '85 and used as our mail server. Nancy now rests in the department's computer museum.



The leftmost display and box is an Apollo DN300, acquired in late '82. Next to it is Fritzi, a Sun 2 acquired in mid-'84. The rightmost display and box is one of our first Apollos (the fifth machine shipped by Apollo), a DN400. Behind and above the Sun 2 is a Sun 3/60.

Brown was a pioneer in using workstations for CS education as well as research. Our first Apollo workstation (model DN400) arrived in '81. By that fall we possessed seventeen DN400s and used them in the classroom for our introductory programming and algorithms courses. The DN400s were supplemented with the next-generation Apollo, the DN300, in mid-'83: sixty were acquired for instruction, fifteen for research. The instructional machines arrived in the first two weeks of the '83 fall semester, just after Jeff Coady, newly hired to administer them. Jeff, who had never seen a DN400 before, soon had to cope with running what was perhaps the largest collection of Apollos outside of Apollo. The Apollos were joined by a Sun 1 workstation in late '82 (*Fritzi* now rests in the computer museum). We acquired a couple of Sun 2s in mid-'84 (one of which, *Munin*, is now in the computer museum) and some Sun 3s in another couple of years. Our first Sun 4 arrived in mid-'87.

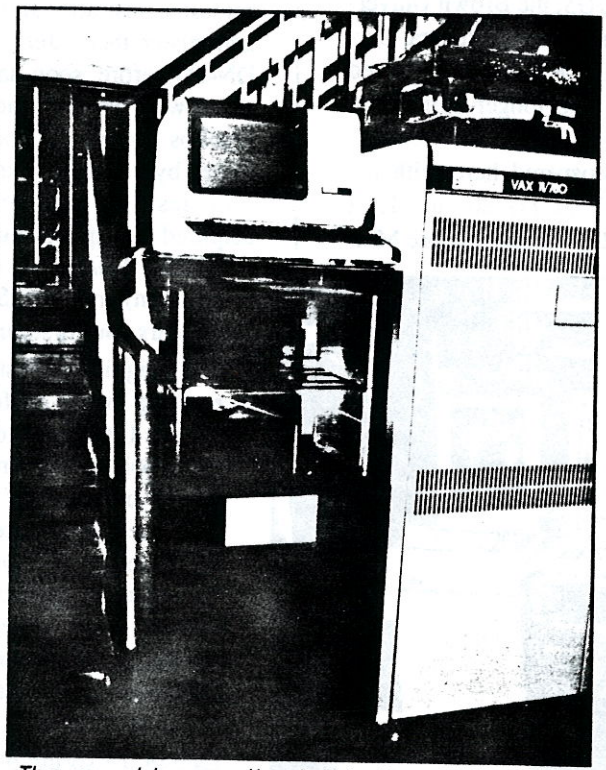
Our original workstations weren't all that exciting to our AI folks. They investigated various Lisp packages for both the VAX and the Apollos, but finally decided that they would be best off with Symbolics Lisp Machines. Fortunately, money was found for these and five were acquired in '85 and '86—*Babar*, *Bimbo*, *Clyde*, *Dumbo*, and *Horton*. They served us well and were retired in '90: one of them now rests in the computer museum, the others were donated to Brown's Division of Engineering.

Late in the spring of 1988 we moved to our present quarters, in the newly constructed CIT building. We had hoped to install our recently ordered SPARCstation 1s in time for the fall semester, but instead, Sun leased us a number of Sun 3s and we used Zaphod (the Encore Multimax), originally a research

machine, as our central facility. We chose not to continue using the VAXes, but sold Sluggo and Skyler; Nancy we kept (at least its primary cabinet—it had grown over the years into two large cabinets holding an impressive 10MB of primary storage, three good-sized disk drives, and two tape drives. All these latter items were disposed of). Nancy became the basis of our computer museum (at a time when VAX-11/780s were still being used at a number of other places). The SPARCstation 1s finally started to arrive in late winter of '89. By the summer we had enough of them that we had no further use for Zaphod, which we sold to Dick Bulterman, late of Brown and then (and now) of CWI in Amsterdam. By '92 our SPARCstation 1s had become a bit dated, so we replaced them with SPARCstation 10s, which now form the bulk of our computer holdings.

The Early Days

The initial configuration of BUGS, built by van Dam's graphics group, became operational in mid-'71. It consisted of a pair of Digital Scientific Meta4 processors and a Vector General vector-graphics display and was augmented with Simale (Super-Integral Microprogrammable Arithmetic and Logic Expediter) in '75. Simale, designed and built by former undergraduate Harold Webber, had a four-processor 18-bit SIMD architecture—each processor had a 38-nanosecond cycle time for an effective peak performance of 105 MIPS. It supported real-time 3D and 4D vector graphics with matrix transformations, clipping, and dynamic level-of-detail management, and it was distinguished by never having a hardware failure in its seven-year lifetime—it was taken down only to replace light bulbs. Simale currently rests in the department's computer museum.



The machine on the left is Simale, 1975-82. On top of it is a VT100; on the right is Nancy, 1979-88. On top of Nancy is SSTARC (Stein, Stabler, Turrentine Automatic Relay Computer), familiar to AM100/CS100 students in the '70s and early '80s, where it was used to introduce logic design.

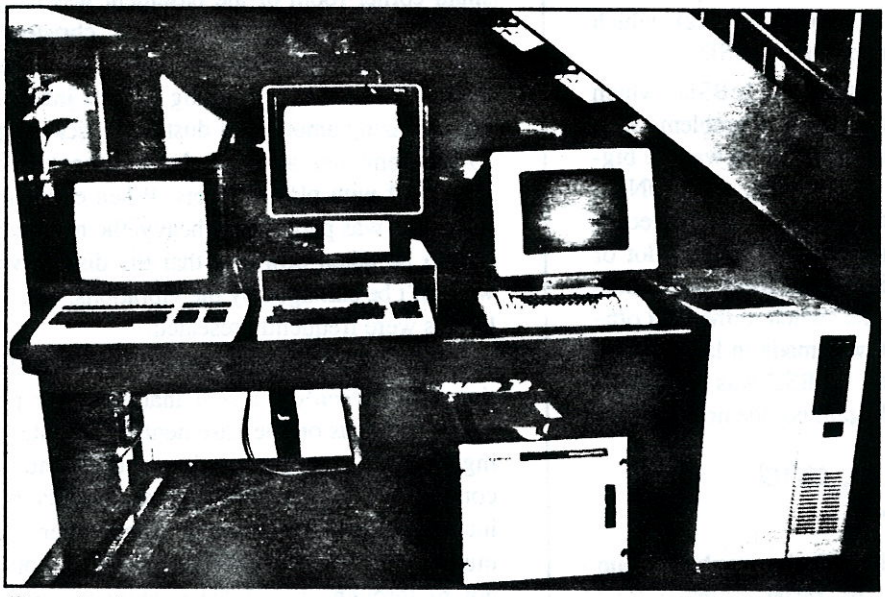
BUGS was originally installed in the University Computer Center at 180 George St. It was connected to the 360/67 via RPC used for dynamic division of labor experiments between the mainframe host and the graphics satellite. We believe this was the first published use of RPC. When we moved to the new building (Kassar House at 151 Thayer Street) in May '79, BUGS moved to the basement, along with Nancy. Its tenth birthday was celebrated in the summer of '81 (those dealing with the VAX were explicitly not invited). It was decommissioned in early '82 when it became clear that there was no future in vector graphics and when work on the extension to 151 Thayer Street (Gould Lab) made part of the basement unusable.

UNIX Comes to Brown

In 1977 DEC announced the VAX-11/780. It was clear to us that this would be an ideal machine on which to run UNIX (an obscure research OS at the time); and it was also clear to us that the Program in CS (not yet a department) needed its own time-sharing system. NSF's new equipment program for CS departments granted us a bit over $100K to purchase our time-sharing system. This was about $100K less than we needed, but, with DEC's help, we were able to buy a VAX-11/780, configured with 512K of memory, one 67MB disk drive, and an amazingly slow tape drive. We considered purchasing a Prime 750 but, fortunately as it turned out, we stuck with our plans to get a VAX.

We intended to receive the VAX in fall '78. However, though renovation of our building at 151 Thayer Street had begun, it was in no shape to house a computer. We knew that there was "plenty" of space in the Barus-Holley and

Prince Lab buildings—all we had to do was to get someone to part with some (temporarily as we hastened to point out). This turned out not to be easy. John Savage (acting director of the program at the time) and I had numerous conversations with our colleagues in Engineering and Physics. The room we thought was lined up fell through at the last minute (I placed a panic call to the loading dock of the DEC VAX factory one morning and convinced them not to ship our computer as it was about to be put on a truck.) By December we finally got a room (in Prince Lab) and the VAX arrived on January 8, 1979.



The display on the left is part of our Ramtek 9400 system, acquired in late '79. The rest of the Ramtek is the leftmost box on the floor. The middle display and box is Fritzi, a Sun 1 acquired in late '82. The rightmost display is Dumbo, a Symbolics Lisp Machine (model 3640) acquired in early '85: to the right of the display and on the floor is the rest of it.

UNIX was not quite ready for the VAX at this time (Bob Sedgewick, Steve Reiss, and I visited Bell Labs in summer '78 to check on its progress and were assured that it would be ready by early '79). So we ran VMS release 0.9, which came with no compilers and nothing of interest except for Adventure and a Scrabble game. (The student we hired to administer the system, Eric Albert, was a champion Scrabble player and enjoyed the game immensely.) In desperate need of a compiler, we became a beta site for DEC's Pascal compiler.

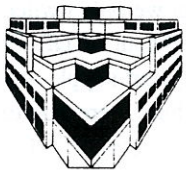
In May '79 the renovation of Kassar House was complete and the people of the department moved in, along with BUGS and the VAX. The building had been wired with RS232 cables and we were ready to put terminals in all faculty and student offices. Except we only owned four terminals. We had ordered four of DEC's new VT100s, but they were in short supply and we were allocated one; the others were due to arrive "soon." Even had they been readily available, they were too expensive for us to acquire in large numbers. So we settled for a cheaper alternative, the Zenith Z19 (also known as the Heathkit H19; despite our poverty, we did not acquire any in kit form). In the meantime, we had gone back to NSF and were awarded additional money. We used this to purchase another 67MB disk drive and 512K more memory. DEC helped out by granting us five VT100s, all of which arrived at the beginning of the '79 fall semester. One of these now rests in our computer museum.

In June '79 UNIX finally arrived. It was release 32V which, as advertised, ran on the VAX, but did not support virtual memory. But it had a compiler and all sorts of other nifty tools and the department finally entered the computer age. (We held no grudges and invited the graphics people to Nancy's fifth birthday party in '84.)

Once we had a C compiler, Steve Reiss wrote *b*, the first generation of the Brown editor. This was quickly adopted by most of the department and its successor, *bb*, is still used by a few diehards (including me).

With UNIX came email. Initially it was only for use in the department—we had no network connections. But in fall '79 I established our first email link to another computer—to "research" at Bell Labs via *uucp*, the Unix-to-Unix Copy program. This was a poor-man's approach to networks—point-to-point connections via phone lines. But it worked and eventually gave us world-wide (if slow and unreliable) email connections. In '82 we joined CSNET and had substantially improved mail service and in '86 we became connected to the Internet.

Late in '79 Berkeley UNIX was introduced and we were one of the first recipients of 3BSD, the first version of UNIX to support virtual memory. It was notable for being impressively slow—it compared unfavorably with VMS in many benchmarks, but even so, few people wanted to run VMS. Less than a year later we installed 4BSD, a much faster version of Berkeley UNIX, followed by 4.1BSD, which we installed as soon as it was available.



In '82, as part of research collaboration with DEC, we were granted another VAX-11/780 (*Sluggo*) for support of graphics work. This was installed on October 6, 1982, just in time for the dedication of Gould Lab that evening. It now became important to get into the UNIX networking business, so we bought two ethernet boards and some cable and acquired an experimental version of Berkeley UNIX, 4.1aBSD (installed in November '82), which added networking support to 4.1BSD.

In August '83 we installed 4.1cBSD, which fixed a number of longstanding problems with UNIX, such as its file system. This was the biggest change since we started with UNIX. Despite a number of warnings, many people were caught off guard and had to do a lot of last-minute scrambling to get their code working again. However, the switch to the next official release, 4.2BSD, was made in late fall and hardly anyone noticed. 4.3BSD was introduced a few years later and again no one noticed.

Graphics, IBM, and Construction

With the demise of BUGS, the graphics group entered the worlds of raster graphics and UNIX. A special graphics room was built in the basement of Kassar and called "BURGER"—Brown University Raster Graphics Experimentation Room (constructed by graduate student and master carpenter Bill Smith). In it was installed in December '79 our first (color) raster display, a Ramtek 9400, currently in our computer museum. A number of notable software projects used this display, including the Interactive Graphical Documents project, BRUWIN (the Brown University Window Manager), and the 4D animation project. Eventually the Ramtek was joined by a couple of Lexidata raster-graphics displays.

In '80 and '81 we began collaborative work with IBM. We needed IBM hardware for this work, so we began thinking about where to put an IBM computer. Serious thought was given to installing the computer in the Kassar House garage (despite the objections of those of us who parked our bicycles there). We eventually decided that the garage would go away to make room for Gould Lab, so the acquisition of IBM hardware was postponed.

When construction of Gould Lab began, a number of changes had to be made to let the construction workers use portions of the basement. BUGS was demolished and Nancy was moved into its place. (By this time Nancy had innumerable terminal connections, etc., so moving it was no easy chore.) BURGER became the construction crew's office, so a small corner room of the basement was taken over for the graphics lab and christened "microBURGER." Running the computers while construction was going on was interesting. Amazing amounts of dust were kicked up, so the computer areas of the basement were sealed off with plastic sheets. When construction work was particularly heavy, the machines had to be taken down so that the disk drives wouldn't be damaged by the vibrations. Circuit boards were frequently reseated.

We were still thinking about an IBM installation and suddenly realized that it would put major demands on the basement air conditioning. We had to up the requirements for the air conditioner, which produced a considerable increase in the size of the air conditioner—so much so that the air conditioner required would not fit through any of the openings into the basement. So the construction crew removed a number of stones from the basement walls to make an opening (just) big enough to put the air conditioner through. We hired riggers (Zavota Brothers) to slide the air conditioner through the hole and set it up in the basement. This was spectacular to watch. They brought in some impressive equipment and some incredibly strong people and got the job done in seemingly no time at all, without a scratch to either building or air conditioner.

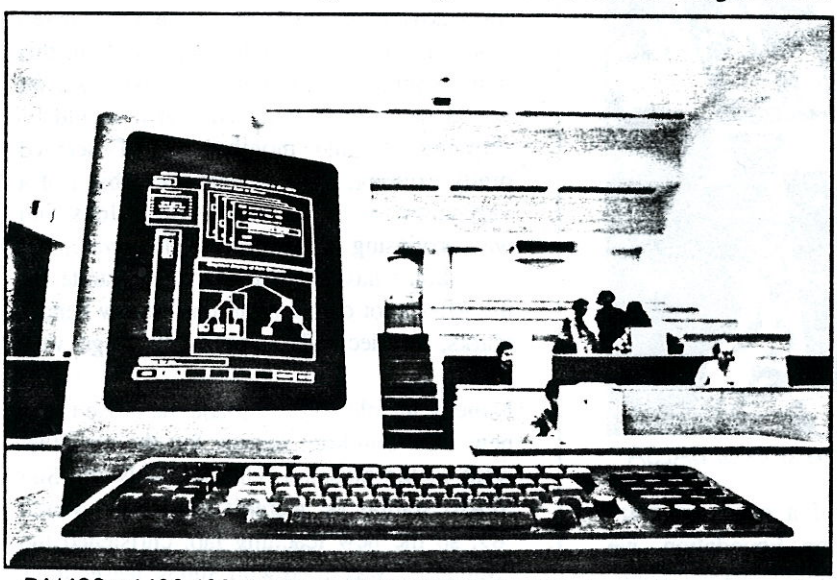
"an IBM 4381 was installed and the department had its first (and so far, only) IBM mainframe"

Finally, pretty much at the last minute, everything was cleaned up in time for Gould Lab's dedication on October 6, 1982. There was now room in the basement, so an IBM 4381 was installed and the department had its first (and so far, only) IBM mainframe, which was used for research on text processing. It was removed a year or so later.

Graphics moved out of the basement and into a spiffy lab within Gould Lab. BURGER was history. The Ramtek and Lexidatas were moved in and were joined by high-end Apollos and a top-of-the-line Evans and Sutherland PS-300 vector display (which now rests in the computer museum).

Workstations

We became intrigued with the idea of workstations in the late '70s when we heard about what was going on at Xerox PARC. Finally in 1980 Three Rivers Computer announced the Perq workstation (but didn't deliver it until much later). This at least made it clear that workstations were about to become commercially available. One of the things that we wanted to use workstations for was instruction, so we applied to NSF's CAUSE program (Comprehensive Assistance to Undergraduate Science Education—a program that got the axe under the Reagan administration) and were awarded $150K. Workstations back then were being quoted for ~$35K each (they weren't being delivered yet), so this was not a whole lot of money. But it was something and we started searching for a workstation vendor.



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DN400 of '82-'83 vintage in Foxboro Auditorium. On-screen is a very early version of BALSA

It was clear to us that we had to make ourselves look exciting so that we could get some assistance (i.e., attractive discounts) from vendors. We put together a brochure describing our needs and our vision for instructional computing. We commissioned an artist to draw a picture of our proposed lab for the brochure and we designed Gould Lab to feature a computerized classroom (holding up to sixty workstations), which became known as the Foxboro Auditorium. We sent the brochure to a number of prospective vendors and donors.

We narrowed things down to three serious potential vendors: Three Rivers, Xerox, and Apollo. Three Rivers was the early favorite, since they had actually announced a commercial product. Xerox, unlike anyone else, had actually produced workstations. Apollo was run by people who were already successful in the computer business (a number had come from Prime and had unsuccessfully attempted to sell us a Prime 750 a few years earlier). We had pretty well decided upon Apollo, but then new developments occurred at Xerox, so we delayed our order. This cost us the honor of receiving the first Apollos shipped. Things became clearer at Xerox in a few days so we put in a firm order to Apollo for seventeen workstations, two with disk drives (33MB each). We received the fifth and sixth machines shipped, in March '81. One of these, "node C," now rests in our computer museum (it was retired from active duty in May 1988). The other machines trickled in and students began to use them in the '81/'82 academic year. One of the more popular first applications written was "PACman," a copy of a then-popular computer game[1].

"we put in a firm order to Apollo for seventeen workstations, two with disk drives (33MB each)"

We became big proponents of workstations and Apollos, giving numerous demos for Apollo's potential customers. Marc Brown, a grad student/staff member, founded the Apollo Users

1. Kassar House was named after Ray Kassar, then the president of Atari, the owner of the rights to PACman, rights that it fought aggressively to maintain. An inadvertent poor move on my part was that someone was playing our bootleg PACman on the Apollo in my office when Kassar stopped by my office during the dedication of the newly named Kassar House in May '82.