Welcome to the Fall 2001 edition of Connect!

This issue explores a variety of recent technological issues and innovations at NYU, but focuses on the two technology conferences that NYU hosted recently: the ACH/ALLC Humanities Computing Conference, and the Teaching More Effectively with Technology Conference. These events were wholly successful, and stand as testimonials to NYU's growing reputation at the forefront of information technology. NYU's dedication to the constant improvement of I.T. services and support is further evidenced in other topics explored in this issue, including the revamped NYU and NYUHome websites; new online Libraries resources; and firewall protection software. We hope you find this issue interesting and informative, and encourage you to share any feedback or article ideas you may have.

ITS would like to extend its deepest sympathy to the friends and family of the victims of the September 11th terrorist attacks. ITS staff worked hard to help the University get through this tragedy and back in operation by maintaining the lines of telephone and electronic communication, and by disseminating important information to NYU students, faculty, staff, alumni and parents over the NYU switchboard, the NYU website, the ITS Helpline, and NYUHome. We are proud to have been able to contribute to the outpouring of support throughout the New York City community in the aftermath of the tragedy.

About Connect

Connect: Information Technology at NYU is edited and published by New York University's Information Technology Services (ITS). Its scope includes information about computing, networking and telecommunications across NYU's various schools, departments and administrative units, as well as developments in information technology outside the University.

Copies of Connect are available at the ITS Faculty Technology Center, the ITS computer labs, the NYU Information Center and most graduate school offices. Copies are mailed to full-time University faculty, staff and researchers, based on mailing lists administered by the Human Resources Division.

If you are a full-time faculty member and do not receive a copy, please notify your dean's office; full-time staff should notify their human resources representative. If you are not among these groups but would like a free subscription, send e-mail to its.connect@nyu.edu.

We welcome your comments about the articles in this issue, as well as suggestions for future issues. Contributions are invited for consideration by the editor.

Opinions expressed in the articles in this publication are those of the authors and not necessarily those of Information Technology Services or of New York University.
<table>
<thead>
<tr>
<th>Academic Conferences at NYU</th>
<th>Online Computing</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACH/ALLC 2001</td>
<td>Rebuilding the Front Door</td>
</tr>
<tr>
<td>Humanities Computing Conference at NYU</td>
<td>Updating the University’s Homepage</td>
</tr>
<tr>
<td>By Kate Monahan, with the ITS Humanities Computing Group</td>
<td>By Drew Hahn, with Donna Filonovsky</td>
</tr>
<tr>
<td>Teaching More Effectively with Technology</td>
<td></td>
</tr>
<tr>
<td>A Conference and Exhibition at New York University</td>
<td>NYUHome v2.0</td>
</tr>
<tr>
<td>By Faculty Resource Network Staff</td>
<td>By Randy Wright and Robert Brill</td>
</tr>
<tr>
<td>Computing in the Arts</td>
<td>Science and Technology</td>
</tr>
<tr>
<td>Internet2: The Next Generation Theatre</td>
<td>Using Computer-based Molecular Graphics</td>
</tr>
<tr>
<td>Multimedia Performances at NYU</td>
<td>in a Science Course for Non-Majors</td>
</tr>
<tr>
<td>By Philip Galanter</td>
<td>By Trace Jordan, Neville Kallenbach, and Marvin Rich</td>
</tr>
<tr>
<td>How Can I Create an Internet2 Performing Arts Event?</td>
<td>Social Sciences, Statistics &amp; Mapping</td>
</tr>
<tr>
<td>By Philip Galanter</td>
<td>Intercooled Stata Version 7.0</td>
</tr>
<tr>
<td>NYU Libraries</td>
<td>By Frank LoPresti</td>
</tr>
<tr>
<td>“Conversations” on the Web</td>
<td>Network Security</td>
</tr>
<tr>
<td>Using a Web-based Environment to Enhance a CAS MAP Course</td>
<td>Personal Firewalls</td>
</tr>
<tr>
<td>By Nancy Freeman Regalado, with Marybeth McCartin</td>
<td>By Tracey Losco</td>
</tr>
<tr>
<td>Digital Reference at Bobst Library</td>
<td>From the Desk of...</td>
</tr>
<tr>
<td>By Jennifer Schwartz</td>
<td>University-wide License for Oracle Products</td>
</tr>
<tr>
<td></td>
<td>By Marilyn McMillan, CITO</td>
</tr>
</tbody>
</table>
ACH/ALLC 2001
Humanities Computing Conference at NYU

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This past June, people from all over the world came to New York University to participate in this year’s joint international conference of the Association for Computers and the Humanities and the Association for Literary and Linguistic Computing, ACH/ALLC 2001. Information Technology Services (ITS) hosted this event, which was co-sponsored by the Faculty of Arts and Sciences, NYU Libraries, and the NYU Humanities Council. The conference, which has been in existence for 13 years, is the most important gathering of academics, researchers, students and industry specialists engaged in humanities computing.

The ACH/ALLC conference takes place every year, and alternates locations between North America and Europe. Previous conferences have taken place at Oxford University, the Sorbonne, Georgetown, and UC Santa Barbara. At this year’s conference, from June 13th–16th, NYU was rewarded with a record turnout—over 300 people attended, over 90 academic papers were presented in parallel and plenary sessions, and there were 20 poster demonstrations of all aspects of computing in the humanities.

Dr. Allen Renear, professor of Libraries at the University of Illinois at Urbana-Champaign and ACH president, remarked that “The conference was an enormous success, absolutely fantastic. For one thing, we think it was easily the largest ACH/ALLC conference ever—which is not surprising given the rapidly increasing sense around the world that contemporary computing techniques are enabling some really exciting new work in the humanities.”

Planning for this event started two years ago, when Lorna Hughes put in a bid to the ACH and ALLC committees for NYU to host the conference, which was accepted. Both organizations were keen to bring the conference to New York City. In addition to New York’s renown as home of many cultural landmarks and attractions, there was a sense amongst both organizations that NYU is developing a number of key initiatives in Humanities Computing, and that the
A poster and demonstration session was held the third evening of the conference. The conference was a good opportunity to showcase these activities. "The conference came at a great time for us" said Lorna Hughes, the local conference organizer. "We have a fully staffed Humanities Computing Group at ITS now, and we are expanding our coverage of faculty and student technology facilities. We have been working on some really exciting initiatives, such as the establishment of the Studio for Digital Projects and Research in collaboration with the Libraries, a new center for faculty to explore technology in the humanities and related disciplines. It was great to be able to host this conference at NYU right now, when I really feel technology is becoming so central to the way we research and teach the Humanities."

Otto Sonntag, Dean of the Faculty of Arts and Sciences, echoed Ms. Hughes sentiment, remarking: "NYU in general and the Faculty of Arts and Science in particular benefited greatly from having visitors from around the globe get a good look at us and our facilities and to enjoy our hospitality. The conference participants, from all I could tell, saw a very impressively organized and run event, offering an enormous range of sessions and presentations. NYU faculty and students, for their part, had a wonderful opportunity to get to know people who are making creative use of computers in the humanities and to discuss common challenges with them."

The local organizing team was led by Lorna Hughes, Assistant Director for Humanities Computing at ITS. A large number of staff from ITS were involved in this initiative; among others, Humanities Computing Specialists Gary Shawver and Matthew Zimmerman assisted with all aspects of the organization, including coordination of registration, housing for delegates, and technical support for this event. Staff from ITS Academic Computing Services assisted with technical aspects of the conference and the logistical aspects inherent in the planning of such a large event.

Dr. Renear praised NYU's efforts highly, saying, "Lorna Hughes and her crew from Humanities Computing were absolutely terrific, amazing. In all my years in ACH, I have never seen anyone so expert at creating the conditions for satisfying intellectual camaraderie."

Support for the conference was provided by a local NYU steering committee that was convened in 1999 when the opportunity to host the 2001 conference was awarded to NYU. The members of the committee were Marilyn McMillan, CITO; Carol Mandel, Dean of Libraries; Matthew Santirocco, FAS Dean; Otto Sonntag and Sally Sanderlin, FAS Deans; Ellen Nantz, FAS Special Events; Jim Matthews, GSAS; and Vince Renzi, MAP.

"After working together to prepare for the conference, it was a thrill to have all the conference on site and in action," remarked Marilyn McMillan, CTIO. "With so much interesting work underway in so many domains, we seem to have reached a new plateau where innovations with computing can strongly promote superb scholarship in these disciplines. I look forward to capturing the energy sparked by the conference as we move forward at NYU."

An international program committee, chaired by John Lavagnino, Kings College, London, was convened, and they worked on the task of putting out a call for papers and then approving a large number of papers and poster sessions. It was felt that this was one of the strongest programs seen at an ACH/ALLC conference yet, with topics ranging from multilingual computing, 3D representation of archaeological modeling, digital libraries, and multimedia archives, to the development of degrees in humanities computing.
As Dr. Renear observed: "The program was terrific, a combination of valuable practical projects and fascinating theoretical insights. By the end, no one had any doubt that humanities computing has become one of the most exciting areas of intellectual work in the world today."

The four-day conference opened with a keynote address by Johanna Drucker, Robertson Professor in Media Studies, University of Virginia. Her presentation described the humanities computing community at the University of Virginia as a context for thinking and rethinking the premises on which an array of projects are currently conceived, and was a useful overview of some of the most cutting-edge uses of technology.

The mid-conference plenary session was a presentation by Professor John Burrows of the University of Newcastle, Australia, whose paper was concerned with "Questions of Authorship: Attribution and Beyond". Burrows has used technology to research the authorship of texts and the stylistic features of the works of Jane Austen for many years, and was awarded the Roberto Busa award for 2001.

This award is given every three years, and is named for Father Roberto Busa, SJ, the pioneer of humanities computing who used punchcards for concordances of texts in the 1940’s. The closing speaker was Alan Liu of the University of Santa Barbara, who talked about "The Tribe of Cool: Information Culture and History".

Thanks to assistance from NYU Television and ITS Network Services, all the keynote sessions were webcast live, and have been archived on the conference website.

Dr. Renear captured the enthusiasm everyone felt about the conference when he remarked:

"Sometimes a conference has that spark, that sense that great things are afoot. And that’s what we felt. That it happened this time, with this much intensity, is due as much to the mood set by our NYU hosts as to anything else...Computing and the humanities in 2001, in New York City, at NYU...can it get any better than that? I don’t think it can."
Teaching More Effectively with Technology

A Conference and Exhibition at New York University

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On Wednesday, April 11 and Thursday, April 12, 2001, the newly established Center for Teaching Excellence at New York University, in cooperation with Information Technology Services, the NYU Libraries, the Faculty Resource Network and the Humanities Council, organized and presented Teaching More Effectively With Technology: A Conference and Exhibition at New York University, a high-level, major initiative by NYU to focus on the role of technology in teaching.

The conference opened with introductory remarks by Vice Provost Sharon L. Weinberg and a welcome by NYU President L. Jay Oliva, and featured a keynote address by Marc Hamilton, Director of Technology, Worldwide Education, and Research Computing for Sun Microsystems. The conference was the very first university-wide event of its kind and included panel discussions on theory and practice, interactive workshops and instructional open houses.

An Educational Technology Expo was open both days, and featured displays by Apple Computer, Blackboard, Dell Computer, Gateway Computer, Macromedia, John Wiley & Sons, Sun Microsystems, NYU Bookstores and Palm, Inc.

The conference targeted faculty, administrators and graduate students interested in using powerful new technological tools to improve and innovate both the content and methods of their teaching, and was attended by 250-300 participants from NYU, as well as from member institutions of the Faculty Resource Network and beyond. In showcasing the technological strengths of our faculty, the conference amply demonstrated how NYU has become a leader in the technological revolution that is taking place on college campuses.

On the first day of the conference, twenty-one faculty members from virtually all NYU schools and divisions demonstrated their innovative use of technology in teaching.

Sessions as diverse as “Research Methods in West European Social Science”, “Performance Studies: Going Virtual”, “Demonstrating Concepts in 20th Century Physics with Interactive...”

Figure 1. Sun Microsystems representative, Marc Hamilton, delivers his keynote address.
Animation", "Online Nursing Resource: A Self-Paced Tutorial and Refresher", "Use of the Computer for Designs of Costume and Set on Stage and Screen", "What the Research Shows", and "Oral Cancer Diagnostics: Practicing for Life" were selected to appeal to the many disciplines represented by conference attendees. Many of the speakers also gave presentations at the recent Faculty Resource Network Summer 2001 Seminar, *Instructional Design for the World-Wide-Web*.

On day two of the conference, thirty-three hands-on workshops were presented by ITS and the NYU Libraries on such topics as "Introduction to PowerPoint to Enhance Teaching and Learning" and "Journal Club and Science Course Readings on the World-Wide-Web", as well as on various computer programs, such as "Introduction to Blackboard: A Learning Management System", "Introduction to Apple’s iDVD Studio Pro", and much more.

The conference concluded with the NYU Humanities Council Presidential Lecture by Demetri Terzopoulos, Lucy and Henry Moses Professor in the Sciences and Professor of Computer Science and Mathematics at the Courant Institute of Mathematical Sciences, NYU. His fascinating lecture addressed the topic of "Synthetic Animals (and Humans): Artificial Life in Virtual Reality", and came complete with an impressive visual showcasing of recent advancements in the field.

The conference was a complete success, and response to the event was extremely positive and enthusiastic.
Artists in every medium have already exploited the standard Internet to present works in all manner of media. But, as most users have found (even those with broadband or high quality on-campus connections), real-time events with uncompressed CD-quality audio and full frame rate full resolution video are still not possible.

Internet2 (12) is an initiative including 180 universities, multiple network service providers, and a number of middleware and protocol development efforts all working towards the invention of the next generation Internet. Internet2 presents artists with the possibility of connectivity that enables the production values they’ve long taken for granted in recording studios, sound stages, and post-production editing suites.

Recent Internet2 Performances

Internet2 has established a new medium for the performing arts. Musicians, actors, dancers, and other artists can perform and interact across multiple sites, and present a real-time shared multimedia experience for audiences at remote locations. To this end, I2 technologies must be carefully adapted for the unique needs of artistic performance. In addition, artists must rethink and adapt their traditional methods to the I2 medium.

NYU is a charter member of the Internet2 initiative. From the outset, the Arts Technology Group of Academic Computing Services has worked with interested faculty and departments to exploit and explore this exciting new technology. As artists with technical expertise, we have provided a systems integration function for all NYU Internet2 performances to date, along with the close help and cooperation of ITS Network Services.

This article briefly presents two recent Internet2-based performance events, as well as a related event using older ISDN-based video conference technology. Faculty and researchers working in the performing arts interested in exploring Internet2 are invited to take note of the related article here on page 18, and to contact the author.

Figure 1. “The Technophobe & The Madman” at NYU’s Loewe Theatre.
"THE TECHNOPHOBE & THE MADMAN"

Billed as the first Internet2 live distributed musical, "The Technophobe & The Madman" was performed at NYU in the Loewe Theatre and at Rensselaer Polytechnic Institute (RPI) on February 20, 2001 (see Figure 1). The work was commissioned by Harvestworks (www.harvestworks.org/) with funds from the New York State Council on the Arts. The funding was initially secured by then Arts Technology Group member, and now Temple University faculty member, Sarah Drury.

The stages at RPI in Troy, New York and NYU in New York City were connected with six channels of full quality video and twelve channels of CD-quality audio. This allowed performers on both stages to be seen and heard by the audiences at both sites. Each stage had three large video projection screens serving as backdrops, and presenting the performers at the far site as they interacted with the performers on stage (see figure 2).

Tyrone Henderson, as the madman, was the central character and singer on the NYU stage, while Maya Azucena played the part of the technophobe at RPI. Exploring themes of desire, alienation and hope in an increasingly technologically complex culture, "The Technophobe & The Madman" has garnered national attention with significant coverage in publications such as The New York Times, The Village Voice, and Wired.

The musical was created by a large team, including composers Robert Rowe (NYU), Nick Didkovsky (NYU), and Neil Rolnick (RPI), video artist Don Ritter, writers Quimetta Perle and Tyrone Henderson, and director Valeria Vasilevski.

Internet2 not only provided the network environment for the actual performance, but also provided the connectivity that was used to develop and rehearse the large-scale multimedia piece. In addition, commodity Internet tools such as websites, e-mail, and the like were critically important, allowing close and frequent collaboration despite the 160-mile distance between Troy and New York City.

Additional information about this project is available at: www.academy.rpi.edu/projects/technophobe/.

INTERNATIONAL COMPUTER MUSIC TECHNOLOGY CONFERENCE

On June 18, 2001, a team of collaborators at NYU and Indiana University presented a multi-site session as part of The 11th Annual International Computer Music Technology Conference and Workshop. This session was the latest event in a series of network-based collaborations with Indiana University that started in the previous year.

The audience at the Indiana-Purdue University campus in Indianapolis experienced a spirited performance by Tom Beyer (percussion), Wendy Luck (flute and vocals), and

Figure 2. A scene from the NYU side of "The Technophobe & The Madman".
Drew Waters (bass) at NYU and Jack Gilfoy (percussion) in Indiana. This was preceded and followed by comments and observations from session organizers John Gilbert (NYU) and Fred Rees (IUPUI). Of particular interest in this session was the technical issue of network latency, and how it must be taken into account by the composers and performers.

As Professor Gilbert noted while reflecting on the performance:

“In music of the past, music in cathedrals also had a kind of latency problem in the delay of sound. This affected the way music was composed and structured, including the elaborate antiphonal schemes that emerged. Certainly, we can incorporate the phenomenon of latency into the performance. This was handled beautifully in "The Technophobe & The Madman".

Many of the structural schemes developed for the Cassandra and Orpheus projects (Dinu Ghezzo, John Gilbert, Alistair Martin-Smith, Lisa Naugle, et al.) have included latency as part of the content. Precise rhythmic ideas become one-way transmissions. Two-way-plus transmissions allow for slippage so that textures are emphasized over rhythmic precision.

Additional information about this project is available at: www.nyu.edu/classes/gilbert/distance/.

IDEA 2001

Professor Alistair Martin-Smith organized a three-way performance and discussion for presentation at The Fourth World Congress of the International Drama Education Association on July 6, 2001. Working with Martin-Smith were faculty co-presentors Belalie Zatzman (York University, Toronto, Canada), Steinar Topland (Bergen University, Bergen, Norway) and Helen Grosso (NYU).

Martin-Smith, of NYU’s Program in Educational Theatre, hosted the session, which presented several live performances and a short film. In each case, student actors and writers presented a traditional creation story while exploring performance using technology spanning two continents and three countries. Due to the bandwidth constraints at York University, traditional ISDN-based video conference technology was used rather than Internet2.

Working with adolescent actors, Professors Martin-Smith and Grosso directed “Taming of the Sun: A Polynesian Creation Story” (see figure 3). This was performed for an audience at NYU’s Black Box Theatre in Pless Hall as well as to audiences in Toronto and Bergen via transmission. Similarly, Professor Zatzman directed college students in “The Divine Woman Who Fell From the Sky: A Huron Creation Story”. Finally, Professor Topland’s college students presented a Norse creation story in the form of the short film “The Theft of Thor’s Hammer” (see figure 4).

As much a workshop as a formal performance, Martin-Smith then led the audiences at all three sites in a discussion of the commonalities of...
concerns and themes in the creation stories from these diverse cultures, as well as the experience of performing in a networked event.

In terms of technology, ISDN-based video conferencing is interesting to compare to emerging Internet2 alternatives. ISDN video conferencing is certainly more ubiquitous and provides a way to interoperate between differing video standards, such as NTSC, used in the U.S. and PAL, used in Norway. However, Internet2 provides a very neutral path for video and audio, whereas video conferencing equipment is optimized for panel discussions and the like. Artists using Internet2 can control all aspects of the presentation, but most video conferencing equipment switches camera views based on which sound source is active. In addition, the sound and video quality of Internet2 connections can be much better than that obtained with ISDN-based video conference technology.

More information on this event is available at: [www.yorku.ca/bzatzman/idea2001/4150.html](http://www.yorku.ca/bzatzman/idea2001/4150.html).

The Future

Like all emerging technologies, Internet2 will become easier to use and more ubiquitous over time, and the associated hardware and software will drop in price. For now, Internet2 is not a simple off the shelf "plug and play" technology, but at NYU we've been able to demonstrate that a collaborative team can make tomorrow's technology available to artists today. Whether one is interested in large-scale, highly finished productions like "The Technophobe & The Madman" or participatory workshops like the Indiana and Bergen events, ideas and project proposals for live Internet2 events are most welcome and practical now at NYU. For questions and considerations you should take under advisement when planning an Internet2 project, please see the related article on page 18.

Phil Galanter is Associate Director of the Arts Technology Group at ITS Academic Computing Services.

Previous NYU performing arts events via Internet2 have included:

Audio Engineering Society—September 1999

In collaboration with McGill University, a live swing band performance was sent from Toronto to the Cantor Film Center via video and Dolby Digital Surround Sound. For more information see the Spring 2000 edition of Connect at: [www.nyu.edu/its/connect/archives/oospring/galantermusic.html](http://www.nyu.edu/its/connect/archives/oospring/galantermusic.html)

ITP Performance Art Class—Spring 2000


Internet2 National Member Meeting—October 2000

NYU participated with a number of other sites to demonstrate a "National Distributed Recording Studio" creating a CD in multiple passes for a live audience. For more information see: [www.internet2.edu/html/falloorialto.html](http://www.internet2.edu/html/falloorialto.html)

Association for Technology in Music Instruction—November 2000

NYU Professor John Gilbert worked with Professor Fred Rees at Indiana University and musicians at both schools to perform together using audio and video over Internet2. For more information see: [www.nyu.edu/classes/gilbert/distance/](http://www.nyu.edu/classes/gilbert/distance/)
"Conversations" on the Web
Using a Web-based Environment to Enhance a CAS MAP Course

Nancy Freeman Regalado, with Marybeth McCartin
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In 1998, I began working with Marybeth McCartin and her staff at Bobst Instructional Services, which then included my daughter, Mariana Regalado. Our aim was to develop an information literacy pilot program and website to support my MAP course Conversations of the West: Antiquity/Middle Ages. I was new to the demanding curriculum of the MAP, to managing a lecture class of such size, to the Web, even to e-mail discussion lists, now so routine. But as a “pilot project,” I felt free to experiment and question without risk.

My MAP Conversations class is based on the theme that over the centuries, there has been a great chain of readers of the Bible, Plato, Virgil, Augustine, Dante, Chaucer, and the other authors I chose, each one rereading, citing, and rewriting those who came before. When creating this course, my aim was to forge this very large lecture class (80+ students) into an ongoing community of readers who would understand that they too are part of that great chain, that they are continuing the “conversation.”

I wanted a method and a technology to guide my MAP students towards three goals. First, I wanted each student to find some effective personal grasp on the dozen “great books” we would read in one semester. Second, I wanted the students to know how to use Library and Web resources effectively so that they would feel the Library and the Internet to be “theirs.” Above all, I wanted our course itself to be a “conversation,” with active discussion among the students in the course, outside of class time as well as in lecture and recitation.

Katie Ohlson Senft, who was then an undergraduate student employee (and is now a graduate student in the Archival Management Program of the History Department) had the know-how to build a beautiful website www.nyu.edu/classes/regalado/, with generous funding from the MAP program. It contains all the information about the course as well as a bulletin board for posting related exhibits, concerts, and plays. In addition, it contains links to Library resources such as the online catalog and research databases, as well as tutorials that help students use the Library effectively. These links help students complete library exercises that were incorporated into the course. The library exercises were designed to facilitate the development of important library and information literacy skills.

The “spot quotation” link that Katie designed and built is perhaps the most interesting and effective aspect of the website. The link incorporates both a methodology for understanding the significance of a whole work through close analysis of one citation and a technology that enables students to share their work. Students select brief quotations from each text and write comments showing how their quotation illuminates the significance of the whole work. Students then sign up in rotation to post their spot quotes and comments on the website. Other students sign up to respond to such postings. I download and grade each posting and add a further response to each posting on the website.

These postings are used by students to prepare for 30-minute open-book quizzes where they write about one of the spot quotes I select from some 25-30 postings. The quiz itself is a test of understanding, thinking and writing skills, not of memory—but the students do remember the quotations and the works because they’ve worked so hard on them!

The students’ evaluations of the website are very positive. First, the students like seeing other ideas and interpretations: “The quotes and comments give me a better idea of other people’s interpretations of the works we are reading and they often point out...
things that I completely missed when reading on my own.” “It provides a dis­
cussion outside of class and [the oppor­
tunity] to hear opinions we may not have time to hear in lecture.” “By seeing other people's ideas, the website has broadened my horizons and allowed me to think on multiple levels.”

Second, the website and our e-mail discussion list give them “an opportu­nity to participate in the class in different ways.” “It allows me to feel more involved with the class.”

Third, study of spot quotations helps them think critically about their readings. “Spot quotes allow students to share ideas regarding the texts without the hassle of actually meeting together privately. The nature of spot quotes also pushes us to think critically about all facets of the text.” “The spot quotations have helped me to focus on the most important aspects of each book. By looking at the responses, I know what is important to study and to touch on when writing my essays.” “Making connections between one tiny section of a book and the whole book is really a help in strengthening the impact of the book.” “The spot quotes make the books feel easier to read and more understandable.” “They allow me to look deeper into the texts and what their words mean within the text.”

Finally, the web postings give stu­dents a sense of control over the course material and their prepara­tion. “I think the most helpful compo­nent is the spot quotes. Seeing what students write and respond, plus your own response, helps in knowing exactly what is expected for the quizzes. It’s refreshing to be in a class where there are no tricks, everything is straightforward and geared toward having the students learn and per­form well.”

Now in its fourth semester, I credit the website with doing all this and more. It has created an environment where students are encouraged to reread every text, the best foundation for understanding. As one student said, “The spot quotes are very useful because they force me to read the books. It is possible to wing an essay or response paper using what was learned in class, but the quote format makes reading necessary.” My lectures are not just a one-way monologue; the students feel that they are in dialogue with each other through the website and through our discussion list-serv, so they “never feel behind or lost.” To fur­ther extend these benefits, I worked with ITS to add a Blackboard annex to my website for the Fall 2001 class. The Blackboard software makes it possible for me to post documents, announc­ements and assignments online, and offers chat rooms for the whole class to further our conversations.

I find that the use of these tech­nologies has made me a part of new conversations, ones I never thought I could join: the conversation we had at the Teaching More Effectively with Technology conference, and this one through Connect Magazine. I’m amazed and delighted to be using Internet technology with my students, thanks to the wonderful team that did it with me! ☀

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Digital Reference at Bobst Library

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In the print-based library of the past, where collections were limited by shelf-space and square-footage, students, faculty and other researchers could easily seek the assistance of a reference librarian while they consulted materials and resources located in the building. But as libraries move further into the digital realm, more and more information is available online. Today, many researchers do not need to consult materials housed in the library as frequently as they had to in the past; depending upon the subject of their research, some researchers might not require the materials physically housed in the library at all.

The “brick and mortar” library, however, was (and continues to be) more than just a collection of books and journals. Services—including expert reference assistance—add considerable value to libraries' collections. In an effort to provide reference help to researchers who are nowhere near the physical reference room, NYU librarians are offering services that employ the same communication media used to deliver electronic collections. At Bobst Library, two digital reference services—the well-established e-mail based Ask-a-Librarian, and a pilot project for real-time “chat” reference service—can address contemporary researchers' needs for professional reference assistance as they work in their dorm rooms or faculty offices, at one of the University’s global campuses, or from any other location beyond the traditional reference room.

What is Ask-a-Librarian?

In September, 1999, Bobst Library instituted an e-mail based reference service called Ask-a-Librarian. Over the three year period since its introduction, Ask-a-Librarian staff have received and responded to over 2000 questions, dealing with specific service policies, technical problems, and research strategies. Users of the service receive an e-mail response to their questions within 24-hours.

In comparison, some readers may be familiar with commercial services like AskJeeves that allow users to enter natural language queries (e.g., “why is the sky blue?”) rather than forcing them to select a few keywords. There is no real human intervention at these sites; rather, a computer program attempts to match the terms of the question with an appropriate web-site for an answer. Other commercial services like AskMe.com and AllExperts.com provide a list of self-proclaimed experts, and allow the user to select the appropriate person or category to answer their question. Many of these services charge a research fee, which is often negotiated directly between the “expert” and the user of the service.

Bobst Library’s service differs from these commercial services in several ways. First, unlike the AskJeeves type of service, real people read and respond to each question. And, unlike the for-profit services offering access to “experts,” users are assured that their question will be answered by a professional librarian without hidden charges. But perhaps the biggest distinction of Ask-a-Librarian is its instructional objective; rather than simply presenting an answer, users are taught how to find information for...
themselves. The resources available to the service’s staff of librarians are the same resources available to the information seeker, allowing an easy transfer of search strategies between the user and the librarian.

There are only a few limitations on the types of questions Ask-a-Librarian will answer. Ask-a-Librarian is not a document delivery service, for example. While we often respond to questions with appropriate citations for books and articles, we generally do not send the full text of articles or documents. Neither will the service provide a full bibliography on a topic, or check on the availability of a long list of items. Rather, Ask-a-Librarian provides the user with the tools and skills to conduct this type of research independently.

**Real-Time Reference**

To supplement its remote reference presence, the Bobst Library is launching a pilot project to provide real-time digital reference during the fall 2001 semester. This innovative service will enable users to receive more immediate assistance with their research. Instead of waiting 24 hours for a response, users will be connected with a librarian in a “chat” window. Here, they can conduct the kind of back and forth interaction that until now only took place at the Library’s reference desks. Technical and research needs can be met the instant problems or questions arise.

Real-time digital reference provides several advantages over e-mail service. First, the librarian is able to determine the true needs of researchers more quickly and easily. Using our asynchronous e-mail reference service, librarians can’t discuss or refine a researcher’s initial inquiry, and on occasion, the intended question is not answered completely with the first e-mail response. Follow-up questions may take days to resolve.

Second, chat reference enhances the instructional component of electronic reference. Librarians can teach users how to search immediately and interactively in a way that is not possible via e-mail, or even in a telephone conversation. In an electronic chat directly with the librarian, web pages can be instantaneously shared back and forth; specific search strings can be suggested, attempted, and revised with both the researcher and the librarian witnessing the same results; error messages can be immediately assessed and resolved with all parties seeing the same information. And, finally, researchers receive assistance precisely when it is needed, rather than having to wait for a response.

**Into the Future**

The Library expects Ask-a-Librarian, chat reference, telephone, and traditional in-person reference assistance all to continue.

On the Ask-a-Librarian homepage, useful information, links, and expert advice are available to help researchers find information online, wherever they happen to be.

Visit Ask-a-Librarian at:
www.nyu.edu/library/bobst/research/as/aska.htm.

These various modes of interaction serve different needs and user populations. E-mail reference provides staff with the luxury of time to investigate a remote researcher’s needs and to construct a lengthy response. Chat reference allows immediacy and the ability to instruct users interactively. But, just as there are many types of resources that are only available in libraries, there will always be reference librarians on-site to provide assistance in the use of all of Bobst Library’s offerings.

Jennifer Schwartz is a Librarian for U.S. and World History, and a member of the NYU Libraries’ Ask-a-Librarian Team.
Rebuilding the Front Door
Updating the University’s Homepage

Drew Hahn, with Donna Filonovsky
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Redesigning any web page is a significant task. There are so many aspects to consider in order to create a site that is useful, visually attractive, easy to download and navigate, and accessible to the vast majority of users. Redesigning the NYU homepage (www.nyu.edu), the electronic gateway to the University’s website (NYUWeb), presented its own special set of challenges.

When initiating a redesign, the NYU Office of Marketing Services and Electronic Publications (MSEP) always begins by looking at content. Ultimately, designing a good website is about finding the most effective way to present the site’s information. The visual design should aid in the presentation of the content, but is rarely the starting point.

Since the NYU homepage’s last redesign in 1998, many more facilities and services at the University have become electronically accessible. Therefore, our office began our redesign by identifying all of the main websites at the University. These include schools, academic offices, and a variety of facilities and services.

While many of these websites were already linked from the existing homepage, we knew from the volume of e-mail to webmaster@nyu.edu that people were having difficulty finding them. After reviewing webmaster e-mail from the past three years, we noticed many of the same questions, and therefore targeted the new design to address these problematic areas.

We took the additional steps of determining what type of commonly requested information was missing from NYU’s site and then integrating it into the new version. This included information about area hotels, restaurants, and parking facilities, as well as tourist information about the Village and New York City.

Once we had identified our content, which consists primarily of links to other areas of NYUWeb, we began working on a navigation structure. The important thing here was to maintain some consistency with the previous version of the homepage, so as to avoid making it too difficult for those people already familiar with our site to find what they are looking for. At the same time, we wanted to structure the navigation so that there would only be one heading under which the user would logically expect to find whatever it was they were looking for. We did this by creating the following menus: About NYU, Academics, Admissions, Research, Resources and Services, Searches and Directories, Maps, and Help.

Eight is typically the maximum number of categories a designer would use to ensure the greatest comprehension and intuition by visitors.

Within those sections, we further organized the links into logical groups and named those groups.

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Drew Hahn is the Director of NYU’s Office of Marketing Services and Electronic Publications (MSEP). Donna Filanovsky is the Office’s Creative Director. MSEP has been overseeing the editorial content of NYUWeb since its inception. The Office provides web design and programming services for the University, as well as marketing research, analysis, and recommendations for all media. MSEP, while separate, works closely with ITS, including partnering on NYUHome and other web-based projects.
When working with a lot of links, this type of sorting helps visitors to quickly assess the layout of the page and make a determination about where to find what they are seeking. By also choosing groups that are based on the nature of information, and not necessarily based on the organizational chart of the University, we made it easier for those less familiar with NYU to reach their destination.

While this content-based navigation works well, it was important to consider the various types of people who visit the NYU homepage. These roles include high school students looking for an undergraduate college, current college students looking to transfer or attend NYU for graduate school, and faculty members looking for teaching resources, to name just a few. It would be absurd to assume that one table of contents could satisfy all of these diverse audiences. Therefore, we didn’t just create content-based navigation, but also role-based navigation.

At the top of the homepage, a visitor can now select a table of contents that is specific to the type of information they are seeking from NYU. The roles are: Prospective Student, Current Student, Visitor, Parent, Faculty or Staff Member, Alumni or Friend, and News Media. When clicked on, these sections offer a list of links to the resources most relevant to that type of person. This is a significant change from the previous version of the homepage.

Once we identified the content and selected the form of navigation, we were ready to tackle a new design. This is often challenging, as you face the tempting option of using new technology that, while potentially very useful, can slow the page loading time and isn’t available to everybody, especially those with disabilities using special browsers. We tried to avoid features that would only be accessible to a small number of people. Luckily, a good designer knows how to do a lot without having to use all of the fancy technology.

Our office created several different designs that were intended to work well with the new navigation; present NYU as an institution of academic excellence; download quickly; and look like a welcoming site to visit. After considering the different concepts, the new design was chosen.
The chosen design was a visual system that is classic in nature, yet flexible enough to show the diversity within the University. The design approach is simple in principle, relying on the structure of an underlying grid while incorporating modern elements, such as rollovers, that are appropriate to the Web. The treatment of these rollovers is subtle yet refined, and the grid, while very structured, allows for a great deal of flexibility. The color palette is traditional and subdued, incorporating a deeper, more sophisticated purple than the one that appeared on the previous site. To complement this new color, a light tan and brown were also used.

Each page has a different photograph that not only adds a splash of color, but also functions as a storyboard, enhancing the subject that it represents. Space below the photos allows for more information about the main subject of that page, which makes the site more suitable for browsing.

We hope that the new homepage provides a front door to the University's various web resources that will remain useful for the next two to three years—the average life span of a website design. With more than 100,000 pages of content visited by more than a half-million people monthly, NYU’s website is one of the largest of any higher education institution. A recent Newsweek/Kaplan National Guidance Counselor survey lists NYU as fourth best in use of the Web among universities nationwide. We hope that our redesign of the homepage helps NYU continue to build upon this impressive foundation.
How Can I Create an Internet2 Performing Arts Event?

Philip Galanter
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Do you have an idea for an Internet2-based performance? Internet2 is still an experimental network and very much a work in progress. Each performance is unique, and so the best first step for interested faculty would be to contact the author of this article to discuss your ideas and options. The Arts Technology Group (ATG) of ITS Academic Computing Services has served in a systems integration function for all NYU Internet2 performances to date, with the close help and cooperation of ITS Network Services. Here, in broad strokes, are some basic questions and considerations for those interested in using Internet2 for art events.

Are all your collaborators on Internet2?

Internet2 includes the Abilene network, which extends to every state in the U.S., as well as numerous university and regional networks. About 80 universities are connected to Internet2 as well as a number of research organizations. Universities which are not members of Internet2 are bridged to Internet2 schools via the regular Internet, but lack the robust network performance that Internet2 provides. While this is not noticeable when sending e-mail, they will usually find sending high quality video to be impossible. So, all of the sites in the performance will have to be at an Internet2 member university. These members are listed at the Internet2 website at: www.internet2.edu/html/universities.html.

It is also worth noting that the Internet2 community has significant links to similar high-performance networks in other countries, therefore, collaboration with artists in other parts of the world may be possible.

How well-connected are the performance spaces?

Even though a given university may be connected to Internet2, different locations on the campus may have varying degrees of connectivity. This introduces the so-called “last mile problem.” A determination must be made as to whether Internet2 capacity crosses the campus the last mile to the performance space. Indeed, on many campuses, performance spaces may have no Internet connectivity at all. And those that are networked may be attached to a campus backbone that is too congested to deliver Internet2-like performance.

Here at NYU, we’ve built a special Internet2 subnet which bypasses the commonly used NYU-NET campus backbone. Supported locations include the Black Box Theater in Pless Hall, the Loewe Theater at 35 West 4th St., the Studio for Digital Projects and Research in the Bobst Library, the ITS Faculty Technology Center, the Music Department recording studios in the School of Education, and the Center for Advanced Technology. In addition, temporary connections have been made to the Cantor Film Center. Internet2 events at any of these locations will not have any “last mile” problems.

Researching the last mile at your collaborators’ campus requires a technical assessment with the help of the central networking staff at that university. The Arts Technology Group (ATG) here at NYU can broker this discussion as part of our integration function.

What CODECs will be used?

A CODEC is a device that accepts video and audio signals as input and converts them to a data stream as output. This data stream is sent over Internet2 to the far site, and then a corresponding CODEC on the other side converts the data stream back into video and audio. Although some
software CODECs running on personal computers are available, in general, Internet2 performance events use dedicated hardware CODECs for improved performance and quality.

Generally speaking, CODECs are proprietary devices that do not offer interoperability at this time. Thus, the same brand of CODEC must be used at each participating site. At various times here at NYU we've used computer-based CODECs, including CUSeeMe, Cisco IP/TV and DVTS (beta software from a project in Japan), and hardware CODECs from VBrick, OptiVision, and Litton.

ATG owns some VBrick CODECs that we can offer for use in NYU projects, and we can even ship them for use at other schools performing with NYU. Again, ATG can broker this discussion and implementation with your collaborators.

**What is the media plan and bandwidth budget?**

Early in the planning stages, a decision will need to be made regarding the media plan. For some performances at NYU, a single video and stereo audio signal to and from the collaborating site has allowed for a technically simple, but artistically rich, performance. The most technically complicated performance to date, "The Technophobe & The Madman", required three channels of video and six channels of audio being sent from NYU to Rensselaer Polytechnic Institute (RPI), and an additional three channels of video and six channels of audio being sent from RPI to NYU.

Each CODEC can typically send and receive a single video channel and two channels of audio. But, along with acquiring the needed CODECs, some consideration must also be given to the total bandwidth the multiple streams will require. This is the bandwidth budget. For example, "The Technophobe & The Madman" required six VBrick CODECs and a maximum of eighteen Mbps in bandwidth.

**How will network latency impact the performers’ timing?**

There will always be a delay between the time when the camera and microphones pick up a performance at one site, and the time when performers at the far site see and hear it in the monitors. In the context of networking, this delay is called latency.

Typically, the latency we've experienced with Internet2 performances is about 1/4 to 1/2 of a second. While this is not a lot of time, it is quite audible and usually visible, and it will seriously impact traditional music and dance performance where the players are trying to interact between the sites.

For example, a saxophone player in New York and a bass player in Los Angeles will have a very difficult, if not impossible, time playing tight fast improvisational jazz together. However, asking the bass player to provide a solo rhythm that the saxophone player can then improvise over will work quite well. The two parts can be mixed in sync in New York, and sent back to the Los Angeles audience. However, the audience in LA will see the bass player pluck a string a noticable fraction of a second before they hear it mixed with the saxophone in the PA system.

In general, successful Internet2 performances are written, composed, and designed specifically for the Internet2 medium. Typically, different sites trade off leading and following, the parts are allowed to be a bit loose, and the slight delays are built into the aesthetic of the performance.

**What are the expectations and requirements for video quality?**

For the general contemporary audience, commercial television more or less sets the standard in terms of video quality expectations. Even though cable television and DVD can

When the actor in NYC delivers a line, it is picked up by a microphone and, with a slight delay, played over the speakers in Los Angeles. The LA actor then delivers a line that is picked up by a microphone and, with a slight delay, played over the speakers in New York.

While this set-up allows for good interaction between the actors, it also introduces a technical problem. If the NYC microphone can “hear” the speaker playing the signal from LA, and the LA microphone can “hear” the speaker playing the signal from NYC, this creates an echo loop and the actors will sound like they are performing in an echo chamber. And, if the feedback is strong enough, a painful level of noise can quickly build up.

Audio feedback is always a consideration with live amplified sound, even in a single site performance. It is an especially difficult problem to deal with in a networked performance because the sound reinforcement and monitoring at each site will impact all of the other sites. Turning up the sound in NYC might create feedback in LA.

There are a number of technical solutions to this general problem, including the use of headphones or wireless in-ear monitors, careful microphone and speaker placement, riding gain at the mixing board, and the use of noise gates and other echo suppression electronics. The point to remember is that audio requires more planning than usual for a multi-site performance, and sound checks will be much more time consuming than those for single site performances.
deliver a superior picture, audiences tend to not consider video problematic unless it is notably worse than broadcast television or VHS tape.

Most hardware CODECs can deliver at least VHS quality video, although a trained eye may notice subtle compression artifacts. Network problems can, of course, cause dropped or frozen frames. While most CODECs can be configured to deliver greater video quality at the expense of greater bandwidth, greater bandwidth increases the possibility that network problems will result in dropped frames. Therefore, a careful balance must be struck regarding video quality and the bandwidth budget.

The ATG has had very positive feedback on image quality to date, even when the videos have been projected on large screens. It is worth noting, however, that projecting video for live stage performance has its own set of technical challenges. Projected video “wants” to be on a dark stage, and cameras “want” a very bright stage, so the mix of live action and projected video will require that the video crew and the lighting designer work very closely together.

SO WHAT HAPPENS NEXT?
Some of these considerations may seem to be a bit daunting, and multi-site Internet2 performance projects do require careful planning and implementation. But the rewards are great, and here at NYU we now have significant experience using Internet2 as a new medium for live artistic expression—expertise that we will happily use to help you plan and implement your project. We look forward to hearing your ideas and project proposals!

Philip Galanter, ITS Associate Director for Arts Technology heads ITS Academic Computing Services’ Arts Technology Group.

NEWS FROM THE ITS STATISTICS AND MAPPING GROUP
(See also page 26 of this magazine for an article on Stata.)

New Versions of Statistical and Mapping Packages available through NYU/ITS (Selected list).

- SPSS version 10.1 (modules such as TextSmart and Answer Tree) for PC (1,2,3,4)
- SAS version 8.2 for PC (1,2,3)
- Stata version 7 for PC (1,2)
- HLM 5 for PC (2)
- ARCINFO version 8 for PC (1,2)
- SPSS version 10 for Mac (1,3)
- SAS version 6.13 for Mac (1)
- LISREL 8.5 for PC (2)
- ARCVIEW version 8 for PC (1,2)

(1) Available at ITS labs (see www.nyu.edu/its/students/labs/ for lab hours and locations).
(2) Available at ITS Academic Computing Statistics and Mapping Lab at the 3rd Avenue North Lab.
Contact Frank Lopresti (frank.lopresti@nyu.edu) for more information.
(3) Site license which allows resale of software to NYU researchers. Visit www.nyu.edu/its/faculty/software/ or contact Eduardo DeLeon (eduardo.deleon@nyu.edu) for more information.
(4) Available at NYU Computer Bookstore.

The Statistics and Mapping Group has started an announcements list within NYU Public Forums.

An announcement list, as the name implies, will only send you announcements. This list is not a discussion list. Announcements will contain information about software and hardware at NYU, and other information the Statistics and Mapping Group moderators want to present to our users. Researchers at NYU should feel free to submit material for publication in the list. Send e-mail to statistics@forums.nyu.edu.

To join, send a blank e-mail to join-statistics@forums.nyu.edu or go to the url http://forums.nyu.edu/cgi-bin/nyu.pl?enter=statistics to get published announcements without joining the list.
NYUHome v2.0

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BUILDING ON VERSION 1 PORTAL SUCCESS

NYUHome, the University's customizable portal to many web-based services and tools, gradually went into production last fall, replacing numerous antiquated NYU-Internet ('is') text-based systems. The conversion was a resounding success. Over thirty thousand individuals' accounts were migrated to the new campus portal.

NYUHome enables students to learn about campus events, to check their e-mail, and to see their schedules and grades; professors can use the online directory to look up colleagues; and administrators can access a wide range of University resources. The customizable channels of NYUHome also offer access to web forums, research tools, news, campus events and more. So far, the feedback that we have received has been overwhelmingly positive. The good word has spread to other universities, who continue to contact us about getting customized versions of NYUHome for their own school.

BLUEPRINT FOR v2.0

Over the past year, the NYU Community has made many useful suggestions on features that they would like to see in future versions of NYUHome. Quite a few of these have already been incorporated in the upgrades that we made during the 2000-2001 academic year. And, as we started planning the upgrade of NYUHome from version 1 to version 2.0, we collected and discussed the suggested improvements that we had not yet incorporated. The NYUHome v2.0 planning meetings to map out the evolution of the portal were attended by developers, students, faculty and staff from around the University. After a series of these meetings, we were able to compile a master list of enhancements: the blueprint for NYUHome v2.0.

QUALITY CONTROL MEASURES

Nearly ready to act upon this blueprint, we decided that it was essential to first take a few important quality control measures that would help ensure the success of NYUHome v2.0. Therefore, we installed a software version control system, improved the existing source code documentation, and streamlined our software distribution system.

ROLES

In addition to performance improvements, NYUHome v2.0 makes use of a concept called "roles". NYUHome v1.6 was primarily aimed at students. By using roles in v2.0, we will be able to provide more personalized access for faculty, administrators, alumni and perhaps, someday, prospective students or even members of other universities. Moreover, the...
roles implementation is nearly transparent to the individual, who sees only the tabs and channels for which he or she is eligible.

For example, administrators will be able to access certain work-related applications from their NYUHome screen, while others will not even see those applications. In order to support roles, new infrastructure was needed. It is called the Roles and Registry Database, and it gathers information from a number of NYU systems.

**DESIGN**

NYUHome v2.0 has a new look and feel. It now makes use of tabs on a multiple framed page. The top frame includes all the tabs that are available to a person based on their role at the University. The middle frame contains e-mail information and is refreshed frequently to alert for new e-mail. The bottom frame contains all the channels associated with the tab that the user has selected in the top frame.

**PREFERENCES**

NYUHome v2.0 has an improved preferences mechanism. It allows a person to view and to update certain ITS database settings associated with his or her NYU account (e.g., e-mail forwarding address, vacation message, etc.). It also allows one to customize individual tabs by turning channels on and off. Finally, it enables each user to change the motif (e.g. color, size, etc.) of his or her own NYUHome account.

**WHAT'S NEXT?**

NYUHome v2.0 was initially beta tested (phase I) on our development machine by about forty people. We are continuing to collect bug reports via our new "Mothra" channel and to make software fixes. In early August, we began beta testing (phase II) on our staging area (1 domain on a Sun E10K) with about 100 testers. We expect to make NYUHome v2.0 available to approximately forty thousand users in Fall, 2001.

Randy Wright is a Senior UNIX Systems Administrator in ITS eServices and the NYUHome developer-in-chief; Robert Brill is a Senior Information Technology Specialist in ITS eServices and the NYUHome project manager.

The beta version of the NYUHome v2.0 homepage.
Using Computer-based Molecular Graphics in a Science Course for Non-Majors

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This article is based on a presentation at the April 2001 Teaching More Effectively with Technology conference at NYU. Development of the course materials and website was supported in part by awards from the Special Grants Program, the Camille and Henry Dreyfus Foundation, and by the National Science Foundation’s program in Course, Curriculum, and Laboratory Improvement.

INTRODUCTION: THE FOUNDATIONS OF SCIENTIFIC INQUIRY PROGRAM

Effective science education for undergraduate students who are not specializing in the scientific disciplines continues to be a widespread goal in our nation’s colleges and universities. At NYU there has been an unusually strong commitment to this endeavor. When the Morse Academic Plan—NYU’s undergraduate core curriculum—was established in 1995, it included an innovative, three-course sequence in mathematics and science for non-majors. This sequence, called the Foundations of Scientific Inquiry (FSI), consists of three courses: Quantitative Reasoning (mathematics), Natural Science I (physical sciences) and Natural Science II (life sciences). Each of the course offerings in the FSI program has a weekly workshop or laboratory where students engage in the process of mathematical reasoning or experimental scientific investigations. A central objective of the faculty who design and teach these courses is to prepare NYU graduates to make informed personal and social decisions in a world that is becoming increasingly influenced by scientific and technological advances.

The FSI program now offers a wide range of courses, each of which focuses on a general theme in mathematics and science. For example, one of the Quantitative Reasoning courses is entitled “Mathematics and the Computer”, in which students explore the mathematical principles of computer operation. In the laboratory projects for this course, students begin working with simple switches to implement Boolean operations and progress to designing their own circuits using logic gates on chips. Our range of Natural Science I courses, which focus on the physical sciences, includes “Einstein’s Universe”, “The Cosmos and the Earth”, “Explorations of Light and Color”, and “Energy and the Environment”. Finally, our life science offerings under the Natural Science II rubric range from courses on neuroscience (“Brain and Behavior”), through physical anthropology (“Human Origins”), to an exploration of ecology and its recent perturbation by humans (“Lessons from the Biosphere”).

THE MOLECULES OF LIFE: EXPLORING BIOMOLECULAR STRUCTURE AND FUNCTION

One of the most exciting areas of modern science is our ever-increasing understanding of how the body works on a molecular level in both health and disease. This is a truly interdisciplinary undertaking, involving scientists from such diverse fields as physics, chemistry, cell biology, and computer science. Our fascination with revealing the molecular machinery of our bodies is accompanied by a practical desire to understand—and hopefully cure—the multiple diseases that currently afflict our society, such as AIDS, cancer, Alzheimer’s disease, and many others.

The design of therapeutic drugs over the past century has mostly been a hit-or-miss affair. Some successful drugs have been discovered by serendipity, others by mimicking a nat-
ural product from plants, and yet others by a massive program of screening thousands of related molecules for biological activity. Yet we are now on the cusp of an exciting breakthrough: rational drug design. This process involves first understanding the precise structure of a therapeutic target—such as an enzyme in a critical biochemical pathway or the receptor on the surface of a cell—and then designing a drug molecule that will block its action. Rational drug design, it is hoped, will enable scientists to accelerate the speed of drug discovery and create new pharmaceuticals with fewer side effects.

Until now, structural information about biomolecules has been notoriously difficult to obtain, but improvements in techniques and advances in automation have made the process more tractable. There are two primary techniques that are used. The first is X-ray crystallography, where scientists use X-rays to probe the arrangement of atoms in a biological molecule while it is fixed in a crystalline lattice.

The second is nuclear magnetic resonance, a newer experimental technique in which a solution of protein is suspended inside an intense magnet. The spins from all the atomic nuclei in the biomolecule then interact with the magnetic field, thereby allowing scientists (after a painstaking deciphering process) to locate the position of each atom in space.

Once the data are obtained, scientists employ molecular graphics programs to display the structure on a computer and scrutinize the region where the key biological function occurs. For example, enzymes facilitate biochemical reactions in our cells by binding their target molecules to a region called the active site. If we can find an artificial molecule of the perfect size, structure and chemical composition to fit into this active site, this molecule will act as an inhibitor and the enzyme will be rendered inactive.

This is the basic principle of rational drug design. The recent explosion of information now available from the human genome sequence adds further impetus and resources to the search for novel therapeutic pharmaceuticals.

Since one of the goals of the FSI program is to introduce non-science students to important areas of current scientific research, we thought that biomolecular structure and function would be an ideal topic for a new course. The outcome was “The Molecules of Life”, a new offering within the Natural Science II suite of courses. This course was jointly designed by Dr. Trace Jordan, Assistant Director of the Morse Academic Plan, and Dr. Neville Kallenbach, Professor in the Department of Chemistry at NYU. They co-taught the course for the first time in the Spring 2001 semester and it will be offered again in the coming academic year. Since we wished to integrate educational technology into the course, Marvin Rich joined the course team as an applications and website programmer.

One of the objectives for this course was to provide students with an opportunity to actively explore the structure of biological molecules, ranging from small amino acids to very large proteins. Since professional researchers use molecular graphics for such investigations, we wanted to see if it were possible to adapt this tool for non-science undergraduates. There were two primary challenges, one technical and one educational. The technical difficulty involved finding a suitable software package that was relatively easy for students to use, not prohibitively expensive, and suitable for implementation on personal computers. Only five years ago this would have been an insurmountable obstacle, since the only molecular graphics programs then available cost thousands of dollars and ran only on large, expensive, UNIX-based workstations. Recently, however, thanks to a group of dedicated scientists and programmers, software has become available that has a large range of features for displaying and manipulating molecular structures. These software packages—called Rasmol and CHIME—can be downloaded for free and function very well on a PC. An illustration of the range of applications for these programs, together with links to download the software, can be obtained through the Rasmol homepage at www.umass.edu/microbio/rasmol/.

The educational challenge involved developing suitable instructional exercises in computer-based molecular graphics that would be appropriate for an introductory course for non-specialists. The use of Rasmol and/or CHIME for teaching biomolecular science had been mostly employed in upper-level courses in biochemistry for science majors. For these courses, it is common to present the biomolecular structures with minimal explication, since the expectation is that students will use them as a self-guided educational tool. While this approach works for science majors who are more advanced in their education, it is completely inappropriate for our course in the FSI program. We therefore developed a series of interactive “instructional modules” for students to work through, accompanied by question-based assignments and performed in course laboratory sessions under the guidance of a graduate student teaching assistant. These instructional modules included: “Introduction to Using the CHIME Software”; “Principles of Molecular Structure”; “Functional Groups in Molecules”; “Principles of Protein Architecture”; and “Enzyme Function and Inhibition”.

One of the images from the course website is shown in Figure 1. It illustrates one of the recent successes of rational drug design: the development
of HIV protease inhibitors. The HIV protease enzyme is shown as a ribbon structure, which is a schematic representation of the arrangement of its many atoms. The enzyme has a critical role in the lifecycle of HIV within our cells, acting to cut long protein chains into smaller ones so that the virus can assemble new copies of itself. Scientists determined the structure of the enzyme via X-ray crystallography, including the precise location and geometrical arrangement of the active site. Based on this information, they designed drug molecules that were specifically tailored to fit into the active site and inhibit the enzyme’s function. One of these “protease inhibitors”—made by Merck Pharmaceuticals—is shown in the figure. While this picture can only give a static view of the enzyme and the drug molecule, the CHIME program allows students to rotate the molecular complex to study its overall structure and highlight particular features using the clickable boxes. By performing the interactive exercises, they gain a deeper appreciation of biomolecular structure and the principles of rational drug design.

CONCLUSION

These instructional modules using CHIME provide a new instructional methodology for the “Molecules of Life” course. They allow us to teach students about molecular structure, enzyme function, and drug design using an interactive pedagogy that simply would not be possible without the use of computer-assisted instruction. We have extensively evaluated student feedback from the Spring 2001 semester and find that the computer exercises are well-received and valued by the students in the class. We are currently working on improving our existing modules for the laboratory projects and adding new modules to accompany lecture topics. Biomolecular science and rational drug design continue to advance at a rapid pace, and we look forward to sharing these exciting developments with our students in semesters to come.

Address correspondence about this article to Trace Jordan at 100 Washington Square East, Room 903. Phone: 998-8078. E-mail: trace.jordan@nyu.edu. Materials discussed in this article are presented on the course website at www.nyu.edu/pages/mathmol/molecules/.

Trace Jordan is Assistant Director of the Morse Academic Plan, with responsibility for the Foundations of Scientific Inquiry (FSI) program, and is also Adjunct Assistant Professor in the Dept. of Biology (FAS). Neville Kallenbach is Professor of Chemistry (FAS) and has served as Chair of the Faculty Steering Committee for the FSI program. Marvin Rich received his Ph.D. from the Dept. of Biology at NYU and has taught for 30 years in the New York City school system.

HIV Protease

![HIV Protease Diagram](image)

**Figure 1.** An image from a course instructional module on HIV protease inhibitors. The HIV protease enzyme is shown as a ribbon diagram, with the protease inhibitor drug bound tightly in its active site. The boxes and text at the right-hand side allow students to explore the structure interactively by highlighting specific features.
Intercooled Stata
Version 7.0

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Stata, by Stata Corporation, is one of the top statistical programming packages. It is often ranked number two by research institutions behind SAS. Like SAS and S-PLUS, Stata is highly programmable, which is a necessity for advanced users. Useful programs have been tested and archived by Stata. Their commitment to moderate the user-groups has lead to a large repository of programs addressing advanced statistical needs.

**WHY USE STATA?**

While SPSS has the fastest learning curve for the novice user, Stata runs a close second, and is way ahead of SAS in this regard. If you're an advanced statistical user, you probably have chosen your programming tools based on those used by your co-researchers or those used in your graduate work. At present, Stata is ahead of most other packages in dealing with complex samples, time series cross-sectional regression, and the now very popular ARCH and GARCH modeling techniques. If this is the type of work you are doing, you already know about Stata. If, on the other hand, you're doing elementary statistical work, you should consider adding this respected tool to your kit.

To give you a feeling for Stata, let's walk through a simple first assignment.

**"STATS 101" ASSIGNMENT**

First, in the "c:\" drive of your PC, make a folder for the assignment named "c:\assignment_1". Once you have started Stata, this folder will house the data and output files pertaining to the assignment. This keeps your work together—a nice feature of Stata.

Next, start up Stata. Figure 1 shows what you will see. Note that there is no data spreadsheet and there are only a few pull-down menus. Unlike SPSS, Stata is run mostly by issuing Stata syntax commands. Use the window "Stata

![Figure 1. The Stata startup window.](image-url)
Command" to enter commands. Below, I'll use bold text to notate commands to enter in this command window.

Enter the command `cd c:\assignment_1` (cd stands for change directory). From now on, any time you save data or output, it will go to the folder “assignment_1”. Enter `log assignment_1`. This command copies your Stata Results window into a file named "assignment_1.smcl". Later, if you wish, you can use this file to copy from and paste your work into a word processor file.

Use the button labeled “Data Editor” (see Figure 1) or enter the command `edit` to open a new editor window. Now you will see your spreadsheet.

Let's put in three columns of data, which we will later name ID, SEX and SALARY (Stata won’t let you name the variables until you enter some data). Now, start entering numbers into the spreadsheet. Rows are cases (e.g., a person’s answers to a questionnaire), columns are different variables. You can use the TAB and ENTER keys to enter the data. TAB takes you to the right so that you could enter a case across a row. ENTER takes you down so that you can enter all the values for a particular variable. Don't use the cursor keys or the mouse to navigate the spreadsheet while entering data.

First, enter some data into a column without a name (see Figure 2). After you have entered some data, double click on a column—anywhere in the column—and a Variable Information window will open. Use this window (see Figure 3) to name and label all three variables. You can label the variable SALARY, “Salary in Thousands of Dollars” so that later, when we run some simple procedures, this label will appear in the output to remind us that salary is in thousands of dollars.

Notice that the Stata Command window is not visible. Before you can do anything other than edit your data, you must end your edit session. Click on the “X” in the upper right corner of the spreadsheet. That ends the data editing session. (Personally, I find that scary, but it will not delete your spreadsheet.) Now you should save your data. Enter `save mydata` in the Stata Command window. This saves your data in the assignment_1 folder on your “c:" drive into a file called "mydata.dta".

Now, let's add value labels for sex so that your output will be labeled to reflect the fact that “0” is male and “1” is female. Stata has a concept of value labels being a separate thing from a particular variable. If you create a value label named "sexes" to use on the variable SEX, you can reuse the value label "sexes" later with another variable. For example, you could use the “sexes” label with the variable that records the gender of the respondents’ first child.

Enter the command label `define sexes 0 “male” 1 “female”`. You have now created the value label “sexes”. You can apply this label to the variable SEX by entering the command: `label values sex sexes`. Next, enter `describe`. This command describes your active data set, “mydata.dta” (see Figure 4). Enter `graph sex` to get a bar chart of sex. Notice how the chart has its own window. If you want to save or print that graph, you must do it now. Unlike the Results Window and the log file, graphs do not accumulate in the Graph window; only one is kept in the window. Now enter `test salary, by (sex)`. This output gets appended to the bottom of the Results Window, which may be printed from the pull-down menu under "File".

**CONCLUSION**

Since Stata commands are typed in by the user, you must
know something about the syntax before starting, so the new Stata user will have to read a bit more than the new SPSS user. The UCLA website at www.ats.ucla.edu/stat/stata/ has a great deal of information for you to read, including a lengthy STATA CLASS NOTES web tutorial for the beginner. Please note that Stata doesn’t import SAS, SPSS, or Excel files, but the ITS Stats/Mapping Group has a program, DBMS/Copy, which will convert data files from most packages.

People at the Federal Reserve use SAS. The Harvard School of Public Health is partial to Stata. If you are going to become a “heavy” user, you will need to use the tools that are used in your field. Stata, like SAS, is a tool for the rest of your research life. And it will impress your friends. At a conference, no stat bully will kick sand in your face.

Intercooled Stata 7.0 is available to the NYU community at the Tisch and Third Avenue North ITS computer labs. Earlier versions are also available at Tisch. Stata is supported by the Social Science, Statistics and Mapping group of ITS Academic Computing Services, whose offices are at the Third Avenue North Dorm, 75 Third Ave., Level C3. Contact Frank Lopresti (frank.lopresti@nyu.edu, 998-3398) or Bob Yaffee (bob.yaffee@nyu.edu, 998-3402) for more information.

Please see the informational box on pages 20 for more news from ACS and the Social Sciences, Statistics and Mapping Group.

Frank LoPresti heads the Social Sciences, Statistics and Mapping Group of ITS Academic Computing Services.
PERSONAL FIREWALLS

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Personal firewalls are becoming a hot topic these days. With more and more people buying and using computers, there is an ever-increasing demand for better Internet access. This heightened demand is not only evident in corporate or university environments; it has also flooded over into the general public, who use and expect large amounts of convenient and quick access to the Internet at home.

Faced with this escalating demand for home access, the marketplace has responded by offering higher speed, 24 x 7 access through DSL and cable modem connections. This creates a dangerous combination in terms of security: inexperienced users plus computers that are constantly hooked up to the network. Seeing this as an accident waiting to happen, programmers came up with a device that could sit between the actual computer and the Internet as a means of protecting the computer from intrusion—a firewall.

WHAT EXACTLY IS A FIREWALL?

There are two types of firewall protection: those put in place to guard a large network of computers, such as those used at large corporations or universities, and those that are designed for use on a smaller scale, to protect a single computer or a small number of machines. This second category, called a personal firewall, can be used to protect your home or office computer and is actually a program that you can install and run on your computer. For those who use a DSL or cable modem connection at home, a personal firewall is a must. Even some people here on campus at NYU might want to run a personal firewall on their office computer for an additional level of security.

A personal firewall provides you with a great deal of information. By reviewing the logs, you can see who has tried to connect to your machine, what kind of traffic has been passed to your machine, and, sometimes, whether someone has sent you an infected e-mail message. A personal firewall also serves as a "Keep Out" sign for others on the Internet. It’s your way of keeping intruders from trespassing onto your computer and your watchdog to alert you when someone is trying to snoop around.

WHY WOULD I REALLY NEED A PERSONAL FIREWALL?

The need for personal firewalls has grown because there are more security risks in today’s constantly networked environment. The bad guys out there have realized that more and more people have started connecting their machines through DSL and cable modem connections, and they’ve stepped up their efforts to find the machines that are not secured so that they can break into them and use them for mischief. The ITS Network Security Group has seen an escalation in network scanning and distributed denial of service (DDoS) attacks. In general, there has also been an increased number of what we call “script kiddies”—people who, just for fun, download and run attack programs in hopes of compromising other machines. To have an additional layer of protection between your computer and the Internet, you need a personal firewall.

WHAT DOES A PERSONAL FIREWALL ACTUALLY DO?

Personal firewalls help you to protect your machine against those people trying to wreck havoc and others who are just poking around in a number of ways. They give you the ability to actually block non-privileged ports on your machine, which would be anything above port 1024. In fact, you can actually block any port, not just non-privileged ports.

But, why is blocking non-privileged ports a good thing? Because if someone is running a piece of hostile software, it is more likely that it will be running on a higher non-privileged port than a lower privileged port. The
privileged ports are already taken and used by well-known applications such as Telnet and ftp.

Mind you, this is not an absolute; you can see cases where the ports are forged with a lower port number in order to get around any type of security software that may be running. There are actually people out there who have enough experience to be able to handcraft a data packet and change the actual port number.

Nevertheless, it's a good thing to only allow connections on those ports that you really need, so this type of blocking is a good precaution. Many personal firewalls let you build a personal configuration, based on the programs you use. As each new connection is made, you are asked if it is OK. This takes longer, but you get a more stable configuration. See below, where I talk about advanced users, for more details about this type of configuration.

Personal firewalls also provide notifications when someone is "poking" at your machine. Therefore, if you do end up being one of the targets in a scan, the firewall can pop up a window letting you know this. In addition to notifying you, it can also collect this information in a log for you. This may be important for you later on if you want to track down the attacker and attempt to prevent them from scanning your computer again.

Some personal firewalls also give you the ability to monitor outgoing connections from your machine, thereby letting you know if there is anything leaving your machine that shouldn't be. This could be the case if your computer has unknowingly been infected with a virus or Trojan and is, in turn, trying to go out to the Internet to infect someone else.

Personal firewalls also enable you to block specific IP addresses manually or automatically. In these cases, if you already know of specific machines that you don't want to have access to your computer, you can block those addresses when you are configuring the software. Some firewall programs give you the ability to do this automatically.

For instance, if the program has already seen an IP address scan your machine, when that IP address shows up scanning your machine a third time, it's automatically blocked. This can be a good thing and a bad thing. Why a bad thing? Because you might block a machine that was trying to send you information you need, but was somehow misconfigured. Or, you might be blocking legitimate traffic (like DNS lookups) that could cause you problems once that IP is blocked.

More advanced users can minimize the inconvenience of unintentional or unwanted blocks by using the firewall to see how various applications work. When installing a new application, you can see exactly what communications are needed and when. You know what ports you blocked on the firewall, so once you start your new software running, you might get an alert telling you that you have an outgoing connection on a high port. With back and forth testing like this, you should be able to tell which ports your software is using to initiate and receive connections, and to configure your firewall accordingly.

Most personal firewalls also allow you to create your own ruleset. This makes it possible to configure the software to permit traffic on port 5190 (a port used by AOL Instant Messenger), but none of the other ports higher than 1024.

**How do personal firewalls work?**

Before you purchase a personal firewall, you should know how they work and that some are more difficult to configure than others. For instance, Zone Alarm and Black Ice are examples of PC platform programs that are easier to use than ipchains, which is made for Unix platform machines. Zone Alarm and Black Ice have a GUI (Graphical User Interface) and offer levels of security ranging from "Careful" through "Paranoid" that you can select by just clicking on a check-box or radio-button. In order to use something like ipchains, you need to have an understanding of Unix-based operating systems and networking in general.

After you decide which firewall you're going to use, you'll want a better understanding of how they actually work. Once you install the program on your machine and configure it, it should be launched every time you turn on your computer. The program basically sits there and runs on your machine in the background. It stands guard and listens to the traffic coming and going from your machine, simply waiting for an incident to occur.

Once the firewall does hear suspicious traffic, it sends you an alert to let you know that it has detected something. It usually sounds some type of noise and then throws a message up on your screen. While the firewall is alerting you, it is also logging the information related to this event. It's recording the time the event started, the IP address of the offending machine and the type of attack it believes it to be. The firewall keeps logging information until it believes the event to be finished, and then it logs the end time. In programs like Black Ice Defender, the firewall also compares the traffic to known intrusion profiles. If it finds a match, it blocks that IP address in order to stop that attack.

In some cases, personal firewalls function like anti-virus software. For some programs, you need to download monthly updates. In the same way that new viruses are created, requiring manufacturers to come up with new ways to protect users against
them, new attacks needing new responses can pop up anytime. As with anti-virus software, the program can only protect you from the attacks it knows about. If you bought a personal firewall product two years ago and haven't updated it since, you're not protected against the new attacks that have surfaced in that time.

A final feature of some personal firewalls is protection against e-mail viruses. Some personal firewalls actually sit there listening for these viruses. Zone Alarm, for example, will alert you if you receive any e-mail messages with a Visual Basic script attached.

**WHAT DO I NEED TO KNOW BEFORE I USE A PERSONAL FIREWALL?**

Personal firewalls are not the “be all and end all” for protecting your computer, so before you use one, you should be aware that they’re not perfect. Besides some of the limitations mentioned above, they can and do give out false alarms. A lot of your initial work with them will be in trying to limit the “false positives.” You don’t want to get yourself into a “boy who cried wolf” situation, where the program keeps alerting you of attacks that are really normal network traffic. After a while, you might ignore the alerts, having seen them before and thinking they meant nothing. Then, when you really were attacked, you might just blow it off, believing it was another false alarm.

Also, personal firewalls can unknowingly pass hostile traffic. Even though you may have been very careful to close all of the appropriate ports and to set up the rest of the software correctly, something may still get through. The personal firewall is not perfect and cannot detect all hostile traffic because not all traffic is what it seems to be. A hostile program can be configured to change its name to some commonly trusted program, such as Outlook.exe, and then sneak in beneath the radar.

Using a personal firewall on your machine here at the University will probably result in seeing and receiving notifications on more traffic than you would on a home DSL or cable modem connection. On campus, you might see traffic that looks suspicious when in fact it is actually automated network maintenance or perhaps the Network Security Group doing maintenance scans to make sure everything is OK. And, since we’re a University, there’s also going to be research conducted on the network—so there are really different types of traffic flying back and forth. Keep these things in mind when you are configuring your software and when you receive your notifications.

**WHAT ARE SOME TYPICAL FALSE ALARMS?**

As I discussed earlier, personal firewalls can have a high noise level and it’s good to know what some typical false alarms can be—this doesn’t mean that you should ignore the alerts, it just means that you shouldn’t go into a complete panic if you see them. SNMP broadcasts can be mistaken for an attack. This has even shown up in reviews of the University’s alerts. HP Jet Direct printers, if not configured correctly, can bombard whole networks just saying, “Hi, I’m here if you want to print to me!” Receiving that kind of communication could cause you to receive a false alert. Another example could be a network ping (IP/2048). This is a packet that is sent as a kind of “Hello, are you there?” and the machine should respond, “Yup, here I am.” NYU’s Network Services will sometimes use this method as a maintenance procedure to make sure that there are no network problems. Unfortunately, to a personal firewall, this might be construed as an attack. Napster also does this in search of other machines with which to trade files.

Ident lookups can also be misread as attacks. For instance, when you connect to a website, the machine on the other side may send back a packet to your machine to verify its identity. This lookup may not come back on the same port, and might even originate from a completely different machine than the one to which you originally connected. This lookup would then appear completely unrelated to your original outgoing traffic and may appear to be an attack. Path MTU (multiple transmission unit) discoveries can be mistaken for an attack because they will appear as a series of multiple pings. Basically, this is an attempt to guide a packet along the shortest route across a network. This is done by routers as an attempt to get you information from the closest location at the quickest possible speed and is a good thing; however, a firewall may not see it that way.

**GENERAL SECURITY ISSUES TO CONSIDER**

As I mentioned earlier, more people are on the Internet for longer periods of time these days. Unfortunately, the longer you’re on the Net, the more likely it is that you’ll be attacked. When machines are constantly connected, the bad guys have more time to pound away at them in an effort to break in. I see this all the time. Having a personal firewall can help you to protect your machine and data from being destroyed or stolen, but even a personal firewall can’t do everything. You should also have a virus-checking program on your machine, so you can have a “belt and suspenders” type of protection. If one fails, you have the other one in place to possibly save you from embarrassment. Remember, as a good Netizen, it’s up to you to secure your machine. You are responsible for what happens on it and for what comes from it. Personal firewalls are...
another way for you to make sure that your machine and data are secure and that you are not contributing to the spread of some new exploit or virus.

**NEW ISSUES**

In the evolution of our increasingly networked world, we run into more and more issues that give us cause to better protect our machines. With the introduction of Mac OS X and FreeBSD, we're going to see one of two things—an increased amount of break-ins or an increase in security awareness. Newly released systems such as these will call for more security measures to protect them.

Viruses and Trojans are not exactly new issues, but they are constantly increasing and remain a concern. If you were hit with the most recent SirCam worm, you know what I am talking about. (You can find more information about it at: www.symantec.com/avcenter/venc/data/w32.sircam.worm@mm.html). Viruses and Trojans pose a new need for greater awareness of what type of traffic is leaving your machine. They put us in the situation where we could possibly be the cause of spreading some new type of virus or Trojan. Just because you're aware of the traffic that is coming at your machine does not mean you're safe. Sometimes outbound traffic is hostile too. If some packet comes at your machine, isn't detected as hostile, and enters under the radar, your machine can then be used to attack other machines. Hostile programs such as Back Orifice and the SubSeven Trojan would cause this type of behavior.

And, finally, be prepared to go through panic attacks. The first time you see that pop-up screen on your machine notifying you that something has tried to initiate a connection with your machine, your blood pressure is going to rise. You're going to want to pick up the phone and scream to someone, “Help! I'm being attacked!” Try to restrain yourself... and be glad that you were smart enough to protect yourself!

You can find more information about personal firewalls and some product reviews at the following websites:

- www.firewallguide.com/freeware.htm
- www.zdnet.com/products/stories/reviews/0,4161,2615071,00.html

Remember that the best offense is a good defense. If you're interested in purchasing a personal firewall, stop by the NYU Computer Store; they can help you pick one out for your specific machine. If you have any security-related questions or comments, visit www.nyu.edu/its/security/, or contact the ITS Network Security Team at security@nyu.edu.

Tracey Lasco is an ITS Network Services staff member specializing in security issues.
To: The NYU Community  
Subject: University-wide License for Oracle Products

I am pleased to announce that NYU has negotiated an agreement with Oracle Corporation to license a suite of Oracle software products for use throughout the University.

The products include Oracle’s database management software for all platforms, as well as Internet application tools and other products. A full list is available at [www.nyu.edu/its/adcom/oracle/](http://www.nyu.edu/its/adcom/oracle/).

This new arrangement enables Schools, departments, offices, faculty and staff to acquire the licenses to run the entire suite or selected products, as well as to get ongoing Oracle support, at significantly discounted prices. Pricing depends upon the scope and nature of use. Even further discounts are available for academic uses of the products.

Under the terms of the agreement, the products can be used only for University business, with includes administration, instruction and research. Neither personal use nor commercial use of the products is permitted.

We have established a new Oracle Licenses service in ITS Administrative Computing Services to manage the licensing process within the University for these products, including software distribution, collection of license and maintenance fees from Schools and departments, and ongoing support. We are available for questions, comments and assistance. You may contact us at (212) 998-1146 or oracle.licenses@nyu.edu. Please also watch the ITS website at [www.nyu.edu/its/adcom/](http://www.nyu.edu/its/adcom/) for updates about this offering.

This new agreement incorporates all previous license agreements that members of the NYU community have with Oracle to use these products for University business. This means that, from now on, Administrative Computing Services will make one comprehensive payment to Oracle for annual maintenance fees for both existing and new licenses. We are contacting all currently known license holders to ensure that maintenance payments previously made directly to Oracle for these products are instead handled through Administrative Computing Services. Please confer with us before making any further payments directly to Oracle associated with these products.

Oracle offers a number of other products that remain outside the scope of the University-wide agreement. For licensing and servicing of those products, please continue to deal directly with Oracle or other providers.
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Published by
Information Technology Services
New York University
10 Astor Place, 4th Floor
New York, NY 10003