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Academic Computing and Networking at NYU
Fall 1996 Volume 7, Number 1
Connect
Academic Computing and Networking at NYU

Connect: Academic Computing and Networking at NYU is edited and published by New York University's Academic Computing Facility (ACF). Its scope includes information about computing and networking activities at NYU's various schools, departments, and administrative units, and outside developments of interest to the NYU community.

Copies of Connect are available at the ACF Innovation Center (second floor, Warren Weaver Hall), the ACF computer labs (listed inside the back cover), the NYU Information Center (50 West 4th Street), and most graduate-school offices. Copies are mailed to full-time university faculty, staff, and researchers. The mailing list is administered by Personnel from university records. If you are a full-time faculty member and you do not receive a copy, please notify your dean's office; full-time staff should notify the personnel representative of their unit. If you are not among these groups but would like a free subscription, please send e-mail to acf.connect@nyu.edu.

You can also read Connect online, through NYU Web, at the URL http://www.nyu.edu/acf/pubs/connect/. Since the summer 1995 issue, most of the material has been published in HTML, the native Web format; earlier issues (beginning with March 1993) are available in the text-only Gopher format.

We welcome your comments and suggestions about the articles in this issue, and about articles for future issues. Contributions are invited for consideration by the editor; for more information, please send e-mail to me at the address given here. Articles are written by members of the ACF staff, unless otherwise indicated.

Opinions expressed in the articles in this publication are those of the authors and not necessarily those of the Academic Computing Facility or of New York University.

Below the authors' bylines are electronic mail (e-mail) addresses. If you do not use e-mail but would like to, call the ACF HelpLine at 998-3333 for information about opening an appropriate account.

This issue was prepared on Apple Macintosh Quadra and Power Mac computers, using QuarkXPress, Microsoft Word, Adobe Type Manager, Adobe Photoshop, and Aldus PageMaker, among other programs. Fonts used in this issue are Palatino for the text and Gill Sans bold for headlines, along with Zapf Dingbats for special effects. Camera-ready copy of text and diagrams was produced using a 600-dpi Hewlett-Packard 4si printer at the ACF; Echo Graphics prepared the halftones from electronic files, and printed and bound the publication.

— David Frederickson

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From the ACF Director

Welcome Back! Here’s What We’ve Been Doing While You Were Away . . .

George Sadowsky
george.sadowsky@nyu.edu

It’s a pleasure to welcome you back to NYU for what we hope will be a productive year for all of us. We’ve been busy over the last several months at ACF, and I’d like to tell you about some of the things we’ve been doing to provide better for your computing and networking needs, for both research and instruction.

ACF Changes

Some time ago, we reorganized ACF into two kinds of groups — technical and user-service groups supporting broad general constituencies, and discipline-oriented groups focusing more sharply upon the needs in specific areas.

Until now, we’ve had three such disciplinary groups — scientific computing and visualization, social-science computing, and arts technology. This semester we expect to extend our efforts by hiring an assistant director for humanities computing. This area, hitherto among the least tractable for computer applications, deserves increasing attention. Among the areas of application are

- language instruction and analysis
- textual analysis
- digital applications in the visual arts
- multimedia applications to create course materials.

We believe that this will fill an important position in our approach to disciplinary support.

Look at NYU Web when you have an opportunity. Work has continued unabated on many sections, and our Distributed Computing and Information Services group continues to work with NYU folks who are helping to move information about the university and its activities to this new form of electronic distribution. In addition, Web interfaces are being developed for some administrative applications, as the notion of an NYU Intranet (see page 3 for more about the Intranet concept) takes more coherent shape. The Distributed Computing group has also grown and is actively serving as our point of contact with you, our customers, for projects involving infrastructure changes and general assistance.

Later in the semester when you call or visit our Help Center, you’ll find both additional staff and students to help you with your problems. The Help Center has shown its value in assisting computer and network users in a variety of ways, and we are strengthening it and reshaping it slightly to provide even greater responsiveness to their needs.

Evolving Networks, on Campus and Beyond

NYU-NET II, our project to upgrade to a second-generation campus network, is nearing completion. During the past two years we’ve substantially revamped the structure and extent of NYU-NET, adding capacity, improving reliability of transmission, and attaching new buildings to the network. This is an investment in infrastructure which is by and large invisible to network users, but it pays off handsomely in terms of being able to carry our increased network traffic with greater reliability.

NYU-NET was originally installed in 1985, and with a variety of extensions, it functioned well for eight or nine years, but was becoming increasingly
congested and hard to use. Now that the network has been freshly revamped, one might ask how long, in the face of rapid technological progress and rapidly expanding demand, it can be expected to provide adequate services. While it's really an empirical question — time will provide the answer — it appears that networks are likely to grow even more rapidly in the future. Several demands will drive the expansion — increased general use; a pronounced shift from text files to high-volume multimedia objects; and the need for more real-time service on the net to support constant-bandwidth traffic such as video conferencing.

The research and education (R&E) community, which was the main force responsible for bringing the Internet to where it is today, is already concerned that its purposes are less and less well served, as the Internet moves quickly to becoming a commercial, ubiquitous service. During the past year, the Federation of American Research Networks, along with EDUCOM’s National Telecommunications Task Force, has sponsored three major meetings focusing on how our needs for network services are evolving, and on the infrastructure that will be required to support those changes. There is serious concern that the current Internet may not suffice, and working groups are busy defining plans for establishing the R&E telecommunications infrastructure of the future. As a member of that community, NYU will be involved in the process; our campus network planning and activities will take these changes into account.

Wider Student Access

Students returning to the Tisch Hall labs will find a substantial upgrade in the computers there. In Bobst Library, network data jacks are being installed, as part of President Oliva’s student computing initiative begun early this year. Now, a student or faculty member with a portable computer will be able to connect to NYU-NET in the library, provided that the machine address of the computer is properly registered. Look for more information about this service as the semester progresses.

Students living in the Third Avenue North Residence, Goddard Hall, and the newly refurbished Brittany Hall will be able to connect their computers directly to NYU-NET from their rooms. By mid-fall, we expect to have installed about 2,000 points of connection to the network in those three halls; over the next couple of years, other residence halls will be made network-ready as well. This investment will make it possible for resident students to access resources and services using NYU-NET at Ethernet speeds — much faster than dialup connections.

The NYU Card and NetID

The NYU ID card now has a different look (see page 5), and promises to be considerably more useful in the next few years. For example, you’ll find something called a NetID — short for network identification — printed on your card, and also encoded on a magnetic strip on the back. This will be introduced in stages this year as the name on your Internet service account on ACF computers. In conjunction with a password, it will be used to authenticate you to the computer on which your account is active and to provide you with access to the network services that the account makes available. Later, the same identifier will provide network-level authentication as we continue to move from a computer-centric model of information processing to a network-centric one.

Since NetIDs will be somewhat cryptic — John Doe would be jd43 if NetIDs had already been assigned to 42 other people with the initials JD — we have introduced real-name aliases for faculty and staff, such as john.doe@nyu.edu, to provide a more legible “business card” address; it can be set to redirect mail to any computer account you have on the network. We should soon have a form on NYU-Web that will let you approve or modify your alias and indicate where to redirect your mail.

As the activities of the university become more dependent upon electronic communication, the NetID and the associated services will become increasingly important. This year for the first time, NetIDs will be assigned to new members of the NYU community. This will of course include all freshmen, whose faculty advisers will want to rely upon e-mail as one way to communicate with them. We expect that this trend will grow, and that within several years almost everyone associated with NYU will want and need a network address.

The Chinese have a curse, “May you live in interesting times.” The times are indeed interesting, but we prefer to regard them not as a curse, but as a challenge to be exploited for what they can provide to assist research and education in the last part of the 20th century. Here and in the rest of this issue of Connect, you can see some of what we’ve been doing.

Have a good year! And when you have a chance, let us know how we’re doing.
NYU Intranet: Opening a New Window on NYU

David Ackerman  
david.ackerman@nyu.edu

For years we've heard that computers are going to make life easier and eliminate paper, when in fact paper has piled up and we all feel like we're working harder than ever. Finally, a number of forces have converged to make these promises seem a bit more likely to be realized.

What are these forces?

The principal force is the World-Wide Web. Inexpensive desktop computers, a ubiquitous network, and multimedia technology have all combined to make the Web both accessible and easy to use. Interest and acceptance have been phenomenal; within a couple of years, millions of people with little previous network experience have gotten involved.

At the same time, people have gained enough sophistication to see that computer programs can and should work together. Moreover, they don't want to have to worry about what kind of computer they have and you have, nor about where the information is stored or where the service is provided. In other words, they want platform independence and full interoperability.

The Web Browser as Front End

Fortunately, the Web provides one answer. Since the protocols behind the Web (and of course, the Internet) were designed to operate across networks and on all platforms, much of the groundwork has been laid.

In many cases, the Web browser has been adopted as a new standard interface, a universal client (that is, a program used from your computer to access information and services on other, usually larger, computers).

At the start, the Web browser was used simply for getting information. The simplest way to get information is through Web pages, where the information is formatted specifically for the Web using HTML (hypertext markup language); at the next level, the Web protocols incorporate FTP and Gopher protocols, so files can be gotten from servers configured for those methods. But there's more; by now, the real power of the browser is becoming evident: it can serve as the front end to an endless array of applications, some old, some new. You can send mail from within a Web browser, and you can fill out forms, and enter data in databases, and search databases — the list goes on, and will go on even farther.

Thus, these forces are producing a type of organization-wide network that more and more is being called an Intranet.

What is an Intranet?

Broadly, it's a network within a business or organization — specifically, it's one using the Internet protocol named TCP/IP for transmission. Hence Intranet, the internal Internet. This network is the necessary foundation on which an Intranet application can be built: typically electronic transactions that let a Web browser do the work of dealing with the application in the background.

Why NYU Intranet?

Like other sizable organizations, NYU has many existing applications and legacy databases. It also has a wealth of people who have become skilled at
using parts of it and need to use others. NYU Intranet — a Web front end running over NYU-NET— makes these applications, and dozens of new ones, work together. Now, sitting at your computer, you can use your Web browser to transact business electronically throughout the university. In coming months and years, the number of applications and transactions will multiply.

What are these transactions and applications at NYU? Once upon a time, to start the semester, a student first waited in line at the Registrar to enroll for classes, at the Bursar to pay, at the JD Center, at the ACF, at the Book Center — and then had to go to Career Services for a job. Soon, NYU-Intranet may open a new window on the University. One day, through a Web browser or its successor, a student should be able to register for classes, apply for financial aid, open an Internet account, find out what books are required for that semester’s classes (and even buy them), and then find a job to pay for it all. Some of these applications are already in place. Instead of waiting in line, the student goes online.

Electronic access to services provides powerful and inexpensive alternatives to traditional means. For example, it will be much easier for ACF to give out 12,000 new Internet accounts using an electronic online form, rather than a face-to-face encounter with our Accounts Office (or, for students, at the computer labs). Moreover, it’s far easier for the user to get this account by completing this form online rather than going across campus, waiting in line, and filling out an application on paper.

Faculty and staff will also find NYU Intranet of service. Purchasing has made some forms available online, and Personnel hosts a series of informative pages. The Book Centers allow professors to order their textbooks and course packets using an online form (see article page 7), and other offices are putting their administrative manuals up on the Web. Some other applications, such as automated registration for NYU-Internet accounts, will soon be working. Others, such as Albert (see page 8) are at an earlier stage of development. Our Intranet services will grow and change with new technologies and new services.

Enhanced Communications

Intranets are not only for accessing relatively stable information in databases, or for providing services electronically. From the start, the Internet has been used for communication. E-mail already is a powerful communication tool; programs such as Eudora make it easy. Our new Intranet services will allow richer communication: the NYU community will be able to monitor rapidly changing information — for instance, checking the status of a particular purchase request. And we hope soon to offer the next generation of tools for mailing lists, discussion groups, and the like.

Security

What about security? As you begin to use these Intranet applications, it becomes increasingly important to ensure that the information you provide over the network is safe and secure. With some businesses, this has to do with monetary or credit card information (and this may be true for some NYU functions in the future as well). But other sensitive and private information is just as deserving of protection.

Enter the Web commerce server — a program that runs on the Web host to serve secure files to you. For example, our Netscape Enterprise Server uses a digital key and 128-bit encryption to scramble information as it travels over the network (for more on encryption, see Tim O’Connor’s articles in the Spring 1996 issue of Connect). Someone using a secure service only needs to open a URL beginning with https instead of http. You can tell that the encryption is in force by looking in the lower left corner of your Netscape browser. Normally, you will see a broken key, indicating a non-secure server. When you have successfully transferred information to or from a secure server, the key is “glued” together on your screen, and is displayed as a solid icon. (With Internet Explorer, you see a padlock for a secure page.) The beauty of all this security and encryption is that it all happens behind the scenes; all you see is that little key on your browser.

Academic Computing currently holds several digital certificates, which allow us to operate secure servers. These certificates are issued by a company called Verisign, only after an extremely rigorous process designed to safeguard anyone forging NYU’s identity in cyberspace.

Another critical aspect to security is identifying the person requesting a particular service. For example, when you log into your NYU-Internet account, you give your username and password. Your password is compared to one you have previously set, thus verifying, or “authenticating,” your identity.

On NYU Intranet, your username will be called a
NYU Card: A (New) Card for All Reasons

This fall, new NYU students, faculty, and staff will be receiving a different NYU identification card. It’s the NYU Card, and it will place a wealth of outstanding academic, recreational, and service facilities at your disposal.

The NYU Card is a permanent card and needs only to be revalidated when an outdated label expires. Faculty, administration, and staff cardholders will receive new labels during the month of October. Students will receive new labels upon successfully completing registration and having been financially cleared by the Office of the Bursar.

On the NYU Card, you will find your Network Identification, or NetID. You will use your NetID, combined with a secret pass-phrase, to access many network information services at NYU. For example, any employee or candidate for a degree or diploma is eligible for an NYU-Internet computer account, which will provide ACF e-mail services, Internet access, and more. Your NetID will be your NYU-Internet account name.

In order to use your NetID and activate your NYU-Internet account, you must register receipt of your NetID and select your secret pass-phrase. For the present, faculty and staff do this at the ACF Accounts Office (305 Warren Weaver Hall), and students do it at the labs. In the future, you will be able to do it by accessing the URL http://www.nyu.edu/acf/start. You will then connect to a secure Web server, which will encrypt (encode) the information you enter for security purposes.

In the future, the magnetic strip on the back of the card may be used to store Library information, and the barcode sticker would no longer be needed. The card could also be used as an electronic key to enter certain buildings with CardKey capabilities. When the cardholder inserts the card in an appropriate door, a central database would be accessed through NYU-Net that would check for permission to open the door. Finally, the NYU Card could be used as a debit card; the cardholder could add money to an NYU account and then use the card to purchase goods and services, on or off campus.

For the fall 1996 semester, the NYU Card will be given to all new students and personnel. Current students and employees may turn in their old cards for the new NYU Card. The NYU ID Center is located in Main Building, room 418. For more information about the NYU Card, contact George Gilmore at registrar@nyu.edu.

— George Gilmore and David Ackerman
registrar@nyu.edu • webmaster@nyu.edu
George Gilmore is NYU’s Registrar.

NetID, and your password will be called a pass-phrase (to emphasize that it should not be a single word, which is less secure). Not only will they be used to access an e-mail account, but they also will be used for network authentication. The difference is that your NetID and pass-phrase may be used for all types of services on the network — not just the ones for which you have set up a specific account.

Coming This Year from ACF

One new Intranet service to become available this academic year will allow new students to activate their NYU-Internet accounts by using an online form. The students will access a Web page and type in their NetID, which will be printed on their new NYU Card. The page will then direct the student to validate their identity, by requesting private information. Again, this will be encrypted as it travels over the network, so users need not fear giving information such as their student ID number. The user will then input a secret pass-phrase and the new NYU-Internet account will be activated.

Universal access to the network — when each member of the NYU community has a NetID — will allow NYU to provide many other services. Using methods similar to those outlined above, students could request inclusion in a new student e-mail address directory; offices and departments can apply for network services; and students can apply for residence-hall Ethernet connection, and can check and update their student information.

If these plans work out as intended, universal NetIDs and Intranet services just may end up making life easier for the NYU community.
The NYU Job Market Goes Online: Career Services on NYU Web

Trudy Steinfeld
stenfldt@is2.nyu.edu

The Internet — especially the World-Wide Web — is becoming a very powerful tool and resource for finding jobs. Today, there are Web pages to help in job searches, home pages for companies and organizations, information on professional associations, and individuals' personal sites with onscreen copies of their résumés. NYU's Office of Career Services (OCS) has created its own Web site to remain on the cutting edge in the world of job-hunting. Through the World-Wide Web, both students and employers now have round-the-clock access to the Office of Career Services.

The OCS page (http://www.nyu.edu/careerservices) was developed to make the job-search process more efficient for both students and employers. The page can be accessed by an immense number of users, both on campus and off, offering a single point for finding and providing career information. With a click of the mouse, a user can explore the entire OCS Guidebook, a manual outlining services and resources the office offers. Upcoming events at the OCS are listed in a calendar, so students logging on from home can be aware of the goings-on. The OCS annual survey of recent graduates, Life Beyond the Square, can be found on the page. This report has been of special interest to prospective and incoming students, as well as employers.

Another reason for creating the page was to increase the number of job opportunities for NYU students. Employers can utilize the OCS Web page to list available positions more conveniently than ever: With a few strokes on their keyboards, employers can now list jobs electronically, indicating job category, qualifications, responsibilities, hours, salary, and contact information. On-campus employers can complete an online form requesting student employees; the information is then retrieved from the Web by OCS staff members. The on-campus jobs are printed and posted for viewing at the Student Employment and Internship Center. Off-campus employers can also post job opportunities. As the job descriptions are received online, they enter a queue from which they will be sent in order to the office's database system.

This fall, that database system, NYU CareerNet, should be accessible via the Web as well. NYU CareerNet is a database of part-time, intern, and full-time job listings provided to students by OCS. Many employers post their positions with OCS to specifically target NYU students. Even though the job listings will be available on the Web, access to them will be limited by a password program, insuring that the positions are viewed only by NYU students. Additional validation procedures will also come into effect to allow access to recent graduates and alumni of NYU.

The World-Wide Web is exactly that: worldwide. The OCS Web site can therefore provide a variety of links to other locations on the Web. There are a number of Web pages that provide job listings throughout the U.S. and the world. Some of these sites also contain company information, job-hunt tips, and even more links throughout the Web. The OCS page also assists students with their job research by providing links to employer home pages that contain...
Pick Your Books and Build Your Course Packs Online through NYU Book Centers

Chelle Cheuvront
chvrntc@is3.nyu.edu

This fall, the NYU Book Centers are introducing three new Intranet services that will make ordering and buying books easier for both faculty and students.

Faculty members will be able to use the new online course form to request books for the spring term. They can view it through a Web browser, fill it out directly on the screen, and submit the request electronically to the Book Center’s ordering department. This on-line ordering system will eliminate the hassle of finding, filling out, and sending the standard paper form, and should help encourage faculty members to submit requests early. Not only do early requests give the Book Center more time to research, order, receive, and price books; they also save students money by making more used books available and reducing the number of rush charges and out-of-stock situations that often occur with late orders.

The Book Centers will introduce another new service for faculty use early next year. This will allow faculty to build their custom course packets online. These booklets, which are compiled of articles and excerpts from different authors and publications, require copyright permission to be cleared for each component before the course packets can be assembled for use in the classroom. The new Intranet service will allow faculty to build and submit their course-packet lists, monitor the status of their permissions, and add or delete items during the copyright process.

The third new service will simplify book purchasing by making course material information available to students before they come to the store. From the Book Centers’ Web site, registered students will be able to simply input their ID number and then instantly view and print the titles, costs, and inventory information for the books needed in all courses for which they’re registered. If a book is out of stock, that will be indicated, as well as whether the book has been reordered and, if so, the quantity ordered. Students can check the book’s status daily to avoid unnecessary trips to the Book Center. Furthermore, a printout of the books serves as a useful shopping list, to ease the process of finding books. Eventually, the Book Center plans to let students purchase their books directly through the Web site.

Other possibilities are being considered for the future. If you have any questions or comments about the Intranet services now being offered by the NYU Book Centers, or suggestions for new ones, please contact Assistant Director Phil Christopher at chrstphr@is.nyu.edu.

Career Services (continued from page 6)

company profiles and contact information.

The OCS Web page has caught the eye of many Internet users and Web surfers. Campus administrators, high-school students applying to college, other university career centers, employers, and the media have all noticed the usefulness and effectiveness of the site. The National Association of Colleges and Employers has done an article about the OCS Web site in its newsletter, Spotlight. Technology is rapidly opening new routes for job searches, and the NYU Office of Career Services is definitely keeping pace.
Searching for Paydirt on NYU Web? That, and Group Projects, Will Soon Be Easier

The enormous (and growing) size of NYU Web is making it harder for people to find what they are searching for. They know about, and use, Web search engines such as Yahoo, Lycos, and AltaVista. Those will turn up items at NYU, but there should be a good way to search just NYU Web. So far, there hasn’t been.

From the time NYU Web was launched, the Web team at NYU has been testing different software products that would help us make it easier to navigate. Finding a good tool from a reliable company is difficult: Some promising products come from fledgling companies that may not survive. Some companies are reliable, but its products don’t serve our needs. We want to be sure that whatever product and company we choose will grow with us and support NYU Web for some time to come.

After much searching and testing, we’ve narrowed the field to two possibilities: Open Text and AltaVista. We’ve come to an agreement with AltaVista to be a beta-test site of their Enterprise server when it is released for testing in September. AltaVista is a division of Digital Equipment (DEC), which makes much of the software and hardware used to run NYU-NET and its services.

Their AltaVista software would be used by NYU Web on two important fronts: searching and newsgroups. Now a Searching Tool That Works

Most users have done searches on the Web. The process is simple — type in a keyword, click the “Submit” button, then review the different “finds.” But what happens behind the friendly Web-based front end?

Every search page relies on a search engine. When you type whales, for example, in the input box on a search page, and then submit your request, the search engine goes to work. But it doesn’t search the Web at that point; rather, it searches its own database of information, called an index. It pulls out all the references to whales and presents them to you in its own format.

Each search engine has its own database. A variety of means are used to compile and update the databases. Some are made up of submissions from people who send in the URL and keywords for their Web site; the links may or may not be evaluated before being posted. Other search sites send out “Web crawlers” — software robots that go from site to site, indexing the pages.

The larger a database grows, the longer it takes to retrieve all the references to satisfy a request. Our database on NYU Web will, of course, not be as large as Yahoo, for example, but that will make it faster and easier to find the desired NYU page.

Discussion Online

ACF has also been experimenting with a number of Web-based programs to facilitate group discussion and collaborative work. These are next-generation replacements of the clumsy but functional old standbys, network newsgroups. They have potential to not only replace the old technology, but also extend and enhance the functions.

During the fall, we will be recruiting several classes for pilot tests of AltaVista Forum, which uses a Web front end, and is therefore reasonably simple to use. Once we’ve completed installation and testing, and have evaluated the results with the participants, these newsgroups will be available to and accessible by everyone at NYU.

— Kristina Abeson

Kristina.abeson@nyu.edu

Kristina Abeson is ACF Information Services Coordinator for the Distributed Computing Group.

Introducing Albert

New York University’s Division of Enrollment Services and University Computing Center are working on an electronic information service that will provide access to student information through NYU Web. The service is named Albert (after NYU founding father Albert Gallatin), and a pilot project is scheduled to begin sometime during the spring 1997 semester.

The functions Albert will offer will be much like the ones the NYU View kiosks offer now. Grading and transcripts, courses, financial aid, and other important student information will be available to students through an NYU Web page. Due to the confidential nature of these pages, they will be stored on a secure server, and the information will be encrypted while being transmitted over NYU NET. As on the NYU View kiosks, a proper student ID number and associated PIN must be typed in to gain access to Albert.

In the future, Albert could have even more functionality, allowing for an electronic application for admission and online course registration. In the spring 1997 semester, the College of Arts and Science freshman class will be the pilot group, testing Albert’s abilities. They will not only use the new information service, but will also provide feedback that will help to improve Albert’s service.

— George Gilmore and David Ackerman
NYU Web Usage Soars

To no one's surprise, NYU's main Web server, www.nyu.edu, has been used more and more over the last couple of years. But exactly how much? How many people visit NYU online? And where are the visitors coming from?

The graph at the right shows how often the server has been accessed since it was launched in August 1994. (It does not reflect the use on other NYU servers, such as those at Tisch's Interactive Telecommunications Program, the Stern School of Business, the Medical Center, or the Economics Department, among others.) Whenever you point your Web browser to any address that starts with http://www.nyu.edu, our Web server records a “hit.” As you navigate around www.nyu.edu, it serves other pages to you, and it records each one as another hit (but not when you return to a page in the same session, since your browser probably displays it for you from its own cache). We compile these statistics monthly on our server, but they could be generated weekly, daily, or even hourly.

While traffic has increased dramatically, there are variations in usage. For example, during the winter and summer vacations, the number of hits dips slightly.

During the summer of 1996, usage reached a plateau at about 1.7 million hits a month. Of these, 1.6 million come from within the United States, and half of those from computers on NYU-NET. The other 100,000 visits or so per month are from eighty other countries all over the world, with about 20,000 from Canada, 12,000 from the United Kingdom, and 2,000 from Mexico, as well as 196 from the Dominican Republic, six from Fiji, and one from Liechtenstein.

—Kristina Abeson
kristina.abeson@nyu.edu

ResNet: Putting the Dorms on the Net

Student dorms are joining NYU-NET. Previously, residence-hall rooms were connected via Ethernet individually, on demand, and only in Third North and Goddard. Now, whole residence halls are being wired, with connections available for every student. Eventually, all residence halls will be wired.

This systematic rollout has begun this fall at Brittany, Goddard, and Third Avenue North. This initial phase consists of 1415 data jacks serving over 1800 students (some will use hublets in their rooms to allow a single jack to serve two people). The residence-hall network consists of a fiber-optic backbone linked to switches that split the available bandwidth between a number of secure hubs. These special hubs permit links only with computers that have Ethernet addresses pre-registered with the ACF.

Students must provide their own computers and Ethernet cards, but registration, connection, and services are without charge. Students can register for the service using a Web-based form at http://www.nyu.edu/acf/resnet

This residence-hall network is called ResNet — a term widely used in academe. ResNet is fully distinct, buffered from NYU-NET by its own dedicated router. Support services will be provided by a staff of student employees called, appropriately, ResTechs. ResTechs live in the residence halls they serve, providing help to their neighbors. They are dispatched via pager by the ACF Help Line.

The ResNet project is a joint undertaking of ACF and the Office of the Vice-President for Student Affairs.

—Joshua G. Feldman
resnet.coordinator@nyu.edu
Joshua Feldman is the ACF ResNet Coordinator
When Is Your Real Name Your Alias?

One of the less endearing aspects of this whole computer revolution is the awkward usernames that are used for e-mail addresses and for logging into computer accounts on the shared machines. The end is in sight: they’re going away.

Now, you can even have mail sent to you under your real name. Revolutionary concept.

The usernames were designed for efficiency in various computer systems and for different administrative reasons. Some had to be eight characters, neither more nor less, all caps; some could be either caps or lowercase; some included numbers. All were relatively short, since not too long ago, anything long slowed things down. Ideally, the usernames would be memorable, but the ideal was often not realized.

From now on, usernames will be replaced by NetIDs, which are formed from a person’s initials and a number. It seems I’m the first person with the initials DJF to be issued a NetID, so mine is djfl; the next person will be djf2, and so on. Simple, and easy to remember. If I get a new e-mail account, it will be housed on the newest IS machine, and my actual e-mail address will be djfl@is5.nyu.edu. A bit crisper than the old frdercksn@acflcluster.nyu.edu.

But why not a real name?

You may have noticed that for the past year or so, we’ve been publishing e-mail addresses for ACF staff members with their real names; we’ve been testing out a system that can look up the full names in a file and direct the mail to the actual account; for instance, mail sent to david.frederickson@nyu.edu would be redirected to my account at djfl@is5.nyu.edu.

In computer parlance, david.frederickson is an alias — an alternative name that is listed in the lookup table with my actual username or NetID. Any member of the NYU faculty or staff can have such a real-name alias or business-card alias. In a day when multi-megabyte video files are being transmitted over the networks, a few extra bits to provide intelligible names are bytes well nibbled. Aside from the paradox of calling a real name an alias, it’s a good development. The beauty of the system is that if your e-mail account is moved to a different machine, you don’t need to notify anyone; we simply reset the forwarding address and your mail follows.

This isn’t the only use for an alias. Mail programs can use aliases (or, as some mailers call them, nicknames) to save time. I have my copy of Eudora (the mail program I use) configured so that when I type in a short nickname, Eudora supplies the full name and e-mail address: I type jj and the message goes to jurowj@acf2.nyu.edu, where Jordan Jurow can read it.

An alias can also supply several addresses: I type contrib, and Eudora looks up a list of nicknames on that list, then supplies the full addresses for a couple of dozen regular contributors and sends a message to them. Conversely, a group of people — the staff of an office, the people who share a responsibility, the officers of a club — might want to set up an alias with the ACF that forwards mail sent to a group to the individual members of the group; thus such aliases as postmaster@nyu.edu, registrar@nyu.edu, comment@acf.nyu.edu.

Any NYU department or office, or any OSA-recognized student club, can set up the second kind of e-mail.
NYU Medical Center Holds Conference on Uses of the World-Wide Web

More and more, the World-Wide Web is becoming an essential tool for academic institutions. Its uses are diverse with potential applications ranging from student instruction to university administration. On September 25, the NYU Medical Center will hold a conference to inform participants of the various roles that the Web can play in teaching hospitals. While the focus of the conference will pertain specifically to the academic medical community, it should prove informative to anyone looking to utilize the World-Wide Web in an educational or administrative environment.

Topics to be covered at the conference include the following:

- **Clinical research** (e.g., through remote patient registry, data entry, and data analysis tools)
- **Medical education** (e.g., through multimedia presentations for medical, nursing, and postgraduate audiences)
- **Disease-based patient support groups** (e.g., cancer-patient information resources)
- **Disease-state management** (coordination of patient services; tracking through care)
- **Patient self-referral to physicians and hospitals** (e.g., using the results of programmed questionnaires)
- **Universal medical records** (globally accessible, secure records shared between regional hospitals, private physicians, and payors)
- **Laboratory-test and procedure ordering, result access, and billing** (serving both in- and out-patients)
- **Advertisement of hospital and physician services**
- **Secure distribution of credentialling databases**
- **Purchase of services** (e.g., payment of tuition, hospital bills)

The one-day conference on September 25 seeks to familiarize participants with actual and possible roles for the Web in these areas; update them on the progress of Web implementation in the academic medical enterprise; and clarify the potential legal issues that pertain to the use of the Web in academic medicine. The conference will include presentations, roundtable discussions, and question and answer sessions.

Speakers include:

- Martin Nachbar, M.D., Director of the NYU Hipppocrates Project.
- Carey R. Ramos, J.D., Partner; Paul, Weiss, Rifkind, Warton & Garrison.
- Mark Selby, Executive Director; Health on the Net Foundation, University Hospital, Geneva, Switzerland.
- Betty G. Smith, M.S.N., R.N.C., N.N.P., Assistant Professor of Clinical Nursing; Columbia University School of Nursing.

The conference fee is $75 or $35 for students with valid ID. You can register via the World-Wide Web at http://rcr-www.med.nyu.edu/rcr/web~conf.html. For more information please call 263-5295.

If you’re not in a rush, wait a few weeks. Soon it will be possible to request your alias online, through the ACF Web pages at http://www.nyu.edu/actl/.

— David J. Frederickson
david.frederickson@nyu.edu
David Frederickson edits Connect.

ACF Ups Space for Personal Web Pages

In response to many requests during the past year for more space for Web work, ACF has raised disk quotas from 500 kilobytes to 2 megabytes for all users of NYU-Internet accounts. This provides you with more room to store files as part of your personal page on the server pages.nyu.edu. This allocation is entirely separate from your e-mail quota, which is held on a different server entirely.
Innovation Center Forges Links to Language Learning and Resources

Jeffrey Lane and Vincent Doogan
jeffrey.lane@nyu.edu • vincent.doogan@nyu.edu

As a part of its current initiative in humanities computing, the ACF staff has been researching multilingual computing and evaluating various computer-based tools for learning languages. The humanities initiative complements ACF’s existing discipline-based support areas, including arts, social science, and scientific computing. (See George Sadowsky’s article on page 1 for more details.) The center of these efforts is ACF’s faculty Innovation Center (room 201, Warren Weaver Hall) where staff and faculty learn about, explore, and evaluate various language-learning computing resources.

Thus far, our efforts have focused on these areas, discussed more fully on the next pages:

• Developing ACF Multilingual Web: This is a collection of resources, information, and links that will be of particular interest to faculty working in languages other than English, or those interested in how computing is conducted in other languages. Links to Web-based language-learning sites are included.

• Acquiring and evaluating language-learning software: Several excellent “off-the-shelf” programs are available, and ACF maintains a collection of them in the Innovation Center for demonstration and faculty evaluation. We will add to this collection based on faculty or department recommendation.

Computing in a language other than English often becomes a complicated issue, with each kind of computing task presenting its own special hurdles. One concept in the field of multilingual computing is “localization.” This refers to tailoring a computer system to a native language, including changing commands into that other language, changing conventions of representing currencies and time, and so forth. But it can also mean translating an entire software application into another language. This type of customization can involve adjusting a machine’s operating system; the method of making this change is different depending on what platform (operating system) is being used.

For the Macintosh, for example, it is possible to purchase Apple Language Kits that support several languages and that respond to applications that comply with Apple’s Worldscript standards. When a kit for a particular language is installed and a compliant program is launched, the computer user is immersed in an application in that language.

There are too many variations and exceptions to these processes to say that using a foreign-language computing environment is a straightforward process. Keyboard layouts, screen fonts, printing fonts, etc., all have to be properly configured in order for a system to work. Telecommunication using a foreign language is further complicated by limitations of certain computing protocols. The article on page 15 discusses some of the problems and solutions.

The ACF staff is committed to supporting efforts of faculty who wish to work in this area by providing demonstrations or advice. Departments or faculty interested in this area may contact ic@nyu.edu for further information, or call 998-3044.
Multilingual Web Links Language Resources at NYU and around the World

ACF's Multilingual Web is by now one of the most comprehensive multilingual sites available on the World-Wide Web. It contains a host of articles, links to software and hardware, as well as online newspapers, magazines, newsgroups, and language-learning resources. The scope and diversity of the site mean that it can serve as an instructional tool for foreign-language students and teachers, and as an informational database for all who want to employ the power of multilingual computing.

ACF Multilingual Web was started in mid-June 1996; since then, the staff of the ACF Innovation Center has been following almost every link related to multilingual computing, from Internet machines in Singapore to hosts in Iceland. The thousands of links and resources available through the Multilingual Web are broken down into six main sections and fifteen specific language sections. Despite the large volume, these links remain easy to access thanks to the organization of a frame-based interface which divides the Netscape browser into separate but interrelated windows.

The main page features information of general interest which lets you know what’s available through the site. It has the following six sections:

- **What's New** notes any recent additions to the site.
- **Technical Issues in Multilingual Computing** provides articles, tutorials, and links related to technical issues in multilingual computing. Examples show you how to integrate multilin-

Innovation Center Multilingual Computing Resources

At the Innovation Center, a selection of language software is available now for the NYU community, listed below. We will be expanding our list; for the latest, check our Multilingual Web site at http://www.nyu.edu/acf/usg/multi-

**Language-Learning Applications**

- EZ Language, by IMSI
- Learn Russian using pictures, words and sounds
- Learn Italian using pictures, words, & sound
- Berlitz
- Think & Talk in French
- Think & Talk in German
- Transparent Language Version 4.0
- Spanish Now
- French Now
- Mac Lang 4.2
- Spanish

**Multilingual Web Browsers**

- Accent Multilingual Browser
- Tango Around the World

**Multilingual Mail Applications**

- Accent Multilingual MailPad

**Multilingual Web Publishing Software**

- Accent Multilingual Publisher

**Multilingual System Software**

- Languages Kits For MAC OS
  - Apple Language Kit
  - Japanese Language Kit
  - Arabic Language Kit
  - Chinese Language Kit
  - Russian Language Kit & Cyrillic Language Kit
  - Hebrew Language Kit

**Multilingual Word-Processing Software**

- Accent Professional WP
- Nisus Writer
Multilingual Computing Resources at ACF describes multilingual software and hardware you can currently use at NYU's ACF.

• Multilingual Guestbook allows you to add your links, thoughts, and suggestions and shows who has visited the site lately.

In addition to these sections, you can access Multilingual Web's resources via clickable individual languages. Eventually ACF Multilingual Web will feature Arabic, Chinese, French, German, Greek, Hebrew, Hindi, Italian, Japanese, Korean, Persian, Portuguese, Russian, Spanish, and Turkish.

Each individual language section offers you several link categories — the Russian language section, for example, lets you choose between

• Technical issues in Russian-language computing
• Russian hardware and software
• Russian language learning resources
• Russian academic resources
• News and media in the Russian language
• Miscellaneous Russian resources
• Just for fun
• Russian ACF resources

In keeping with the collaborative spirit that gave rise to ACF's Multilingual Web, users are encouraged to contribute to the collection of articles, resources, and links. The staff will incorporate your suggestions into the pages, so that Multilingual Web continues to evolve and expand.

— Johannes Paul Lang and Jordan Jurow

Johannes Paul Lang is on the ACF Innovation Center staff; Jordan Jurow is on the staff of Connect.

Q: I've been away from my NYU-Internet account this summer and have not checked my e-mail since the spring. Will any mail sent to me over the summer be waiting for me? Do I need to renew my account?

A: As long as your affiliation with NYU continues (whether as student, faculty, or staff), you should not need to renew your NYU-Internet account.

It should have remained active over the summer, and any e-mail sent to you during that time should be awaiting you when you log into your account this fall.

Since passwords need to be changed at least every six months, it is possible that your password may need to be reset in order for you to log into your account. Or perhaps you have forgotten your password since the last time you have logged in. In either case, due to security concerns, the password must be reset in person. If you are NYU faculty, staff or administration, go to room 305 WWH from 9 to 5 Monday thru Friday with your NYU ID. If you are a student in a degree or diploma program, go to an ACF student lab with your NYU ID.

— L. Barnett

Call the ACF HelpLine at 998-3333
With the proliferation of computers throughout the world, the need for applications that can process more than one language at a time has grown. To address this need, manufacturers and software developers have been exploring ways to overcome the barrier presented by the thousands of written characters, scripts, and symbols used every day across the globe.

The first wave of internationalization was the creation of localized systems. Apple, Microsoft, and IBM delivered language-specific operations systems as early as the mid-eighties. While the level of localization varied from product to product — using native language in documentation only, using native language in menu systems, filenames, applications, system calls, compilers, error logs — they all stopped short of being capable of multiple languages. In addition, different language systems often required language-specific applications — Chinese Windows did not run applications developed for Japanese Windows, and vice-versa — resulting in serious cost increase of software development.

Second came language-enhanced systems, localized computers that could switch between languages and use a wide range of software. Such a system was WorldScript, introduced by Apple in 1992. WorldScript technology allowed users to install language kits on an existing native system and switch at will between languages. In order to make use of this feature, one needed to use applications that understood WorldScript Technology. (Apple supplies appropriate versions of TeachText with each language kit, and there are additional applications, such as Word Perfect 3.5, Nisus Write, Photoshop 3.0.5).

WorldScript technology was as close an approximation of a multiple-language computing system as possible without the use of a fundamentally redesigned operating system. An ideal internationalized system, however, would have to go further. It should offer provision for a uniform platform for all software regardless of the language or languages used, and in addition it should offer portability across applications, platforms, and networks.

The central issue of such undertaking — internationalization — was character encoding. By the late 1980s it was clear that existing international encoding standards and quickly emerging national substandards, while serving their local needs well, could not provide the necessary foundation for a unified global system. ASCII, the venerable 7-bit system, could code only 128 characters. ISO 8859 (AKA Latin-1), an 8-bit step-up, could code 256 characters. While sufficient for most European alphabets and some non-roman alphabets, such as Cyrillic, Hebrew, and Arabic, these standards lacked the capacity to render non-alphabetic languages that use sets of symbols and ideographs. To accommodate the goals of internationalization, the lowest common denominator — the number of bits assigned to each character — had to be increased.

In 1989, an informal group originated by Xerox and Apple, and later joined by AT&T, IBM, Lotus, Microsoft, NeXT, and Novell, founded the Unicode Consortium. The group published its first standard for character encoding in 1990 (Unicode Standard version 1.0). At the same time, the ISO (International Standard for Information Technology — CLC/ISO 10646) followed suit, and the two organizations have worked closely ever since to ensure compatibility and interoperability.

Singapore University has pioneered in developing multilingual tools; its Web page, here, shows some of the fruits of that effort.
Standards Organization) was working on a similar encoding scheme, ISO 10646; this was a 32-bit system, with potential code space for 4 billion characters. To avoid confusion, the two organizations agreed to combine their standards. Unicode Standard version 1.1 and ISO 10646, finally published in 1993, were identical in the 16-bit range. The result was a comprehensive character set organized as a table of 16-bit values that allowed for 65,536 possible characters — alphabetic, syllabic, and ideographic alike — with ample space for standard scientific and mathematical notations as well.

In addition, Unicode also resolved the unique problem of character ordering and contextual form in scripts like Arabic and Farsi by adding semantic information (character ordering and multidirectional algorithms) on the code level. For example, in Arabic each character can take different shapes depending on whether it falls at the beginning, middle, or end of a word, or the beginning of a sentence. Since each use requires a different ligature, each position needs to be encoded as a separate character.

How would software and hardware based on such an encoding system help the end-user?

A student could present a paper using special characters, multiple alphabets, ideographs, and symbols. A historian could use hieroglyphs in the same sentence with descriptive text. A linguist could use multidirectional text to illustrate her point in Arabic, Chinese, and Thai within the same file. A business owner could search multinational phone books online, in which names are represented with correct and consistent spelling. Information managers could scan databases containing data in different languages. They could sort, compile, and display the result with a variety of software. And, of course, one could use extensive computer networks to publish, e-mail, and browse in multiple languages.

What hurdles must such an encoding system overcome?

- Accommodation of additional scripts. Are 65,536 characters indeed enough to provide truly native systems? There are many skeptics. The logical extreme to 7-bit ASCII, with its 128 characters, is the Chinese writing system. Already represented in Unicode form with 20,902 characters (as part of CJK Unified Han) and 21,252 more waiting to be encoded, this ideograph system alone will quickly outgrow the result with a variety of software. And, of course, one could use extensive computer networks to publish, e-mail, and browse in multiple languages.

(continued on page 51)

**Bits, Bytes, and Character Sets: Mathematics Is Density**

**Character Sets**

When we type something on a computer or transmit it over a network, we're limited by the character set available. An old standard American typewriter couldn't readily type accented letters or British pound signs, because they weren't part of the available character set; conversely, a French typewriter probably didn't include a dollar sign.

On a typewriter, the character set was limited by the number of typing keys: about forty-five keys, with the number of characters doubled by using the shift key. On a computer, with more keys on the board and more combining keys added to the lowly shift, the number of characters in a set is limited not by the keys but by mathematics. The ASCII set that's most commonly used has 128 characters (actually, several of the "characters" are invisible, for things like tabs and line breaks and spaces); the common ANSI set adds another 128 characters, mostly letters with diacritics used in European languages, for a total of 256.

Why such strange numbers, and not a round number like 100 or 200?

**Bits and Bytes**

The reason for the peculiar numbers lies in binary mathematics. If you think back to junior high, you may recall a frustrating period wherein your teacher tried to convince you that non-decimal number systems, with more or fewer digits than ten, were possible. A binary system, with only two digits, 0 and 1, is possible — though inefficient in terms of space, since decimal 2 is represented in binary as 10, and decimal 3 as 11, decimal 4 as 100, 5 as 101, etc.: numbers get longer faster in binary. But binary code is basic to computers, which are essentially millions of minute switches that can be either on or off — a pair of states easy to represent with 1 and 0.

Now with a one-digit binary number, we can have either 0 or 1: two choices. If we add another digit, we get four choices: decimal 0, 1, 2, and 3. Another digit doubles the number of choices again, to eight (0 = 0; 1 = 1; 10 = 2; 11 = 3; 100 = 4; 101 = 5; 110 = 6; 111 = 7 ... ).

So a principle emerges: each binary digit you add doubles the number of choices, or the size of the decimal number you can represent — 4 digits yield 16 choices, 5 yield 32, 6 yield 64, and 7 yield 128. (You may recognize the series as powers of 2: $2^1, 2^2, 2^3, 2^4, ... 2^7$.)

In computer terminology, the choice between a 1 and a 0 is a *bit* of information, and all computer codes are made up of strings of these bits: 100111010100101, ad infinitum.
Electronic Publishing: Fulfilling the Promise? Fall Colloquia

Two NYU presentations this fall will offer close looks at aspects of the burgeoning electronic-publishing industry. On Friday, October 25, Jean-Claude Guedon, of the comparative literature department at the University of Montreal, will review the development of electronic scholarly journals over the past several years and provide an overview of their exciting potential for scholarly publication. Professor Guedon will then focus on two critical issues for their further growth: the need for legitimacy and prestige, and for a viable economic model.

Bernard Gwertzman will discuss newspapers on the Internet at another presentation on Friday, November 15. The New York Times online edition, of which he is editor, will be a special focus of his Internet tour.

Both presentations take place at 2 p.m. in Room 109, Warren Weaver Hall. All NYU faculty, staff, and students are welcome to attend.

These talks are part of a continuing series of NYU colloquia on computers and communications. Produced each fall and spring semester, the series is co-sponsored by NYU's Academic Computing Facility and the Faculty of Arts and Science, with support from Apple Computer, Inc. Additional departments and schools join in co-sponsorship of individual colloquia.

As we go to press, additional presentations in the series are being planned. For details and updates, please check the NYU Web at http://www.nyu.edu/acf/nyu-events/.

Flyers about each colloquium are mailed to all NYU faculty. To receive an e-mail flyer, or to be added to the ACF’s mailing list, please send e-mail to document@nyu.edu. All colloquia since 1993 have been videorecorded, and have been placed on reserve at the Avery Fisher Media Center in Bobst Library, where they can be viewed onsite or borrowed by faculty overnight for incorporation in a class session.

— Estelle Hochberg
estelle.hochberg@nyu.edu

Estelle Hochberg coordinates the ACF-NYU colloquia.

But a long string like that is very hard to read, to check, and to transmit; it helps to break the string into smaller bytes to keep things straight. By now, the 8-bit byte is well-nigh universal; and eight binary digits, not coincidentally, yield 256 choices.

**E-mail and 7-bit ASCII**

Like classic Teletype machines (which were based on telegraphy and the very limited Morse code), early computers contended themselves with numbers and capital letters, along with a few punctuation marks; these fit comfortably within a 64-character set. But if you need lowercase letters as well, you’ve passed that limit and need the 128 choices provided by 7 bits. Thus the ASCII set.

When you send a string of electrical pulses over a wire, it’s a good idea to have a way of checking to see whether the transmission is clean; the electrical pulses of static could well garble your transmission. For that reason, modem transmissions often include a check bit, which gives a good indication of whether the bits got through ungarbled: if the sum of a string of digits is odd, the check bit is 0; if even, it’s 1. Not foolproof, but useful. Thus one possible protocol is to transmit 8-bit bytes, with the eighth bit being a check bit. And that leaves us with either ASCII or — if sender and receiver agree on it — another 128-character set.

As its full name (American Standard Code for Information Interchange) implies, ASCII is American, which made sense when most computing was American. To represent languages other than English, though, more letters are needed; those needs were met with the ANSI set and with other code pages, which made it possible to assign code strings to other letters. Fairly early on, good word-processing programs allowed one to take characters from a dozen different sets, for different national scripts, and for various intellectual fields such as mathematics, chemistry, or engineering. But to do so, the user, or at least the program and computer, must constantly shift from one code page to another, essentially saying, “Look on code page 14 and give me character number 37; now go back to page 1,” and so on. It works; it’s relatively cheap in terms of storage and computer time. But it’s messy, and it still doesn’t include all the characters one might need. Russian, anyone? Georgian? Thai? Japanese?

**The Dream of a Universal Character Set**

As computers became more powerful, storage cheaper, and transmission faster, considerations of economy became less pressing. And though economy is still important in many situations and in most developing countries, the rapid changes we’ve seen in computing and networking make it seem pointless to hamper ourselves by sticking to 7-bit or 8-bit character sets. Why not have a 10-bit set whose 1024 characters could represent all European languages? Or a 16-bit set that could include large swaths for Chinese and Japanese ideographs? And thus the idea of Unicode was born.

— David Frederickson
From June 26 to 28, NYU's Kevorkian Center for Near Eastern Studies and its Institute of Fine Arts were hosts to the eleventh annual meeting of "Informatique et Égyptologie" ("Computers and Egyptology"). This international conference, held this year at the Kevorkian Center, brought together Egyptologists and computer specialists from Egypt, Czechoslovakia, France, Germany, Italy, the Netherlands, Russia, and the United States to discuss and demonstrate the ways in which the microcomputer and the Internet have revolutionized the study of the civilization of Ancient Egypt. Since this year's sessions were coordinated with the annual meeting in Boston of the International Congress of Professional Egyptologists, a related association largely oriented towards specialists working in museums, most of the scholars attending our NYU conference also represented several of the most famous collections of Ancient Egyptian art in the world: the Louvre, the Turin Museum, the Brooklyn Museum, the Metropolitan Museum of Art, and the Cairo Museum. We were especially honored by the presence of Dr. Mohammed Saleh, the Director of the Egyptian Museum in Cairo, the largest collection of its type in the world, and his chief of Information Services, Dr. Mohammed Shirni.

The "make-or-break" factor in meetings such as this, of course, is the quality of the equipment offered the speakers for their presentations. As the director of the conference, I was truly fortunate in receiving top-notch technical support from the efficient staffs of the Kevorkian Center, Campus Media Services, and the Academic Computing Facility. My colleagues were all very much impressed with NYU's technical expertise. Having attended several annual gatherings over the years, I can say that our NYU meeting certainly provided our speakers with the most glitch-free equipment thus far, including two powerful state-of-the-art computers, LCD screen projectors, and an Internet connection. In the few pages allotted to me here, only a sampling of the talks can be summarized. The Internet thus could make its presence felt not merely in theory, but through connections to active Web sites during three papers delivered at the conference.

Can a Database Be Universal?

As some of the Net surfers among my readers are already aware, major museums are setting up Web sites, allowing the general public to gather information about pieces in their collections and even to view some of the objects. We were informed that within a short time, nearly all of the Louvre's great Egyptian collection will be accessible to professionals needing certain basic technical data about objects, thus greatly reducing one of the most frequent, and time-consuming tasks curators must deal with. However, because Egyptologists speak many languages, a way had to be found to allow scholars to conduct research in their own tongue. As formidable as this problem might seem at first, these difficulties are actually readily surmounted by the use of lexicons — multilingual, linking databases that provide an interface for the users. (I've discussed lexicons in more detail in previous issues of
This publication; see those of November 1993 and September 1994.)

It is not surprising that such a useful technique has been widely accepted among museum professionals. Quickly grasping the great practical value of lexicons, the Louvre — one of the first of the major museums to go online — developed a large-scale descriptive lexicon for its Egyptian objects. The Egyptian Museum in Cairo was given a copy of this database several years ago, and, Dr. Saleh noted, has since adapted it for their own use. Like physicists in their quest for an overarching Universal Field Theory, several Egyptologists have been attracted by the possibility of creating a unifying lexicon and numbering system for all Egyptian collections. Prof. Dirk van der Plas presented an online demonstration of a lexicon recently completed by the Centre for Computer-Aided Egyptological Research and then graciously offered it gratis to anyone wishing a copy.

One of the most productive and instructive discussions ensued at this point, when Dr. Saleh pointed out that even the more modest Louvre project had to be modified to accommodate the procedures of the Cairo Museum, since those collections, naturally enough, are organized differently from the Louvre’s. This observation struck a responsive chord among many of the scholars in the room who pointed out that they too have widely varying ways of conceptualizing, hierarchizing, and naming data. One of the attendees with many years experience in the practical business world showed how modification of an international lexicon defeats its purpose by quickly leading to a “classic parts-number problem,” where non-standard terms and numbers make it hard to retrieve information about items in the system. International standards are easy to propose, but very hard to implement, given the idiosyncratic nature of scholars.

Saving an Installation with a Virtual Museum

Dr. Emily Teeter of the University of Chicago’s Oriental Institute Museum demonstrated a “virtual museum site,” a particularly intriguing application which permits people to “visit” the collection, even while it is in the process of being reinstalled. As she “walked” us through the galleries, it was possible to select certain of the artifacts for closer inspection. An added advantage of this program is that, once the new installation has been completed, the museum will have for its archives an interactive record of how the collection was previously exhibited.

Electronic Publication via CD-ROM and the Web

Many academic institutions are faced with problems caused by the ever-increasing price of publication, especially when many photographic reproductions are required. Several of the conference papers described efforts to address this problem by offering bibliographical material on the Internet or by producing CD-ROM disks, methods of publication that are not only cheaper than books, but have the advantage of being interactive as well. Dr. Andrey Bolshakov of the Hermitage Museum proposed how he might produce amazingly detailed photographs of Egyptian papyri simply by scanning them and offering the compressed graphics files for sale on CD-ROM. Needless to say, these would be considerably less expensive for both the producer and the customer than finely-printed books. Strikingly enough, this technique actually exposes these delicate objects to less potentially damaging light than a normal photographic studio session might. Another fascinating presentation, by Dr. Peter Der Manuelian of the Boston Museum of Fine Arts, (continued on page 30)
Matlab: A Powerful Tool in Scientific Computing

Hua Chen
chenhu@acf2.nyu.edu

Matlab — for Matrix Laboratory — is a high-level programming environment for mathematical and scientific computation widely used in academia and in industry. The Matlab system derives much of its computing power from two core components. The first is a package of high-quality numerical linear-algebra routines. From the start, there has been a close and continuous association between Matlab and scientific-computing researchers. As a result, many state-of-the-art numerical algorithms have been incorporated into the Matlab system.

The second component crucial to the performance of Matlab is its graphics compatibility. The 2D and 3D graphics of Matlab are based on the geometric representation of matrices and vectors, hence it works seamlessly with the rest of the system.

From this highly optimized core of mathematics and graphics, Matlab is further extended by a family of application-specific packages called toolboxes. Each toolbox contains a collection of Matlab scripts (called m-files) and programs written in Fortran and C (with Matlab interface). Over the years, MathWorks and others have developed toolboxes with applications ranging from numerical analysis and statistics to neural nets, fuzzy logic, and financial modeling. This dynamic development process has made Matlab an ever-expanding software system, reflecting ideas and efforts of leading researchers and practitioners in many fields of science and engineering (see a listing of toolboxes opposite).

Hua Chen is a systems administrator with the ACF Science and Visualization group.

This article is the first in a series that will describe scientific software available to the research community at New York University on ACF computing systems.

Matlab is probably the most widely known software system because it is relatively easy to learn and use and it is available on systems ranging from desktop microcomputers to workstations to high-performance parallel multiprocessors. It also provides toolboxes which are tuned to specialized areas in science and engineering.

In future issues of Connect, software used for molecular modeling, image and signal processing will be featured with an emphasis on how instructors and researchers employ them.

—Edward Friedman
friedman@nyu.edu

Edward Friedman is the ACF Associate Director for Scientific Computing and Visualization.

This high-performance computing engine is complemented by a user-friendly programming environment. The user interface of Matlab is command-driven and interactive. The basic data objects such as matrices and vectors can be easily constructed and manipulated in a functional syntax that is close to the way it is done on paper. Since many problems can be solved with a simple one-line procedure call or function call, Matlab can be used quite effectively without resorting to extensive code writing.

Matlab has its own high-level programming language, which the system interprets. Therefore it is
### Matlab Toolboxes

- Matlab Compiler and Matlab C Math Library.
- Chemometrics
- Communication
- Control System
- Financial Toolbox
- Frequency Domain System Identification
- Fuzzy Logic
- Higher Order Spectral Analysis (Hi-Spec)
- Image Processing
- LMI Control
- MMLE3 Identification
- Model Predictive Control
- Mu-Analysis and Synthesis3.0
- NAG
- Neural Network
- Optimization
- Partial Differential Equation
- Quantitative Feedback Theory
- Robust Control
- Real-Time Workshop
- RTW Ada Extension
- Signal Processing
- Spline
- Statistics 2.0
- System Identification 2.0
- Symbolic Math
- Wavelet

much easier to program in it than in many common lower-level languages such as Fortran, Pascal, or C, since the programmer can concentrate on the logic and the efficiency of an algorithm without being burdened by issues such as variable declaration and memory allocation. Of course, this ease of use comes at a price. As with many interpreted languages, there is often a performance penalty in running time, especially if the program is dominated by loops. However, in most cases, this extra time needed to run the program (possibly up to ten times as much) is more than offset by the amount of time saved in programming (by a factor of 10-100).

For projects in which performance is the overriding objective, there are two ways to achieve run-time efficiency within the Matlab programming environment. The first is to use the Matlab compiler, which translates an m-file into C code and generates a Matlab callable binary file (called a mex-file). The more traditional method is to optimize the script by "vectorization" — which means to convert iterative operations on scalar data into matrix operations on matrix objects.

This flexible and intuitive programming environment has made Matlab a powerful development tool. For example, a new user with basic knowledge in linear algebra can start to write concise, easy-to-understand, and very efficient codes within weeks. An experienced Matlab user, with sufficient understanding of the underlying mathematics of a (continued on page 49)

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**Coming This Fall to an ACF Server Near You: Mathematica 3.0**

After five years of development, Mathematica 3.0 will be released this fall. It will be available on nearly all ACF computer systems.

Mathematica is a system for doing mathematical computation. It was originally released in 1988 and Version 2 came in 1991. The program is in two parts, a front end on the user’s computer, where expressions are entered and results are displayed, and a kernel, which can run on the user’s computer or a more powerful central computer, where the calculations take place. The front end shows a notebook that looks the same on all computers. The full text of the Mathematica Book, a 1400-page reference manual, will be available in notebook form on-line.

The most notable new feature is the support of standard mathematical notation for input and output. An expression such as

\[ \int_0^\infty \sin \theta d\theta \]

can be entered from the keyboard or by selecting from palettes. Palettes for mathematical operations and 700 special characters are built-in, as well as international character sets and Unicode. Buttons can be user-defined, and commands can operate on selected portions of an expression. The notebook interface is now fully programmable, “so that anything you can do interactively to a notebook in the front end you can also do by sending appropriate commands to the front end from the kernel.”

Mathematica has been used at many NYU departments: Economics, Medicine, Chemistry, Mathematics, Computer Science, and Music Technology.

—Howard Fink

howard.fink@nyu.edu

Howard Fink is Manager of the ACF computer lab at the operations on scalar data into matrix operations on matrix objects.
Mapping the Genome with a Microscope —
Optical Mapping at the Keck Lab

In the W. M. Keck Laboratory for Biomolecular Imaging of the Department of Chemistry, a team directed by Dr. David Schwartz is engaged in optical mapping of genomic material. Collaborators in the Computer Science Department include Dr. Bud Mishra and Dr. Thomas Anantharaman. A visualization of part of the current process is illustrated on these pages.

The larger red grid is a collage of 8100 microscope images showing thousands of DNA samples that have been arrayed on a single surface. The blue images detail a small portion of a single such microscope image. The side of the red grid represents about 8 mm, and the bottom edge of each blue image represents about 30 microns (0.03 mm).

All of the images are captured on a sophisticated type of optical microscope known as a fluorescence microscope. Typical optical microscopes form images by shining light through a sample and magnifying the shadow of the object. Fibers as thin as one micron can easily be seen. However, DNA is only about 0.002 micron thick, much too thin to cast a shadow. The trick is to arrange for the DNA to emit light so that it stands out. This is done by staining it with a fluorescent dye. In the resulting digital images, 15 pixels represent about one micron, and the edge of one full-size image represents about 100 microns.

The purpose of making images of DNA is to find the location of specific landmarks along the DNA. One important class of enzymes in the molecular biologist’s toolkit comprises the restriction enzymes. These enzymes cut the DNA wherever they find specific short sequences, and there are thousands of different enzymes available. If the DNA is under tension when the enzyme cuts, the DNA pulls away from the cut sites. This produces a visible gap in the image of the DNA molecules, which serves as a landmark that can be mapped. Measuring the location of these landmarks with a microscope is called optical mapping.

In our procedure, the glass surface that holds the DNA for optical mapping is chemically modified. When a small droplet containing thousands of identical DNA molecules is placed on this surface and allowed to dry, the molecules are elongated by fluid flow and stick to the surface, as shown in the blue images. A machine places many of these droplets at fixed grid positions on the glass surface — in our example, 100 droplets on a 10x10 grid. Each droplet may contain DNA from a different source.

In order to expose landmarks along the DNA molecules, the surface is treated with a restriction enzyme. The enzyme cuts each DNA molecule at each restriction site, and the stretched DNA springs back. When this surface is treated with the fluorescent dye, mounted on the microscope, and scanned by an electronic camera, the resulting images look like those shown here. These images are pseudocolored for publication.

The green grid shows the actual spacing of the 81 individual images captured from one of the droplets; in the red grid, the spaces are eliminated. The bright specks in the two grids are the DNA molecules. Software developed in the lab automatically identifies each molecule in the image by isolating it from the background, and finds its central path or backbone — shown here as a line of red pixels. Then the intensity levels along the backbone are analyzed, forming a profile of the molecule and identifying the locations of the cuts that serve as landmarks on a map of the DNA (shown in the graph at the top of the page).

The whole process is repeated using different restriction enzymes. Since each enzyme cuts at a different DNA sequence, using another enzyme exposes a whole new set of landmarks. In time, when enough cuts have been correlated, the entire sequence can be deduced.

Optical mapping is a new approach to the problem of mapping genomes. It directly produces ordered restriction maps of DNA samples, using small amounts of material, in a process that is being automated. Population genetics requires the analysis of the differences among many individuals. Optical mapping will provide a rapid and low-cost way to determine these differences.

Edward J. Huff and Estarose Wolfson
huffe@carbon.chem.nyu.edu
estarose@carbon.chem.nyu.edu

Edward Huff and Estarose Wolfson are both researchers on the genome project they discuss here.
MathMol Brings 3-D to the Classroom

Project MathMol (http://www.nyu.edu/pages/mathmol) is an interactive Internet site aimed at introducing elementary and high-school students to the world of molecular modeling and its relationship to mathematics. Using resources at the ACF Scientific Visualization Center, we’ve been working on the site since December 1994 (see Connect, Summer 1995). The site presently receives well over 2000 hits a month to its various components.

This summer, two students have been working in the Scientific Visualization Center making new additions to the MathMol site, in order to better assist the K-12 community, as well as college-level students. The students involved are Mark Cheng (Computer Science) and Shiela Estacio (SEd).

We’ve been working to develop materials that can be delivered across the Internet; the work has involved efforts in two main areas: the first is a hypermedia textbook; the second is a library of three-dimensional molecular structures that can be used to complement study with traditional classrooms and textbooks.

What Is a Hypermedia Textbook?

A hypermedia textbook is an integrated set of Web pages and links that are similar in many ways to a regular textbook. However, it has several distinct advantages —

- It can make use of animations and sound, and even 3-D interactive images through VRML (virtual reality modeling language).
- It can be linked to numerous additional resources via hypertext links.
- It can contain interactive experiments making use of Javascripts that are embedded within the HTML source code.
- It can be kept up to date with current information. Being up to date is a major problem in primary and secondary education, especially in an urban school system.
where most textbooks are outdated. It will now be possible to update textbooks, whether to add new information, or to change the content to meet the needs of varied populations of students.

The hypermedia textbook can be reached this September via the MathMol home page or directly at http://www.nyu.edu/pages/mathmol/textbook/.

Library of 3-D Molecular Structures
In addition to creating the hypermedia textbook, we have been updating and expanding the Library of Molecular Structures at http://www.nyu.edu/pages/library/library.html. This site, too, has been active since 1994, and has been getting about 1000 visitors a month. It contains perhaps 100 molecular structures that can be viewed interactively in 3-D, using either VRML or RASMol (public-domain software for Mac, PC, or Unix systems).

The mathematical coordinates for many of the structures were produced through x-ray crystallography at various laboratories, and are available in the literature and on public databases. Others have been assembled from smaller components using software such as Insight II, available at the Science Visualization Center.

Three-dimensional molecular images can be produced by a variety of software packages; in all cases, the package has to be given specific data about the location and type of each atom involved. What we've done here is to create the appropriate data files, making the images available to the public in a variety of formats.

These structures will be helpful not just to the K-12 community but also to undergraduates studying the sciences.

— Marvin Rich
richm@acf2.nyu.edu

Dr. Rich is Visiting Scientist in the Department of Biology and the NYU teacher liaison for the New York Collaborative for Excellence in Teacher Preparation in Math and Science.

Connect: Academic Computing and Networking at NYU Fall 1996 25
"I learned different things about the computer — how to do a net search, how to use Photoshop, and how to do different kinds of math and chemistry on the computer." (Shadia Carlo, student, East Side Community School)

"When I first looked at the HTML language I thought I would never get it, but the help of the staff and everyone else made it very easy to learn anything." (Andrew Rasmussen, teacher, Institute for Collaborative Education)

"Can you make this program longer? One month is too short." (Jose Camilo, student, Seward Park High-School)

"I came disliking computers but your class and instructors made me look forward to this class." (Andrew Lu, student, Institute for Collaborative Education)

"I liked doing project Web pages because I learned some very useful information." (Joel Collymore, student, South Shore High-School)
Online and In the Lab: Devising New Ways for Teaching about Science and Math

Lindsay Wright
wright@is2.nyu.edu

In 1994, NYU's School of Education began to work with the Academic Computing Facility to co-host the summer computer program for high-school students, which ACF had offered free to participants for nearly three decades. "We saw great potential in this program," says Dean Ann Marcus, "and hoped that the school's involvement might eventually lay the foundation for closer relationships of Education students and faculty with the students and teachers of New York City high schools, particularly in the area of educational technology."

Last year, working closely with the ACF's Vincent Doogan and Jeff Lane, Shirley Hanein, educational-technology specialist and graduate student in the school's Department of Teaching and Learning, created a four-week curriculum for 35 ninth- and tenth-grade students from a variety of high schools in Manhattan and Brooklyn. The curriculum gave the students - many of whom had no previous computer experience - an intensive introduction to computers and networks, moving rapidly from basic software skills such as wordprocessing, spreadsheets, and databases into telecommunications skills covering e-mail, the Internet, and Web-page design and authoring. The school hired four NYU graduate and undergraduate students as instructors, and they worked closely with the students on the development of both team and personal Web pages.

The results were so impressive and the students were so enthusiastic about the program that we - Lee Frissell, the School of Education's Director of Field Projects; Vincent Doogan, the ACF Associate Director for User Services; and I - immediately began to plan for the summer 1996, and agreed that the School of Education should take responsibility for the continuation of the summer program. This time we had something different in mind: we wanted to build more academic content into the curriculum, and we wanted to forge student-and-teacher leadership groups that would return to their high schools to support technology initiatives.

First, we needed to find a way to involve our faculty and graduate students in curriculum development and instruction, while at the same time increasing the academic content of the curriculum to meet some of the needs of the public schools we work closely with. A focus on math and science seemed a natural for us and the public schools alike, and we had just hired a new faculty member, Assistant Professor Brian Murfin, who was very involved in technology and science education.

Accordingly, I proposed to Professor Murfin that he develop a two-part course for School of Education seniors and graduate students in math and science education. The first part, to be offered in the spring, would have students learn about educational technology and develop the curriculum for the summer program, focusing on technology for math and science. The second part, in the summer, would have the same students actually teach in the summer high-school program, under Professor Murfin's supervision, for credit toward their degrees. We didn't have enough time to get the two-part course off the ground for the spring, but we did find a good alternative, which Brian explains in the next article. We expect to develop the course more fully this fall. (continued on page 30)
School of Ed Students Develop Curriculum for HS Math and Science Program at ACF

Brian Murfin
murfin@acf2.nyu.edu

In the spring of 1996, the first “paperless” class in NYU’s School of Education was conducted. The course, Microcomputer Applications in Mathematics and Science Education, was for math and science teachers — mostly graduate students. All course materials were delivered to the students by computer through Web pages, e-mail, and newsgroups (the materials can be viewed at http://www.nyu.edu/classes/murfin/welcome.html). All student assignments were also submitted electronically, as text inserted in e-mail, or as mail attachments. A philosophy of learning by doing, along with total technological immersion, influenced the design of the course.

Preparing the Teachers

One of the most important goals of the course was to develop technological awareness and a beginning level of technological literacy to the teachers of science and math. There was very little time devoted to watching someone demonstrate or talk about technology, and very little reading about technology. Instead, hands-on exploration of technology was stressed — individually, with peers, and with the instructor. The instructor’s role was to design experiences, to provide starting points, to define prerequisite skills, to troubleshoot, motivate, and provide moral support, and to listen to and learn from the students.

Technological literacy has several components, among which are perseverance, patience, risk-taking, and awareness of commonalities between applications and programs. The students learned by doing, over and over again, and this total immersion in the technology was designed to bring about technological literacy.

The latter can be operationally defined as the ability to sit down at any computer with any program, and, with a minimum of assistance, to function at a basic level. For example, a technologically literate person should be able to use any new word-processing program on either a Mac or a Windows machine, and be able to create a document, save it, and print it. Once the students discovered them, the similarities among various applications and resources — locating help, using the Escape and Enter keys, finding tutorials, Readme files, FAQs (files of frequently asked questions, with their answers) — were constantly reinforced. The three Ps of computer learning (patience, persistence, and practice) were repeatedly stressed. The students were also encouraged that, though they might find total immersion in technology painful at first, it should be rewarding once they reached a certain level of expertise and could function independently. Spoon-feeding was avoided, exploration was essential. Collaborative and cooperative learning, peer tutoring, and a low student-to-instructor ratio were also requirement. Computer technology was the sole means of learning about that technology.

Throughout the semester, the NYU students completed many tasks that involved the application of various types of technology in math and science. They created Web pages, which can be found online at http://www.nyu.edu/education/scied/student.
Developing a Summer High-School Curriculum

One of the tasks posed was to create a curriculum for the summer program for high-school students sponsored by the School of Education and ACF. Four volunteers from the class — Clay Wollney, Chenai Kairimakwenda, Emmanuel Osula, and Laurrie Brinckerhoff — designed a proposal involving math, science, and technology. All four were in-service teachers, some in math, some in science.

There were several goals:

• for students to use technology to learn math and science
• for students and instructors to learn together
• to provide a variety of experiences to accommodate different learning styles and different levels of ability
• to provide a supportive environment
• to provide training in basic computer skills
• to be sure students understand the significance of object-oriented programming
• to engender enthusiasm in the students for the use of technology in math and science
• to create technologically literate individuals
• to create a balanced program where students spend roughly equal amounts of time on and off computers
• to expose the students to cutting-edge technology
• to have each student create a personal Web page
• to have students take part in group projects applying technology in math or science
• above all, to make sure that the students and instructors all have an exciting and enjoyable four weeks

Five NYU students who completed the technology course — Jason Appel, Eric Stainrook, and Jennifer Rehn of Math Education; Shindy Jones and Laurrie Brinkerhoff of Science Education — agreed to serve as instructors for the summer program, along with an Americorps student from Stern, Neil Mody. Shirley Hanein, a graduate student in the Department of Teaching and Learning, coordinated the technology aspects of the program.

The NYU students devoted many hours and many meetings to fleshing out the proposed curricu-

The Summer Course

First, the high-school students and their teachers were given a basic introduction to technology. After this, wordprocessors, spreadsheets, and databases were introduced through activities that integrated science and mathematics. These activities ranged from analyzing the physics of blowing bubbles in Washington Square Park, to racing toy cars down wooden ramps, to constructing animal databases.

Early on in the program, the students were introduced to the World-Wide Web and told that they would be developing personal and group Web pages related to math and science. The first and last hours of the day were free time, when students could work on their Web pages and check their e-mail. Each day a new technique in Web-page design was introduced until by the end of the program the students were incorporating Java scripts, clickable image maps, frames, and other devices to make their Web pages more interactive. The high-school Web pages are available at http://www.nyu.edu/education/scied/summerwebs.htm.

The students also explored other applications of technology such as videoconferencing using CUSeeMe, text-based virtual reality, simulation programs such as Stella, Hothouse Planet, SimEarth, and SimLife, specialized math and science software such as Geometer's Sketchpad, MayaMath, Voyage Through the Solar System, Science Dictionaries on CD-ROM, and so forth. The Yorb car, a camera-bearing vehicle controlled remotely through the Internet, was demonstrated to the students by a member of the Center for Interactive Telecommunications. They also explored the use of microcomputer-based labs with the assistance of the Dr. John Halpin of the Chemistry Department. Field trips to the Media-scapes exhibit at the SoHo Guggenheim Museum and teacher-student basketball and volleyball games at the Coles Sports and Recreation Center provided breaks in the routine and a change of scene from the computers in the ACF lab at 14 Washington Place.

One tremendous aspect of the summer program was the splendid relationships that developed between the instructors and students. At all times...
there were six NYU student instructors, six high-school teachers, and twenty-seven high-school students. This allowed all of the students to receive individual attention, and tremendously valuable interaction took place between the secondary school students and their teachers. The experience gave the NYU students a wonderful opportunity to have an extended contact with New York City high-school students in a very supportive environment. By the end of the four weeks, the NYU students had matured into confident, capable teachers with excellent skills in the application of technology in math and science. The high-school teachers were an integral part of the program as they learned along with the students and provided guidance and focus to the several group projects. The high-school students were simply superb; some of their fine work can be seen on their Web pages.

The program began and ended with fun-filled pizza parties, and the most frequent parting comment from the high-school students was that the program was too short and they wished they did not have to leave. The consensus of all participants was that the program was a resounding success.

Teaching Math and Science (continued from page 27)

We want graduates of our teacher-education programs to be skilled in technology, so that they can integrate technology into their own classroom projects in the schools. There are few opportunities, however, to actually practice teaching about technology, and the summer program seemed an ideal setting to help them get that experience.

"As we thought about redesigning the curriculum," adds Lee Frissell, "we also decided to change the participants. We wanted to involve high school teachers in the program along with their students. We hoped that when they returned to their schools in the fall, the students and teachers would form technology leadership groups that would train other teachers and students in computing and telecommunications and formulate plans for using technology in their own schools."

The School of Education invited nine high schools in Manhattan and Brooklyn — ranging from large traditional schools to small alternative ones — to select three ninth- or tenth-grade students and one or two teachers to participate in the summer program: the Lab School, School for the Future, Institute for Collaborative Education, East Side Community School, Manhattan Village Academy, Seward Park High School, Clara Barton High School, South Shore High School, and Erasmus Hall's Institute for Science and Math.

In all, the nine schools selected twenty-seven students and six teachers to participate in the program. Neither the students nor the teachers were required to be math or science whizzes, just capable, responsible, and serious. As a result, the program attracted English, art, and science teachers, and the students came with a wide range of experiences in science, math, and computing.

The School of Education is continuing to think creatively about the future of this summer program, and hopes to seek external funds to support the summer 1997 offerings. We think this project has good funding possibilities because the benefits are nicely spread among different groups. Although the program benefits individual high-school students and teachers, the team approach ensures that their training will be passed on to others in their own schools. Bringing teachers together from several local schools encourages networking and joint projects. And our own graduate students learn to design a comprehensive curriculum in technology, science, and math from the ground up and then deliver it to high-school students."

The Ultimate Dictionary

Most of the final day of the conference was devoted to relating the progress on perhaps the most important computer endeavor in Egyptology today — the development of the new Wörterbuch, or hieroglyphic dictionary. The Berlin Academy has embarked on a project to store the data on approximately five million cards and thus produce a new dictionary. The highly sophisticated programming techniques that have been developed to do this enormous task would merit an article by themselves.

I hope this account can convey something of a greater reality in today's academic life: the computer has become far more than a word processor. As arcane as Egyptology may be, this meeting reflects the many ways scholars throughout the humanities now use computers in their daily work.
On-Demand Is in Demand at SCE

Ruth Opad
opad@is.nyu.edu

This semester, the School of Continuing Education (SCE) will see finance students (or not see them) studying, online, some very traditional topics — finance and law. Students working professionally in an area of finance are invited to work entirely at their own pace and place via the Internet as they study several noncredit courses. These courses include:

• Legal Research and Writing on the Internet: Designed to balance exposure to new research techniques with intensive legal research and writing under the guidance of, and subject to critique by, the instructor. Each “class” includes a legal research assignment to be performed using a variety of legal research media, with a writing assignment due each week. Additionally, each student anonymously reviews and critiques a fellow student’s work for each class and posts the critique electronically for all course members to review and discuss.

• Global Licensing and Negotiations: Focuses on a variety of sample agreements representative of various sectors in the American and global economy. Topics include: trademark merchandising, patent and technology transfer, and copyright assignments. Industry sectors include: computer technology, entertainment, merchandising, and franchising.

• How to Write a Financial Analysis: Takes the student through all the necessary steps to research, analyze, and write a professional financial analysis. The class works through a major corporation’s financial statements and performs research on the Internet. This is an interactive course, and students are expected to solve problems and write up results. Online discussions are encouraged.

These new classes join the school’s other technologically advanced courses, pioneered by SCE’s Virtual College, which offers an advanced professional certificate in information technology. It’s always been the school’s goal to make learning convenient for working adults. This is just the twenty-first-century version of that tradition.

SCE now also reaches out to even more students and potential students via the Internet, through its new and expanding sites on the World Wide Web. Most don’t even have to come in to NYU to register — they can now enroll by phone, mail, or fax, and signing up online may not be that far off.

Ruth Opad is Advertising Manager at NYU’s School of Continuing Education.
Interdisciplinary Research in the Humanities and Sciences

Tom McNulty and Peg Eby-Jager
mcnulty@is.nyu.edu

As the borders between disciplines become less distinct, contemporary research grows increasingly interdisciplinary. Until recently, scholars limited themselves to a standard roster of indexes, books, journals, and other resources in their respective fields. The literature scholar would consult the MLA Bibliography (still a standard tool for literary research), specialized bibliographies, and the like; similarly, art historians would consult the Art Index, exhibition catalogues, artists' monographs, and other products of the art press. Like their counterparts in the humanities, researchers in science, medicine, and technology have their own highly specialized resources. In the not-too-distant past, only rarely did academics from one discipline venture into another.

In the last installment of this column (Summer 1996) we discussed basic techniques for searching very general databases. In this article, we’ll use three hypothetical research topics to demonstrate the use of scientific resources for the humanities scholar. All of the science titles discussed here are available in the Coles Science Center on the 9th floor of Bobst, while the humanities resources can be found in the General and Humanities Reference Center on the main floor.

"Bullseye" Interdisciplinarity

When a research topic is clearly split between the humanities and sciences, it is advisable to explore the literatures of both disciplines. For example, historians interested in current medical thinking on Vincent van Gogh might go directly to the source they’re most familiar with — the Art Index. While this is, at first glance, an art-history question, we’re really looking for medical professionals’ views on the issue. Undoubtedly some art historians will be aware of the relevant medical literature, and indeed it might be reported in art history monographs and journals.

Medical resources including Medline, the nation’s largest database of medical literature, provide a significant number of critical works on the medical history of the Van Gogh. These include “Vincent: the Self-Portraits” (Psychoanalytic Quarterly, Jan. 1993) and “The Wing of Madness: The Illness of Vincent van Gogh” (Canadian Journal of Psychiatry, Sept. 1993) among several others.

Historical Context

The polio epidemic had a tremendous impact on American society in the earlier part of the twentieth century. One of the major political figures of this century, Franklin Delano Roosevelt, was afflicted with the disease, and it is important to consider contemporary ideas about poliomyelitis when taking the measure of Roosevelt’s accomplishments. The researcher might begin with America: History and Life — one of the major indexes to the literature of US history. Indeed, this strategy yields a few significant articles including one gem, “FDR’s Extra Burden” (American Heritage, 1973). Like our previous example, however, this topic has medical as well as historical aspects, and the resources of both disciplines...
will help us to round out the picture. Two science and medicine databases in particular — MedLine and History of Science and Technology (HST) — yield a wealth of contextual information, including articles like "Dirt, Flies, and Immigrants: Explaining the Epidemiology of Poliomyelitis." (Journal of the History of Medicine and Allied Sciences, 1989). HST will also identify important monographs like A Summer Plague: Polio and Its Survivors (Yale University Press, 1995). The Medline, Health, and CINAHL databases (see sidebar) provide a number of additional citations dealing with aspects of the history of polio, the development of the poliovirus vaccine, and public health measures employed to combat the epidemic in the United States.

**Pieces of the Puzzle**

Science resources often provide a piece of the puzzle on a topic that fits squarely in the humanities. In the literature of music history, for example, the researcher might encounter references to the Fibonacci sequence, a numerical system that is based upon sums of integers and that has applications not only in music but also in architecture and computer

(continued on page 41)

### Databases at Coles Science Center

The following databases are available at Bobst's Coles Science Center located on the ninth floor.

- **AGRICOLA;** 1984–present *
- **AIDSLine;** 1980–present *
- **Biological & Agricultural Index;** 1983–present
- **BIOSIS (Biological Abstracts);** 1990–present *
- **Cancerlit;** 1983–present
- **CINAHL (Cumulative Index to Nursing and Allied Health Literature);** 1982–present
- **Health;** 1975–present *
- **History of Science & Technology;** 1976–present **
- **Inside Information;** 1992–present **
- **Medline;** 1966–present *
- **Periodical Abstracts **
- **PsycINFO;** 1984–present
- **PsycLIT;** 1974–present *

* Also available to remote users with DIALOG account. See schedule of DIALOG training sessions.

** Also available remotely via RLIN/EUREKA on the NYU IS account menu.

### Fall Training Sessions at Bobst

#### DIALOG Sessions

DIALOG is an online system of more than 200 databases providing up-to-date information on a wide range of topics. Anyone wishing to access DIALOG must first attend a training session. They are held in the East room of the Avery Fisher Center, 2nd floor, Bobst Library. Prerequisite: Current NYU ID.

- Friday, Sept. 20, 10:00–11:30 am
- Tuesday, Oct. 1, 6:00–7:30 pm
- Friday, Oct. 18, 10:00–11:30 am
- Wednesday, October 30, 10:00–11:30 am
- Thursday, November 7, 6:00–7:30 pm
- Friday, November 22, 10:00–11:30 am
- Wednesday, December 4, 6:00–7:30 pm

#### Other Classes

For information about what is covered in these classes, pick up a flyer at any of the Library's service desks or check out the Bobst Web page.

### Introduction to the Library:

- Tuesday, September 17, 7:15–8:15 pm
- Friday, September 20, 1:00–2:00 pm
- Monday, September 23, 7:15–8:15 pm
- Wednesday, September 25, 6:15–7:15 pm
- Monday, September 30, 10:00–11:00 am
- Thursday, October 3, 6:15–7:15 pm
- Monday, October 7, 7:15–8:15 pm
- Tuesday, October 15, 10:00–11:00 am
- Wednesday, October 16, 6:15–7:15 pm

### Library Research Strategies:

- Friday, October 4, 10:00–11:30 am
- Monday, October 14, 7:15–8:45 pm
- Thursday, October 17, 6:15–7:45 pm
- Tuesday, October 22, 7:15–8:45 pm
- Wednesday, October 30, 6:15–7:45 pm
- Friday, November 1, 10:00–11:30 am
- Monday, November 4, 7:15–8:45 pm
- Wednesday, November 20, 6:15–8:45 pm

### Internet Basics:

- Tuesday, September 17, 10am–12 noon
- Tuesday, October 1, 5–7 pm
- Friday, October 18, 10am–12 noon
- Wednesday, November 6, 5–7 pm

### Introduction to the World—Wide Web:

- Friday, September 27, 10am–12 noon
- Wednesday, October 9, 5–7 pm
- Friday, October 25, 10am–12 noon
- Tuesday, November 19, 5–7 pm
The Digital Arts

Carla Escoe (left); Heathe Birnbaum (above); Helen Rousakis (below).
A Gallery of Student Art Work from School of Ed Courses

The art works on these pages were produced by students in the Art in Media program of the School of Education's Art and Art Professions Department.

Several of the students — Miquel Bohner, Carla Escoe, Jim Jeffers, Tatiana Kronberg, Manuela Mozo and Helen Rousakis — participated in Computer Art 1 taught by Shelley J. Smith. In this course students focus on more advanced aspects of two-dimensional imaging using specific photo-manipulation and paint programs such as Adobe Photoshop and Fractal Design Painter, as well as object-based and page-layout software such as Adobe Illustrator and QuarkXPress. The students are encouraged to develop a meaningful body of work while applying the new procedures or processes introduced in the course to fundamental considerations of form and content.

Kathleen Ruiz taught two classes in the Art in Media program. In her Introduction to Computer Art course, the students learn to use the computer to augment and expand conceptualization and expression in making art. This is done through exposure to specific applications in both two-dimensional and three-dimensional art. The stu-

Fanny Chu (left); Peter Wohlsen (above)
Miguel Böhmer (top); Jim Jeffers (middle); Tatiana Kronberg (left)
students whose works appear from the Introduction course are Heath Birnbaum, Fanny Chu, and Peter Wohlsen.

In the Advanced Projects in Art and Media course, Ruiz’s students — here Jin A Lee and Yung-Te Wu — develop major art projects that are fully realized and represent an evolution from computer sketches to finished work. These works usually involve more than one discipline and application. The software covered enables students to create digital video, three-dimensional virtual forms, and virtual reality environments, while continuing to work in digital photography, painting, drawing, and printmaking.
Learning to Communicate through the Still Image (in Action)

Joe Citta
joseph.citta@nyu.edu

Visual Communication in the Image is the name of a pilot course in the Undergraduate Department of Film, Television, and Radio (TSOA) that was first offered in the spring of 1996, the first entry into the digital arts for freshmen in the department. Laura Clemons and I each taught one section.

Judging by the work produced by the students, the course has made a successful start. Since this is a pilot course, student feedback helps the instructors reshape the syllabus. Another section will be added this fall, and follow-up courses are also being considered so that students can continue exploring digital media in their storytelling.

The course will enable beginning film students to delve into communicating ideas, information, and stories through the image, which is basic to all filmmaking. Students in the class use the Macintosh computer and Adobe Photoshop along with other software applications to manipulate images. Macromedia Director is used to present their images. Sound editing software such as Macromedia SoundEdit16 is used as well. Students are encouraged to explore and “play” with their images, using the software. Though this is not a filmmaking course, some use the assignments to fashion opening credits and other sequences they will use later in films. The students are required to maintain a journal of their work, to use flow charts, and to storyboard their ideas. Using digital technology, students are offered a greater flexibility in image manipulation while learning the traditional framing, sequencing, lighting, and shot-making associated with traditional use of the still camera.

The pictures on this page are a sampling of student work from my section this spring. We’ve selected projects that show up well in stills; other projects depend so much on motion or interactivity or story lines that they cannot be shown to advantage in print. For those, you’ll have to look at NYU Web. The class has its own Web page, where you can view contributions from each student:

http://www.nyu.edu/classes/citta/soa/visual.

The apartment piece is a very ambitious interactive work by Jon Magel and Ravi Nandab, in which the user can explore an apartment by clicking with a mouse on menu items, pictures, or areas on a floor plan, and can view the room’s interiors using QuickTime VR – a technology that allows the user to view the environment in 360 degrees, as if standing in the middle of the room and looking around. (For more about QTVR, see page 40.) The long strip at the top of the page is a “stitched” photograph that is used to create the Quicktime VR movie.

The other pictures here are taken from a clever interactive usage of a QuickTime movie by Jon Chin. He has put together a collage of strongly colored video sequences; the user can create his own computer art by using the mouse to drag the smaller movie screen around the larger monitor screen, leaving a trail of superimposed images behind — almost like finger-painting with a QuickTime movie.

I am very excited about the use of NYU Web in instruction; this fall I plan to use it even more as a teaching tool.

(continued on page 41)
Apple’s QuickTime VR: Virtual Reality on a Virtual Shoestring

Johannes Paul Lang
ic@nyu.edu

Virtual reality — walking through computer-generated 3D environments, manipulating imaginary or distant 3D objects — is the stuff of dreams for many a multimedia enthusiast, and almost the stuff of many computer games. And there are serious uses for VR, as well (there will be an article on VRML, the Web language for virtual reality, in a coming issue of Connect). There are limitations, though: for the motions within the environment to be totally unlimited, either the environment has to be very sketchy, or the computer has to be phenomenally powerful. So you have to accept some limitations.

Now QuickTime VR (QTVR) software for Macintosh and Windows brings virtual reality to the home or office computer without any special equipment or extra costs. With QTVR, you can experience a 3D photographic or rendered representation of any person, place, or thing. Using your mouse and keyboard to rotate objects, you can zoom in or out of a scene, look around 360 degrees, and navigate from one scene to another.

This issue has still panoramas from several examples of QTVR. One is shown below; others are on pages 18–19 and 38–39.

QTVR Panoramas

QuickTime VR scenes (also known as panoramas) can be made from photographs, video stills, or computer renderings. Most scenes are made from photographs, as they provide the most realistic images.

To photograph a QuickTime VR scene, a camera (any kind of camera that produces still pictures) has to be placed on a tripod and carefully leveled, with the center of the lens exactly above the tripod’s pivot point. Then, depending on the lens you are using (any lens can be used except a fisheye lens; the results with standard 35mm cameras are pretty good, but for great VR panoramas, 15mm lenses work best), you rotate the camera and take pictures at regular increments (e.g., with a 15mm lens, you would use increments of 30 degrees).

After scanning in the pictures (or negatives), or downloading digital images if you were using a digital camera or had your photographs developed on a CD-ROM, you use special software (a program called MPW, contained in the QTVR Developer Kit) to “stitch” the single images together into a single long panorama. While stitching, QuickTime VR warps the images. Then it automatically maps the overlapping features and stitches the images together into a single large PICT file; you can then edit the image with a program such as Adobe Photoshop before creating the final QTVR scene.

Warping the images makes the stitching possible, but it also creates distortion. Straight lines become curved; everything looks bent. When you open a QTVR scene, though, the QuickTime VR Player corrects the distortion, unwarping the part of the image displayed in the Player window. As you look around, the software keeps up with your movements, unwarping and displaying your view of the panorama on the fly. The player allows you to zoom in and out, and to move up and down a few degrees. You can also link more than one panorama together into a multi-node panorama.

QTVR Objects

Unlike scenes, in which you navigate one panoramic image, or several, an object is composed of a number of images each showing the object from a slightly different angle. As you turn the object or...
tilt it up and down, the software responds to your movements, displaying the images as a QuickTime movie. In other words, QuickTime VR objects are navigable movies. Object movies and panorama movies can be combined. In a museum installation, for instance, you might move through the space, then “pick up” an object and turn it while you examine it.

**Availability**

The software for playing back QTVR movies is free. You need to have QuickTime installed on your PC or Mac, and you have to use a small utility program (QTVR Player) to watch the movies on your machine. All the software can be downloaded at no charge from the Web at http://quicktime.apple.com. More information on QTVR can be obtained at http://qtv.quicktime.apple.com.

At same Web address, you can also obtain free software tools to create QTVR object movies and to transform a panoramic picture into a QTVR scene. If you get hooked and want to progress to advanced QTVR creations, though, you will need to purchase the QTVR Developer Kit, available from Apple Computer.

**Interdisciplinary Research (continued from page 33)**

Science. To research the musical applications it is reasonable to expect that the vast majority of information will come from indexes such as the *Music Index* and *Muse*, and a recent search produced thirty relevant hits from the latter music index alone. What’s missing from these sources, however, is an explanation of how the sequence was formulated and how it works mathematically. “On Approximation Methods of Leonardo Fibonacci,” from the journal *Historia Mathematica* (vol. 3, 1976) provides this important piece of the puzzle and it too comes from the *History of Science and Technology* database.

These hypothetical research problems, selected to showcase some of the resources offered by Bobst Library’s Coles Science Center (9th floor), represent just a few of the possibilities available to the researcher. Once an interdisciplinary perspective is taken, the possibilities are limited only by the imagination of the scholar.
Statistics and the Social Sciences

Statisticians' Lib: Using Scanners and OMR Software for Affordable Data Input

Frank LoPresti with Zvia Segal Naphtali
frank.lopresti@nyu.edu • naphtali@is2.nyu.edu

Falling prices for reliable scanners, along with improved software, should make life simpler for researchers in the social sciences. While programs like like SPSS and SAS satisfy most needs for statistical analysis, they depend on the existence of good, clean datasets. You can now create such datasets using Remark Office OMR (optical mark recognition) software and a low-priced scanner. I have been using Remark with a two-year-old Pentium-based computer and an HP 4P scanner for affordable, robust, versatile input of questionnaire data to file.

Before I describe how it's done, let me give a short history of data input. That will give you an idea of just how big an improvement this style of input is.

The Data Bottleneck

For years, people who do statistical analysis have been designing questionnaires, getting them filled out by respondents or interviewers, and then somehow wrestling the data into a computer. The questionnaires might be a department's student evaluations, a perfume company's evaluation of its packaging and ad campaign, or a PhD candidate's thesis research. But always, the most problematic aspect of data collection has been getting the data from the questionnaire into the computer.

With the first computers, much of the data was input by creating decks of punched cards. While this process allowed one to create the necessary computer files, it was subject to input error and thus had to be verified. To verify the data, one created two hypothetically identical decks and compared them to each other; any discrepancy indicated an error. One then went back to the questionnaire to find the right value — and then had to punch a new card to correct the mistake. Although some keypunch machines allowed you to copy 79 of the 80 fields and edit the one incorrect punch, the process was still time-consuming and therefore expensive. Only well-funded researchers could afford to verify; others merely “checked for errors with a friend.”

Over the years, we have seen developments to aid in the task. Keypunch sessions were replaced by input sessions at mainframe terminals. Using primitive text editors on mainframe computers, researchers typed line after line of questionnaire responses to create a file. Correcting an error now meant revising a single line, not an entire card.

A great improvement came with personal computers. With spreadsheets and wordprocessors, data could be entered with relative ease, with or without verification. I was excited when laptop PCs came out and packages like DE/SPSS were developed. DE (Data Entry) allowed one to create screens with active fields for data to be typed in by the user. The data ended up in SPSS (Statistical Products and Service Solutions) files. Unfortunately, this method of data collection has a fairly high overhead — it requires a PC for each collector of data. It is useful in many controlled situations in a social-science lab, where one machine can serve for many experimental
Test Questionnaire for Remark Demo on November 15

Your ideas and opinions matter a lot to us. The editors of Connect need your help! The questionnaire is designed to get feedback and suggestions on how this publication might be improved.

The completed questionnaires will be scanned during Frank Lopresti’s talk on November 15. (For details, see the schedule of classes at the back of this issue.) The results will be published in a future issue of Connect.

Please fill in the boxes like this O - not like this O or this O .

Age
Sex: male O female O

Department

Academic status Undergrad O Grad O Faculty O Staff O

Where do you get Connect?
I get it in the mail O
I pick it up at an ACF lab O
Other

We would like to know which articles you read and how you rate the quality
Check as many as you read

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Overall, is this publication useful to you in your work?
Not useful O Somewhat useful O Very useful O

What kind of articles would you like to see us publish?

Thanks for your response! Please mail the completed questionnaire (flat, in a large envelope) to Connect, Room 324, Warren Weaver Hall, mail drop 0711.
subjects, one after another.

My mentor taught me that the task of creating a clean data set from questionnaires should be budgeted the lion's share of a project's resources. In the early days of computing, data entry was a substantial and ugly task.

**Automated Data Entry**

At about the same time that punch-cards were developed, another technology came into use that allows multiple-choice forms to be read. These forms are probably familiar to most people from tests like the SAT. I took tests on these forms back in 1955.

Originally, the answers could be “read” by the computer because the soft pencil lead that filled in the bubbles or squares conducted electricity between matched pairs of minute electrodes. More recently, the marked forms have been scanned optically; the technology is still expensive and difficult to use. Hardware dedicated to this limited task costs several thousands of dollars. It is used along with software that allows us to design our own forms — a difficult skill to learn. Otherwise we pay specialists to design the forms or we buy generic answer sheets that can be used along with a separate questionnaire.

Such a solution might be satisfactory for a large academic or administrative department, but it is of limited flexibility and is beyond the means of most individual researchers and small groups.

Since the data go from the form directly to the computer, traditional data verification isn't needed. And in testing situations such as the SAT, the subject can usually be held responsible for poorly filled out forms. But in other situations, ambiguities resulting from partially filled-in bubbles, partial erasures, and crossed-out answers have to be resolved by an operator who cleans up the form with eraser and pencil — an often costly intervention. Over the years, this technology has made few inroads at NYU as a data-input method.

**Will OCR Help? Or Maybe OMR?**

Optical character recognition (OCR) is a technology that works quite well on uniformly typed or typeset material, though the user must still be prepared to correct several errors per page. But on handwritten material, it is nearly useless; though it can be “trained” to recognize a given person's handwriting, that trainability would be no help in deciphering a series of short questionnaires filled out in different hands. Nor is it intended for reading forms and questionnaires. Thus, OCR wouldn't be useful to survey researchers.

Traditional OMR (optical mark reading) software is too expensive, and current OCR isn't much help. The Remark Office OMR software for Windows 3.1 fills the gap by recognizing filled-in bubbles (and even barcodes) on user-defined forms, and by allowing an operator to complete the data files by typing in the data from handwritten responses.

**How It's Done**

Once the questions have been developed — a major undertaking not discussed here — the researcher can use any wordprocessor to design the questionnaire itself.

Remark allows several types of answer fields to be used in the design. Many questions can be fully automated using traditional bubble OMR fields — the mainstay of automated forms, allowing easy marking for true-or-false responses, multiple-choice questions, or a rating of ranges, as from best to worst. (The “bubbles” can be virtually any shape or size.) Barcodes can also be used — most likely for ID numbers to be pasted in, but possibly attached to images that could be inserted. Additionally, open fields — blanks — may be used. These would allow a respondent to write in a name or country of birth, say, rather than trying to encode a 10- or 15-letter name in a field of bubbles 26 high.

There's considerable freedom in the design of the questionnaire for Remark, since the researcher can essentially tell the software where on the form to look for answers, and what to look for. The “bubbles” to be filled in can be of any shape desired and in any array; the blanks can be of any length. You can also place tick marks at the corners of each page to help orient the scanner.

The next step is to create the template — to tell the software what to look for. First, you scan in a clean, blank copy of the entire questionnaire. Then, you analyze each page: using the mouse, you draw a rectangle around each field to be read, and indicate whether the answer is recorded in OMR bubbles, written on a blank line, or pasted in as a barcode. At this point, you assign the meaning for each array of bubbles — numeric range (Likert scale) or categoric (true-false or multiple-choice). You also point out the tick marks if you’ve used them, which helps the software to align the scanned form properly.
After the forms have been filled out, we are ready to get the data into the computer. Basically what happens now is that the forms are scanned and the software extracts the data. The scanner (preferably with an automatic page feed) scans in around four pages per minute. After the physical forms are scanned in, the operator normally doesn’t handle them again; they filed and, emergencies aside, forgotten.

On the computer monitor, the operator sees a window like a spreadsheet, with each row representing the answers from one questionnaire, and each column representing a variable. (Each question may produce one or more variables, depending on the design.) If a cell is highlighted and has no value, the operator needs to intervene — either because there was a problem reading a bubble field (too many bubbles marked, or a messy scan) or because a handwritten answer needs to be typed in. Using the mouse, the operator double-clicks on the highlighted cell, an action window opens, showing an image of the unresolved answer. In the case of an

Creating a template in Remark: After scanning in a blank questionnaire, we draw rectangles around the fields we want to capture; that has already been done in the page shown on the left of the screen. Here we are editing the OMR field in the larger rectangle; we specify that it is a 4x20 array of bubbles, indicate where the labels are, and type in the table values (Poor, Fair, etc.). Once all fields are defined, the template is ready to read the filled-in questionnaires.

Course on Survey Design and Analysis
Professor Naphtali will explore the uses of Principia Remark software in questionnaire design and implementation in a workshop, Surveys and Interviews by Example, which meets on three Fridays this fall (Oct. 25, Nov. 1, Nov. 15) from 9:00 am to 2:00 pm.

For more information, contact Zvia Segal Naphtali at 212/998-7405 or at naphtali@is2.nyu.edu, or go to http://www.nyu.edu/classes/naphtali/ on NYU Web.
Hierarchical Linear Modeling with HLM/2/3

Robert A. Yaffee
robrt.yaffee@nyu.edu

Hierarchical linear modeling (HLM) enables a researcher to study multi-level systems simultaneously. Some social scientists study individuals in context, so the individual and the situation can be examined at the same time. An economist might wish to study micro- and macro-level variables and their interaction, such as the macro-level variables that influence the output of the firm. An organizational sociologist might wish to study the individual within the organization. Other scientists might wish to study individual growth models or perform meta-analyses. HLM is the statistical analysis of the multi-level models.

To help researchers perform hierarchical linear modeling, NYU’s Academic Computing Facility obtained a license for HLM/2/3 from Scientific Software in Chicago. HLM/2/3 consists of two statistical packages, HLM2 and HLM3, designed to perform two- and three-level modeling, respectively.

Consider educational situational analysis. An educational sociologist may want to investigate the effect of both individual (micro-level) and school (macro-level) variables on academic achievement. Surveying a sufficiently large selection of schools, the researcher may study achievement as a function of the personality characteristics of the students at the lower level and as a function of organizational characteristics of the schools at the higher level. For each school surveyed, a regression equation is computed for reading achievement as a function of psychological characteristics. Each equation possesses an intercept and slope for each independent psychological variable. For the whole set of schools, there is a complete set of regression equations. Using this complete set, micro-level psychological effects on educational achievement (reading, in this case) can be assessed.

At the higher, macro level of analysis, saved intercept and slope values form randomly distributed outcome variables of statistical models of higher-level effects. If there is one intercept and one slope coefficient, there are two equations at the higher level. One set explains the random intercept at the school level and the other set explains the random slopes at the school level. These equations may be regressions, analyses of variance, or analyses of covariance. If students are the units of analysis at the individual level, schools might be the unit of analysis at a higher level. Examples of school-level variables might be urban or rural, private or public, and proportion of minority students. If there is a yet higher level of analysis, the variables at this level might pertain to the whole school district, such as climate, population density, or region of the country.

Separating the individual effects from either contextual or compositional effects at a higher level is not difficult. A researcher may indicate contextual effects by using two effects. For one effect, he may subtract the school mean from the individual score on an independent variable. This effect provides for the individual deviation from the school mean. By including the group mean and that individual contextual effect in the equation, the researcher has corrected for the school mean. The result is the data on individual deviation from the mean.

individual deviation score, the researcher may perform contextual or situational analyses. The compositional effect (Be) is the extent to which the organizational-level relationship (Bo) differs from the individual-level relationship (Bl): Be = Bo - Bl.

Estimating the parameters of the models is performed by several algorithms. Randomly varying level-1 coefficients are estimated with empirical Bayes, while level-2 coefficients with complex error structures are estimated with generalized least squares. Maximum likelihood estimation via the EM algorithm is used to deal with the unbalanced nature of the variance components. Residuals of the level-1 coefficients are based on ordinary least squares, so that residual analysis is required.

As a computer program, HLM/2/3 has a few drawbacks that might daunt new users. Real limitations with file input, missing data, multilevel weighting, and graphical analysis of residuals could plague a student. The program restricts input to only two types of files: ASCII or SYSTAT input files. HLM/2/3 also has limitations in handling missing data. It assumes complete data and can tolerate missing data only on level-1. It has no provision for replacing missing data. Although HLM/2/3 provides for either listwise or pairwise deletion of cases in computations, pairwise deletion of data can lead to insurmountable statistical problems. Consequently, the manual for this version suggests using listwise deletion. It is necessary before entering the data to be sure that the level-2 file contains no missing data, for the HLM/2/3 program will read such missing data, as legitimate values.

Owing to the multilevel analyses, the user will have to know how to design the weighting for his study, which will depend on the nature of the sampling plan as well as the conceptual nature of the project. The program allows for two sets of weights that may be used together and may allow nesting of lower levels within upper levels. If complex sampling plans are used, the weights will have to be computationally tailored to the sampling plan and study design by the statistician in the data file (serious researchers should consider the use of Survey Data Analysis (SuDaAn) for this purpose).

Another problem with HLM/2/3 is the necessity of residual analysis with ordinary least-squares residuals computed on level 1. HLM/2/3 has no provision for graphical analysis of the residuals, which are subject to homogeneity and normality requirements. For these types of tests, the researcher will have to interface the data files with other statistical programs in order to be sure that his models are valid.

Notwithstanding these limitations, HLM/2/3 is a

(continued on page 49)

Extrapolative Forecasting: Exponential Smoothing with SPSS and SAS

If a researcher interested in longitudinal analysis has a series of data points over a time span, there are several methods he may use to define the nature of this series. Time-series analysis may be divided into five basic classifications: extrapolative, decomposition, Box-Jenkins, spectral, and dynamic regression models.

On the basis of a model of a given time series, future values of a series may be generated as a forecast over a chosen time horizon. The researcher first graphs the data and then divides it into initial and validation datasets. After formulating a model on the basis of the initial dataset, he compares its predicted values to the actual values of the validation dataset. The forecast is fit to the validation data, and residuals of different models are compared to determine the best-fitting model. The researcher can then use this model to forecast later developments in the time series. In this article I’ll address the highlights of extrapolative analysis, the principal techniques of which are incorporated into both SAS (Statistical Analysis System) and SPSS (Statistical Products and Service Solutions). ACF offers SPSS/Windows 6.12 and SAS/Windows 6.10 on its local area networks, and SPSS/Unix 5 and SAS/Unix 6.09 on its RS6000.

Extrapolative methods consist of a variety of exponential smoothing techniques. First, there is simple exponential smoothing, with or without a constant (a baseline level for the series). Second, there is Holt exponential smoothing with a trend (a deterministic tendency over time) for long term patterns. Third, there is Winters exponential smoothing, which involves a linear or quadratic trend with a multiplicative or additive seasonal (regular variation around the trend) component. There is also stepwise autoregressive exponential smoothing for more short-run fluctuations.

Exponential smoothing methods are typically cheaper, easier to use, and need less data than the fifty or more equally spaced values over time required by the Box-Jenkins techniques. For these reasons, smoothing methods are often applied to production, sales, and inventory control where strong consideration is given to keeping costs down and profits up; however, if seasonal variation is present, typically at least two years of data are necessary for both exponential smoothing and Box-Jenkins analysis. Dynamic-regression models are particularly good for development of social-science theory, insofar as they can handle more independent variables (hypothesis of simple
US Gross Value of Products Forecast
Federal Reserve Board 1996 data

Billion from White House Economics Briefing Room

A forecast of U.S. GVP linear trend with no seasonality is graphed in SPSS and SAS. The 1996 data for graphs of gross value of products for the United States economy were obtained through the aid of the White House Economic Statistics Briefing Room and the Bureau of Labor Statistics. Statistics indicating the health of the economy and society are now available at White House World-Wide Web site. Link to it through the ACE Statistics and Social Science Web page, at http://www.nyu.edu/acf.isoacscil.

Exponential smoothing is based on the concept of moving average. If the researcher computes a mean of the first twelve data points (of say fifty), records it, moves one time period ahead from the previous starting position to compute the average for points two through thirteen, and then reiterates this process until the end of the series is reached, the new data series recorded is called a moving average of order twelve. The moving average smooths out irregular fluctuation, and a double moving average — a moving average of a moving average — smooths it out even more.

Exponential smoothing represents an improvement on moving-average smoothing. Simple moving averages give more weight to mid-range data values, whereas exponential smoothing has the decided advantage of giving more weight to recent observations and exponentially smaller weight to historically distant observations. A simple exponential forecast for one time period in the future is the forecast of the current value plus the average error. The average error of the series at the present time is the quantity of the value of the series at the present time, divided by the total number of values, minus the quantity of the forecast of the current value, divided by the total number of values.

Coupled with this moving-average concept, the Holt model accommodates a constant, linear trend for long-run forecasts, or a quadratic trend (for projections of a recent change in the series) in SAS. SPSS offers the option of a dampened trend (one that tapers off) instead of a quadratic trend. The Winters model accommodates seasonal fluctuations in the series as well. Both SPSS and SAS allow for a multiplicative as well as an additive Winters model. Both SPSS and SAS permit custom-designed smoothing and forecasting.

The relative fit of these models is assessed by the sum of squared errors. SAS and SPSS produce a wide variety of measures of fit; the model with the best fit is the chosen model.

Extrapolative forecasting in SPSS and SAS share vast similarities of capability. Both can handle additive as well as multiplicative seasonal models; both handle no trend,
linear, and options. SPSS has an exponential trend option while SAS has a quadratic trend option each program provides for fixing chosen parameters; and both allow the user to custom-design models. Both SAS and SPSS have stepwise autoregression algorithms that may be used in forecasting. (With the stepwise autoregression, a time trend is found and the differences between the actual data and the trend line are computed. These residuals are then fit using autoregressive estimation. According to the SAS ETS User's Guide, this procedure is usually near optimal and computationally inexpensive).

Despite these similarities, there are important differences between SPSS and SAS. For automatic parameter selection, SPSS has a grid search capability which finds and utilizes optimal parameters based on the minimum sum of squared errors for each of these parameter values. With SAS, forecasting is not so automatic unless the researcher has a competent knowledge of SAS macro language to set up the automatic forecasting procedures. (You can find the macros for this automation in Brocklebank and Dickey, Forecasting Techniques Using SAS/ETS Software Course Notes). SPSS is easier to graph but SASGRAPH has more power and flexibility in its production and presentation.

SAS and SPSS could be improved by the addition of certain features. Although SAS lacks fully automatic detection and estimation of seasonality and trend parameters, SPSS does have a provision for a grid search for the best trend and trend parameter. While both SAS and SPSS possess the basic methods, neither SAS nor SPSS includes all of the techniques. They lack such methods of smoothing as Trigg's tracking signal monitoring system, Chow's adaptive control method, and Harrison's harmonic smoothing, for example. More specialized packages for forecasting, like Sybil Runner (by Lincoln Systems in Westford, Mass.) and Forecast Pro (by Business Forecast Systems, Belmont, Mass.) possess these capabilities. Compared to the graphing capability in some specialized packages, forecast graphs complete with forecast intervals are cumbersome to construct in SAS and not automatically generated by SPSS. Even though SPSS graphs are generally easier to construct here, they typically do not have the same power and flexibility as those of SAS. Although SPSS can produce the forecast values, it does not automatically produce the forecast interval limits, with the exponential-smoothing procedure. SAS can generate both forecast value and forecast interval limits, so its graphing of forecasts tends to be more sophisticated than with SPSS. Neither SAS nor SPSS at this point in time has automatic comparison of results of different runs.

—Robert Yaffee

HLM/2/8 (continued from page 47) program that allows sophisticated multilevel contextual analyses, including repeated measures to perform analyses of individual growth, as well as designs to perform meta-analyses. It may well eventually become part of the standard statistical repertoire of social scientists. If you want to use this package or need help with its application, contact me by phone at (212) 998-3402 or by e-mail to robert.yaffee@nyu.edu.

Matlab (continued from page 21) particular field of application, can build a customized environment with new commands and new toolboxes.

Because of this powerful combination of a user-friendly development environment and a high-performance numerical-computing kernel, Matlab has become the software of choice for thousands of scientists and engineers around the world.

The choice of mathematics software for an individual user, however, depends to a great extent on the field of application. For example, Mathematica may be a better general-purpose mathematical-computing system; and Maple is regarded as the leading software for symbolic computing. We hope to have similar discussions about these systems in the coming issues. Further information about Matlab can be found online at www.mathworks.com.

SAS Licenses: New Medium, New Fee

The ACF is changing the way that it licenses and distributes SAS to researchers at NYU. Starting this fall with version 6.11, new versions of SAS will be distributed on CD-ROM. The single license price of $300 includes both the Base and all additional modules; the yearly renewal fee is $150. This represents a sharp departure from prior years, when licensees were charged one fee for the Base set and an additional amount for each extra module.

Those who already hold a current license for SAS for Windows can upgrade to version 6.11 by paying the $150 renewal fee. As in prior years, those who have a license for SAS for DOS must pay the new purchase price.

To order the new version of SAS, contact me at the ACF HelpLine, 998-3333. Please allow several days for delivery.

—Jane DelFavero
jane.delfavero@nyu.edu
The back-to-school season is upon us and with it the special sales that our vendors offer at the beginning of the new academic year. It’s a great time to be shopping for a new computer or peripheral, or to upgrade your current system. The Computer Store is filled with new products and special savings, so stop by and see us now.

Mac and IBM Offer Savings Packages

Special savings are available on Apple printers when you purchase a selected printer with one of the back-to-school Power Macintosh configurations. Buying them together would enable you to save over $100 on the cost of the printer. For instance, a personal Laser Writer 300 is only $475 with a Power Mac 7600/132. These savings are available on a variety of printers, but only when purchased with one of the back-to-school systems.

The newest Power Macs with increased processor and CD-ROM speeds are available at the Computer Store as back-to-school specials. The Power Mac 7600, for example, is now running at 132 MHz and comes with an eight-speed CD-ROM drive. With the exception of the all-in-one Power Macintosh 5260, all the new Power Macs feature the eight-speed CD drives for enhanced functionality.

IBM’s offering is the IBM 365 E and ED series computers — both available at the Computer Store. These laptop computers feature a 586 100Mhz processor, 10.4-inch dual-scan display, 8MB RAM (expandable to 24MB), a 540MB hard drive, and Windows 95. The 365E is currently selling for $1755 and the 365ED, which has a 4X CD drive, is currently $2433. If you need a lightweight, dependable laptop, you might want to check these out.

Clones! Clones!

Many students and faculty members have requested that the Computer Store carry a PC clone. Until recently, we had not found one with the features and level of reliability that our customers expect from the products we sell. Over the summer, we began selling Dynex computers at the Computer Store and have been very pleased with the pricing, functionality, and reliability of this line.

The back-to-school configurations for the Dynex models come with a Pentium processor running at 100Mhz, with 16MB RAM, 1.6 GB hard drive, 8X CD-ROM drive, and 14-inch monitor for $1890. The 133MHz configuration with 16MB RAM, 1.6 GB hard drive, 8X CD-ROM, and 15-inch monitor sells for $2185. You can also design your own computer and Dynex will assemble it to your specifications. The components Dynex uses are nonproprietary and of the highest quality, so adding options or upgrading should be easy. The Dynex computer has been thoroughly tested for performance and reliability, is compatible with the NYU Net, and comes with the manufacturer’s three-year warranty.

Peripherals

Iomega, manufacturer of Zip and Jaz drives, is offering a variety of back-to-school rebates. There is a $50 rebate available when you purchase a Zip drive before September 15, and a $20 rebate on a 10-pack of Zip cartridges during the same time period.
Global Village is also offering a $50 rebate on the purchase of their Platinum line of modems. Please see the staff in the Computer Store for coupons and other rebate offers.

Software

In our software department, Corel is offering their WordPerfect suite (WordPerfect, Quattro Pro, Presentations, Envoy, CorelFlow, Sidekick, and Dashboard '95) for only $39.95 during the fall. Borland is offering a free copy of Quicksite with the purchase of Delphi, Paradox, C++, or DBase. There is a MacBasics bundle, which includes RAM Doubler, Speed Doubler, Conflict Catcher, Anti-Virus, Norton Utilities, and Adobe Type on Call, for $120. At this time of year there are lots of savings in our software department, so please stop by and see what we have to offer.

The Latest Information on NYU Web

Over the summer the Computer Store has set up a Web page with up-to-date pricing information and spec sheets on many of our products. Please check it out, along with the rest of the NYU Book Centers information at http://www.bookc.nyu.edu, or access our information from NYU's home page. If you have any comments or suggestions about our Web pages, we would be glad to hear from you.

Unicode (continued from page 16)

the code-space provided by Unicode. To purists, to omit any character or script would compromise a truly international system.

• Data Input. Considering the number of characters in a 16-bit script such as Japanese and Chinese, keyboards at best can hold only a fraction of the characters, even utilizing special key-combinations. Such systems use input method editors, IMEs, to act as a second layer of transmitters. While a tedious process, advances in touch-screen and pen-based technologies have given IMEs a big boost.

• Font size. Since Unicode is concerned only with identifying and producing characters, and not with how they appear, any font can be used for display and printing. The disadvantage, of course, is that to have at least one font that supports all scripts described in Unicode, one needs substantial hard-disk space. A complete Japanese font set can occupy megabytes of space, compared to the 40 to 60 kilobytes required for a typical Roman font.

• File size. Will Unicode necessarily double the size of each text file? Yes. Will the larger size be of consequence? Less and less — as networks speed up, even a double-length text file will be transmitted fast enough; and in any case, even a substantial text file is minute compared to the sound, image, and video files that are now routine on the Internet.

Despite these hurdles, Unicode may soon become the most common multilingual character-coding system. Support for multiple-language use is quickly growing. New operating systems — AT&T's Plan 9, Windows NT, Novell's Netware 4.01 Directory Services, Sybase's Gain Momentum, and Apple's Newton already support Unicode. Projected Mac OS 8, Copland, and updates of Win95 will also be Unicode-compliant. In addition to operating systems, emerging 32-bit development kits and compilers will be supporting Unicode characters.

Promising large-scale implementations of Unicode are also under way. The National Library of Australia deployed a set of software tools, MASS, to provide a multilingual environment for clients and developers. The library hopes to catalogue its multinational archive for continental and transcontinental usage. MASS (Multilingual Application Support Service), was developed by the Institute of Systems Science at the National University of Singapore. Using an X-terminal emulator program called UXTERM, clients can input, display, and search data in over 150 languages.

Another example comes from the language development team of Duke University. WinCALIS (Computer-Assisted Language Instruction System for Windows) is an extensive Unicode-based program designed by language teachers for language teachers. Currently used by the computing labs of Duke, Vanderbilt, Tufts, Rice, and James Madison Universities, WinCALIS is proving itself to be a strong model for language instruction.

The engineering of Unicode is not a purely technical issue. The phenomenal growth of personal computer usage around the world, along with the dramatic shift of hardware and software development away from North America, has changed the way we look at computing. New questions have been raised: Will there be a continuation of parallel standards or will we have a new all-encompassing standard? One question has already been answered: old standards will have to change.
ACF Classes, Workshops, and Talks

General Information
All members of the NYU community are welcome at the ACF’s classes, workshops, and talks. There is no charge for any of the ACF instructional sessions, but participants should have a current, valid NYU ID card. In some cases, as noted just after a course description, an appropriate computer account is required.
Seating capacity: To avoid overcrowding, we have listed maximum seating capacities for each class. We recommend that you arrive a few minutes early in order to secure a spot.
Classes by arrangement: Faculty members may sometimes arrange special classes for a specific course or research group. These do not necessarily have to be given at an ACF site. For classes in statistics call Frank LoPresti (998-3398); for other applications, call the ACF HelpLine (998-3333).

Computer accounts: There are several kinds of ACF accounts, which give the holder access to different machines and services. For more information, see pages 53 and 60, or call the ACF HelpLine at 998-3333.

— Vincent Doogan
doogan@nyu.edu

Vincent Doogan is the ACF Associate Director for User Services.

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To Get Your NYU-Internet Account

If you are an NYU faculty or staff member, or a student enrolled in a degree or diploma program, you are automatically eligible for an NYU-Internet Account. These accounts provide e-mail and a set of text-based tools for accessing, from your computer, a wealth of information resources at NYU and around the world. You can use your account to communicate with colleagues via electronic mail, network discussion groups, and NYU Web, to explore the riches of the World-Wide Web, and to download Internet treasures to your own computer.

To get an account, simply bring your NYU ID card to any ACF computer lab (locations are shown on the map on page 61). Faculty and staff members may come instead, if they prefer, to the ACF Accounts Office (Room 305, Warren Weaver Hall), between 9:00am and 5:00pm.

Connect: Academic Computing and Networking at NYU Fall 1996  53
Choosing Your Computer
(Mac and PC)
This talk is intended to help you select the best personal computer for your needs. It will cover the basic components of a computer, as well as the other hardware required for various tasks. We will also discuss how you can assess your particular needs to establish your criteria for selecting computer tools. Taught by staff from the NYU Computer Store.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Fridays 12:00-1:30
September 13
October 4

Understanding Your Computer
(Mac and PC)
This introductory talk will help you learn about your computing equipment. It will focus on such basic operations as setting up your computer, setting up a printer, and configuring your operating system with the fonts and tools you need.

Discussion will include troubleshooting techniques and other strategies for dealing with problems you might encounter while using your PC. Taught by staff from the NYU Computer Store.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.

2. For PC Owners
Fridays 12:00-1:30
September 27
October 18

Using a Mac at an ACF Lab
(Mac)
A hands-on introduction to the Macintosh computer. Topics include the ergonomics of proper computer use, working with the graphical user interface, understanding the file system, choosing printers, file servers, and other devices, and launching software applications. ACF staff.

Education Building, 2nd floor
Seating capacity: 25; first come, first served; hands-on class.
Tuesdays 11:00-12:00
September 10, 17
Saturdays 11:00-12:00
September 14, 21

3rd Ave. North Res. Hall, level C-3
Seating capacity: 15; first come, first served; hands-on class.
Mondays 11:00-12:00
September 9, 16
Wednesdays 1:00-2:00
September 11, 18

Using a PC at an ACF Lab
(PC)
A hands-on introduction to the PC—the “IBM-type” personal computer. Topics include the ergonomics of proper computer use, working with the user menus on the PCs in the labs, understanding the file system, choosing printers and file servers, and launching software applications. ACF staff.

Tisch Hall, room LC8
Seating capacity: 24; first come, first served; hands-on class.
Wednesdays 11:00-12:00
September 11, 18

14 Washington Place, basement
Seating capacity: 15; first come, first served; hands-on class.
Thursdays 11:00-12:00
September 12, 19

3rd Ave. North Res. Hall, level C-3
Seating capacity: 15; first come, first served; hands-on class.
Mondays 1:00-2:00
September 9, 16
Wednesdays 11:00-12:00
September 11, 18

Using Unix at ACF
(Unix)
An introductory class on using the Unix operating system, variants of which run on several different types of computers at the ACF. Most are accessed at ACF labs through PCs, Macs, and terminals, but the SGI workstations also use Unix. The basics will be covered: logging onto the host machines, organizing files, editing text, printing files, and using applications. See also Using Unix: Special Topics, under “Computers and Operating Systems.” ACF staff.

ACF Unix account required.
Tisch Hall, room LC8
Seating capacity: 24; first come, first served; hands-on class.
Wednesdays 11:00-12:00
September 11, 18

14 Washington Place, basement
Seating capacity: 15; first come, first served; hands-on class.
Fridays 1:00-2:00
September 13, 20
Using Unix: Special Topics (Unix)
An intermediate talk on using the Unix operating system for those who have attended Using Unix at the ACF (see under "ABCs of Computers") or have equivalent knowledge. Topics include file permissions, path, aliases, pipes, redirect, filename completion, command substitution and a number of commonly used Unix utilities such as man, vi, and grep. Ed Nichols.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Wednesday 12:00–1:30
October 16

Introduction to the Internet and Your ACF E-Mail Account (NYU-Internet Account, Unix)
This talk-demonstration will introduce new and prospective holders of the NYU-Internet Account to its menu interface and components. Electronic mail concepts and commands will be explained and demonstrated. The account runs on ACF's DEC minicomputers and is connected to NYU-NET and the worldwide Internet. Lisa Barnett and Vincent Doogan.

Warren Weaver Hall, room 102
Seating capacity: 50; first come, first served; talk/demonstration.
Fridays 12:00–1:30
September 13, 20
October 4, 18
November 1, 15

NYU-NET Software (Mac, Windows)
This talk is intended for those who have TCP/IP connections to NYU-NET from their office or home. The TCP/IP and PPP protocols will be discussed, and software based on these protocols will be demonstrated. The software to be discussed includes Netscape, Eudora, and Fetch. ACF staff.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Wednesday 12:00–1:30
September 18

News Groups and Gopher (NYU-Internet Account, Unix)
A presentation of two Internet services. News groups are special-interest discussion forums on the Internet, and Gopher is an information retrieval protocol in a menu format. Using the NYU-Internet Account, the speaker will introduce basic concepts and demonstrate the command sets of Gopher and Tin, a newsreader utility. ACF staff.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Wednesday 12:00–1:30
October 9

Uploading & Downloading Using Kermit
A useful class for those who want to do their word processing and other work on their desktop PCs or Macs, and then send the files by E-mail or upload them to VMS or Unix machines, or need to download files from distant machines to their own computers. Telnet, FTP, and Archie will be discussed. Johnny Chung.

1. For PC Users
Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Wednesday 12:00–1:30
September 18

2. For Macintosh Users
Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Wednesday 12:00–1:30
September 25
World-Wide Web Browsing and Publishing
The World-Wide Web is a Hypertext interface system for publishing documents containing text, sounds and images. These documents are browsed with software such as Netscape and Lynx. Hypertext Markup Language (HTML) is the mechanism for preparing homepages and other Web creations. ACF staff.

1. Introduction to the World-Wide Web
(Mac, Unix, Windows)
Lynx and Netscape are programs that allow you to browse World-Wide Web servers --- repositories of digital images, sounds, and text. The evolution of these easy-to-use browsing tools has made it possible for even novice computer users to locate desired information resources from across the Internet. This talk will feature a demonstration and explanations of basic concepts and commands.

Warren Weaver Hall, room 102
Seating capacity: 50; first come, first served; talk.
Friday 12:00–1:30
September 27

2. Introduction to HTML
Beginning with the basics of what an HTML file looks like, the speaker will explain the structure of a document and its HTML elements. Sample pages will be analyzed and constructed. Topics will include tags, links, URLs, and embedded graphics.

Warren Weaver Hall, room 102
Seating capacity: 50; first come, first served; talk.
Fridays 12:00–1:30
October 11
November 8

3. Advanced HTML Topics
This session focuses on including images on your Web pages, and "image maps," frames and Java will be explained. The do's and don'ts for writing and designing Web Pages will also be discussed.

Warren Weaver Hall, room 102
Seating capacity: 50; first come, first served; talk.
Friday 12:00–1:30
October 25
Students have been given access via the Internet to these centers as well as to supercomputing centers operated by NASA and DOE. (A kit available from ACF in room 305, Warren Weaver Hall, describes how to apply to some of the NSF centers.) Edward Friedman.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Wednesday 2:00-3:30
September 18

Scientific Visualization Resources at the ACF (Silicon Graphics)
The need to understand abstract and sometimes very large data sets generated from scientific studies is making scientific visualization ever more important. After a short introduction to the field, the lecturer will present an overview and hands-on multimedia demonstration of the various resources—software and equipment—available to scientists on the Silicon Graphics computers at ACF.

Topics discussed will include software packages for visualizing fluid dynamics, molecular models, volumes, and abstract mathematics; modular software packages; libraries for 2D and 3D graphics; image processing, movie, and audio; slide presentations; visual debugging and analysis of computer programs; online hypertext documentation; and conversion between image formats.

Additionally, ACF's stereographics equipment will be demonstrated in relation to both scientific visualization packages and solutions for the computer programmer. ACF staff.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Wednesday 2:00-3:30
October 16

A Viewing of Scientific Visualization Videos
A presentation of videos created at the ACF Scientific Visualization Lab, as well as a selection of videos previously presented at various conferences, such as ACM's IEEE's Visualization and SIGGRAPH and the Computational Geometry Conference. Featured videos will include "The Visible Human" and "The Largest Structures in the Universe." ACF staff.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Wednesday, 2:00-3:30
November 13

Talks on Parallel Computing
Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk. Hua Chen.
Thursdays 12:30-2:00

1. Parallel Computing at ACF
A survey of hardware and software for parallel computing provided by ACF and Supercomputing centers (Cornell Theory Center and Pittsburgh Supercomputing Center)
October 17

2. Introduction to MPI
An introduction to the Message-Passing Interface standard for distributed computing and a survey of existing implementation of the standard.
October 24

3. A Tutorial on MPI
A brief tutorial of the MPI standard based on the implementation at Cornell Theory Center.
October 31

Statistics, Databases, and Spreadsheets

Excel (Mac)
Microsoft's Excel is a major spreadsheet for the Macintosh. Howard Fink.

1. Introduction to Excel
This will be a start-up talk-demonstration on creating a basic spreadsheet.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Friday 2:00-3:30
October 4

2. Advanced Topics in Excel
In this advanced session, formulas and charting will be covered. Knowledge of Excel and Macintosh basics required.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Friday 2:00-3:30
October 11

Scanning Test Scores (Windows)
A demonstration of software to scan and interpret test score sheets to create data sets. ACF staff.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
Friday 2:00-4:00
November 15
SAS Lecture Series
(Windows, Unix)
This series will progress from the basic description and operation of this statistical package to advanced concepts and usage. Robert Yaffee.

Reservation Required (call 998-3333 during week of class). For more details, send e-mail to yaffee@nyu.edu.

Warren Weaver Hall, room 313
Thursdays 4:30–6:00

1. Introduction to SAS
October 3
2. Categorical Data Analysis
October 10
3. Regression Models with SAS
October 24

SPSS: SPSS for Windows
(Windows, Unix)
SPSS (Statistical Package for the Social Sciences) is a comprehensive, integrated system for statistical data analysis. These presentations will use either the Windows or the newer Unix version of SPSS, but the programming concepts are applicable to all versions of SPSS. Frank LoPresti.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.

1. Introduction to SPSS
Data input, transformations of variables, creation of “system files,” and other manipulations of data will be discussed.
   Wednesday 2:00–3:30
   September 25
   Tuesday 1:00–2:30
   October 8

2. Advanced Topics: Regression Models
   Wednesday 2:00–3:30
   October 2
   Tuesday 1:00–2:30
   October 15

3. Advanced Topic: ANOVA Models
   Wednesday 2:00–3:30
   October 9
   Tuesday 1:00–2:30
   October 22

SPSS Running on the IBM RISC-based RS/6000 at ACF
(Unix)
An introduction to SPSS running on a high-performance Unix resource available to NYU faculty and students. This is a Windows-like GUI (graphical user interface) version of SPSS new at ACF. Data and output are displayed in windows rather than through traditional command line mode. Such an application running in a Unix X-windows workstation environment holds interest for academic researchers whose storage, speed, and support needs are beyond the capabilities of a personal computing system. Frank LoPresti.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
   Tuesday 2:00–3:30
   October 29

Time Series Analysis
(Windows, Unix)
This series will cover time-series analysis in detail. Robert Yaffee.

Reservation Required For reservations and information, contact Dr. Yaffee at 998-3402 or yaffee@nyu.edu.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
   Fridays 4:00–6:00
   October 4

1. Introduction to Box-Jenkins Time Series Analysis
   October 4
2. ARIMA models in SAS & SPSS
   October 11
3. Seasonal Models
   October 18
4. Estimation & Forecasting
   October 25
5. Intervention Models
   November 1
6. Transfer Function Models
   November 8

Word Processing

Microsoft Word
(Mac)
Microsoft Word is a major word-processing program on Macintosh computers and is especially strong on typography and formatting.

1. Introduction to Microsoft Word
This is a getting-started talk–demonstration. The basics of creating a document will be covered. Howard Fink.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
   Fridays 2:00–3:30
   September 27
   October 25

2. Advanced Topics in Microsoft Word
Topics will include mailmerge and tables. Knowledge of Microsoft Word and Macintosh basics assumed. Howard Fink.

Warren Weaver Hall, room 313
Seating capacity: 30; first come, first served; talk.
   Fridays 2:00–3:30
   September 27
   October 25
# Important Dates for ACF Users

Here are some dates that you should keep in mind, if you are a user of ACF computing and networking facilities: holiday hours, when accounts expire, when your files must be stored, and so on.

For the regular hours of ACF labs and centers, please see the back cover, where you will also find locations, phone numbers and other useful items. For information on coursework and individual accounts, please see the facing page.

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<tr>
<td>Sept. 23</td>
<td>Yom Kippur                                                                regular hours</td>
</tr>
</tbody>
</table>

### October

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct. 1</td>
<td>New Individual Accounts and those renewed for the 1996/97 academic year begin.</td>
</tr>
<tr>
<td>Oct. 14</td>
<td>Columbus Day                                                           regular hours</td>
</tr>
</tbody>
</table>

### November

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 5</td>
<td>Election Day                                                            regular hours</td>
</tr>
<tr>
<td>Nov. 11</td>
<td>Veterans' Day                                                          regular hours</td>
</tr>
<tr>
<td>Nov. 28-29</td>
<td>Thanksgiving Holiday*                                                   all labs closed</td>
</tr>
<tr>
<td>Nov. 30-Dec. 1</td>
<td>Thanksgiving Weekend                                      regular hours</td>
</tr>
</tbody>
</table>

### December

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. 2-Jan. 6</td>
<td>Instructors apply for Spring 1997 computer accounts for their classes.</td>
</tr>
<tr>
<td>Dec. 2-20</td>
<td>Students who expect Incompletes in fall semester courses should apply for computer account extensions. (Instructor's signature required.)</td>
</tr>
<tr>
<td>Dec. 31</td>
<td>Students with fall semester Class Accounts should store all files they wish to keep.</td>
</tr>
<tr>
<td>Dec. 13-20</td>
<td>Fall semester final examinations                                       regular hours</td>
</tr>
<tr>
<td>Dec. 22</td>
<td>Student Class Accounts issued for the fall semester expire.</td>
</tr>
<tr>
<td>Dec. 24-Jan. 2</td>
<td>Christmas*–New Year’s* Recess                                          all labs closed</td>
</tr>
<tr>
<td>Dec. 21-Jan. 21</td>
<td>Winter Recess                                                            regular hours</td>
</tr>
</tbody>
</table>

### January

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 2</td>
<td>ACF offices reopen after Christmas-New Year's Recess</td>
</tr>
<tr>
<td>Jan. 18-20</td>
<td>Dr. Martin Luther King, Jr. Day Weekend                                 holiday hours†</td>
</tr>
<tr>
<td>Jan. 20</td>
<td>Dr. Martin Luther King, Jr. Day*                                        all labs closed</td>
</tr>
<tr>
<td>Jan. 22</td>
<td>Spring semester begins</td>
</tr>
</tbody>
</table>

* University holiday
† Please note: Confirmed holiday schedules will be posted on the NYU Web and via our online news and bulletin-board facilities, or can be obtained by calling the ACF HelpLine at 998-3333.
Using the ACF Computer Labs

NYU faculty, staff, and students in degree or diploma programs may use the PCs and Macintoshes in the ACF computer labs without charge during designated hours (see opposite for details) or, under ACF access accounts, during all hours of operation.

Getting an ACF Access Account

For entry to the labs at all times, and for priority use of the equipment, you'll need an ACF access account — a coursework or individual account specifying full lab access. An appropriate coursework or individual account is also needed to use some special ACF computers, equipment and services. Coursework accounts cover all the students in a course section, and are obtained by the instructor. Faculty, staff, and students working on department-sponsored projects may obtain individual accounts. To apply please contact the ACF Accounts Office (Room 305, Warren Weaver Hall, 998-3035).

ACF recommends that instructors obtain a coursework account whenever a course will require use of computers and related resources. The application procedure also helps ACF to ensure that the appropriate software and training sessions are available.

Equipment at the ACF Computer Labs

The ACF's four instructional computer labs have over 340 Apple and IBM-type computers. All are linked to NYU-NET, the campus data network, and are connected to Novell-based file servers and printers. Each lab has two or more laser printers. A large collection of software (over 100 packages) is available.

Education Building, 2nd floor (104 computers)

- 33 PowerMac 6100 computers, with CD-ROM drives, 16-in color monitors, 40 MB memory, 100 MB Zip drives
- 23 PowerMac 6100 AV computers, with CD-ROM drives, 40 MB of memory, 250-MB hard drives, 270 MB Syquest drives, 100 MB Zip drives, 17-in multiscan monitors
- 21 Macintosh Quadra 700 computers, with 20 MB memory, 80-MB hard drives, color monitors
- 2 Macintosh Quadra 800 computers, with CD-ROM drives, color monitors
- 18 Macintosh systems in the New Media Center, for special projects and classes in the arts, including one transfer station with DAT, 230-MB Magnetic-Optical drive, 44-MB, 135-MB, and 200 MB Syquest drives, 100 MB Zip drive, and 1000 MB Jaz drive
- 6 Macintosh Iivx computers, with CD-ROM drives and color monitors
- 1 media transfer station, based on a Mac Quadra 800, with a 100-MB Zip drive, a 270-MB Syquest drive, a 135-MB Syquest EZ drive, a Syquest drive for 44-, 88-, or 200-MB media, and a 1000- or 500-MB Jaz drive
- 1 Mitsubishi 35" display monitor with a 270 MB APS Syquest drive and 1 JVC VHS VCR
- 34 APS 270 MB syquests drives
- 50 Iomega 100 MB Zip drives
- 2 JVC VCRs
- 8 Hewlett-Packard flatbed scanners (1 IIC and 7 IICX)
- 4 Hewlett-Packard laser printers (3 IIIsi 300 dpi and 1 IVsi 600 dpi)
- 2 Hewlett-Packard HL300 300dpi Paintjet printers
- 1 Apple 600dpi ColorLaser printer
- 1 Xerox 4220 multiple-paper-size 300dpi printer

Third Ave. N. Residence Hall, C-3 (104 computers)

- 25 IBM PS/2 model 70 computers, with VGA color monitors, numeric coprocessors, and joysticks
- 9 DEC 486 computers, with 8 MB of memory, 120-MB hard drives, color monitors
- 18 Gateway 486DX2 computers, with 16 MB memory, 330-MB hard drives, 15-in color monitors
- 36 Macintosh IIsi computers, with color monitors
- 16 Macintosh Ilci computers, with 17 MB of memory, color monitors

Tisch Hall, room LC-6 (72 computers)

- 1 IBM-type computer with Accent Text-to-Speech Synthesizer, Vocal-Eyes Screen Navigation Software, Zoom-Text Screen Magnification Software
- 35 Gateway Pentium 100s, with 16 MB memory, 1.2-GB drives, Vivitron monitors, CD-ROM drives
- 24 Gateway 486DX2 computers, with CD-ROM drives, 5.25-in and 3.5-inch diskette drives, 340-MB hard drives, 15-in color monitors
- 12 IBM PS/2, 55SX, with VGA color monitors

14 Washington Place (67 computers)

- 30 Gateway Pentium 75s, with 16 MB memory, 696-MB drives, Vivitron monitors, CD-ROM drives
- 23 DEC 486DX computers, with 8 MB memory, 120-MB hard drives, color monitors
- 9 Gateway 486 DX computers, with 8 MB of memory, Super-VGA color monitors
- 5 Gateway Pentium 100s, with 16 MB memory, 1.2-GB drives, Vivitron monitors, CD-ROM drives
**Important ACF Telephone Numbers**
- ACF HelpLine: 998-3333
- Account Information: 998-3035
- Computer Documentation: 998-3036
- Innovation Center: 998-3044
- Statistical Consultants: 998-3434
- 14 Washington Place Lab: 998-3457
- Education Building Lab: 998-3421
- Third Avenue Lab: 998-3500
- Tisch Hall Lab: 998-3409
- Warren Weaver Hall (rooms): 998-3456

**Dial-in Access to ACF Computers**
To connect via modem to NYU-NET, NYU’s campus-wide network, set your modem to 8 data bits, 1 stop bit, full duplex, no parity, and dial one of these numbers.

<table>
<thead>
<tr>
<th>Modern Speed (bps)</th>
<th>Dial Speeds</th>
<th>DIAL accounts only</th>
</tr>
</thead>
<tbody>
<tr>
<td>300-2400</td>
<td>995-3600</td>
<td>253-4698</td>
</tr>
<tr>
<td>9600 or 14,400</td>
<td>995-4343</td>
<td></td>
</tr>
<tr>
<td></td>
<td>225-4698</td>
<td></td>
</tr>
</tbody>
</table>

**For more information:** Visit us on the World-Wide Web at [http://www.nyu.edu/acf/](http://www.nyu.edu/acf/) or call the ACF HelpLine at 998-3333.

---

**ACF locations:**
1. Warren Weaver Hall – HelpCenter and Innovation Center, 251 Mercer St., 2nd floor
2. Tisch Hall computer lab, 40 W. 4th St., (rooms LC-7)
3. 14 Washington Place computer lab, basement
4. Education Building computer lab, 35 W. 4th St., 2nd floor
5. Third Avenue computer lab, 75 Third Ave., level C3

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**Hours of Operation, Fall 1996 (effective September 3 to December 21)**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Washington Place</td>
<td>closed 8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
</tr>
<tr>
<td>Tisch Hall</td>
<td>noon-1:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
</tr>
<tr>
<td>Education Building</td>
<td>closed 8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
<td>8:30am-11:30pm</td>
</tr>
<tr>
<td>Third Ave. North</td>
<td>10:30am-1:30pm</td>
<td>10:30am-1:30pm</td>
<td>10:30am-1:30pm</td>
<td>10:30am-1:30pm</td>
<td>10:30am-1:30pm</td>
<td>10:30am-1:30pm</td>
<td>10:30am-1:30pm</td>
</tr>
<tr>
<td>Innovation Center</td>
<td>closed 9:00am-10:00pm</td>
<td>9:00am-10:00pm</td>
<td>9:00am-10:00pm</td>
<td>9:00am-10:00pm</td>
<td>9:00am-10:00pm</td>
<td>9:00am-10:00pm</td>
<td>closed</td>
</tr>
<tr>
<td>HelpCenter</td>
<td>closed 9:00am-6:00pm</td>
<td>9:00am-6:00pm</td>
<td>9:00am-6:00pm</td>
<td>9:00am-6:00pm</td>
<td>9:00am-6:00pm</td>
<td>9:00am-6:00pm</td>
<td>closed</td>
</tr>
</tbody>
</table>

* Overnight hours begin at this lab just prior to midterm; check [http://www.nyu.edu/acf/nyu-events/](http://www.nyu.edu/acf/nyu-events/) for details.

Exceptions to regular hours: Holiday schedules and other announcements will be posted on the NYU Web at [http://www.nyu.edu/acf/nyu-events/](http://www.nyu.edu/acf/nyu-events/). ACF offices at 251 Mercer Street are closed on University holidays.

Holders of ACF access accounts have priority use of the equipment in the labs during all hours of operation.

Without an access account, NYU faculty, staff, and students in degree or diploma programs may use the Third Avenue lab during all its hours of operation; they may use the 14 Washington Place, Tisch Hall, and Education Building labs on weekdays until noon and after 8 pm, and during all weekend hours of operation.

Access accounts include coursework accounts (obtained by instructors for an entire class) and individual accounts (for students working on faculty-sponsored projects). To apply, contact the ACF Accounts Office, at 998-3035.
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New York, N.Y. 10012

Albert Gallatin's new NYU Card, which will let him register for classes, order books, see his grades, and send electronic mail. For more about the card, see page 5.