Connect
Academic Computing and Networking at NYU

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.

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— David Frederickson

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Network-Assisted Instruction and Learning: Will It Pay Off?

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The growth of the Internet and the World-Wide Web, on both the demand and the supply side, has amazed all of us, even those of us who have seen both grow from infancy to their present state. While their exact growth paths are uncertain, there is widespread agreement that these are technologies that will be central in the way we communicate and do business in the future.

The number of Internet hosts increased by 85% in the last year, from over 5 million to about 9.4 million. New countries were connected, and the Internet increased its penetration in countries where it was already established. The implications of this growth for education are not clear in detail, but there is widespread optimism that the net will affect the educational process in many fundamental ways.

Is this optimism justified for higher education? There have been earlier attempts to employ information technology — computers and networks — in the learning process. Each technology has left its mark, but none has had the cataclysmic effect upon education that early proponents had forecast.

It may be useful to examine previous attempts to change the learning process through information technology. Most of the attempts fall under the rubric of CAI, or computer-assisted instruction.

Computer-Assisted Instruction

Early CAI attempts used batch-computing facilities — where the user would feed program and data, via punched cards or tapes, to a large computer. They were generally limited to mathematical and scientific calculations, where the learning process capitalized upon the superior calculating power of the computer and could tolerate long periods of inactivity between interactions. Time-sharing systems that began to be produced in the mid-1960s offered a superior environment for more rapid interaction, but no significant new learning paradigms resulted from them.

In the 1960s, serious work with CAI stand-alone systems was pioneered by IBM in secondary schools with its Model 1500 minicomputer. The system was unsuccessful in the marketplace and eventually disappeared. A more significant attempt was made at the University of Illinois, where the Plato project developed complex learning software for a large number of subjects. Plato software executed on specialized, relatively expensive machines, and did not go much beyond Illinois in that form. When desktop computers were first sold, the Plato project made an attempt to shift to a PC platform, but failed to gain significant acceptance in that market.

In the 1980s, desktop computers were seen as a partial cure to some educational ills. IBM and Apple seeded schools at all levels with microcomputers, and they established major programs to encourage authors of educational software to produce for their particular hardware platforms. Universities were induced to operate centers to review and distribute software for higher education. Libraries of hundreds, possibly thousands, of software modules were amassed, but it is my impression that the reuse rate of this software was relatively low and disappointing. As of this writing, neither of the principal distribution programs is still active.
Desktop computers have brought major benefits to education. Some programs have made certain aspects of education more efficient, as well as improving the quality of work. Niche software in certain areas, such as Mathematica, Biosym, and Photoshop, strongly supplements teaching in traditional areas and adds significantly to the learning process. However, the desktop computer is not now seen as a panacea for educational problems, but rather as a powerful tool that can be employed in specific areas with solid results.

Producers of CAI software have had to deal with major obstacles. It's a rule of thumb in the profession that it takes 100 hours of development time to produce one usable hour of class material. Only dedicated instructors and developers are likely to stick to the process. Another hurdle is the multiple platforms — IBM, Macintosh, NeXT, and Unix — among which the developer must choose. Furthermore, marketing, production, and distribution require substantial effort as well as sharing revenue with others. Finally, much software, CAI or not, demands revision, bug fixes, updates, and help for its users. To the extent that qualified developers of CAI software are individual academic professionals, it is evident why such software is limited.

Network-Assisted Instruction

To what extent will efforts at NAI (network-assisted instruction) be more successful than efforts at CAI have been? I think there are several reasons to be more optimistic about NAI than CAI. They rest largely upon the emergence of the World-Wide Web as the computing environment of choice for much of today’s Internet activity.

- **Access to content.** The networked environment of the Web allows access to a very large content space that is rapidly growing. The migration of content to the Web is already a major trend, and is likely to grow by orders of magnitude. Within limits, this content is available for any instructional material written for the Web. CAI efforts had little access to content other than what was included in a specific program, and generally had little or no complementarity with other software.

- **A single platform.** The trend to open systems and standards, exemplified by the widespread convergence upon the Unix operating system and the TCP/IP protocols, has now produced convergence at the application and content level upon HTTP and other Web protocols. Browsers implemented on many different platforms produce essentially the same user interface. The Web community is converging upon accepted formats for all object types of interest. Multimedia incompatibilities are finessed. Material prepared for the Web can be retrieved and used by almost everyone.

- **Low distribution costs.** Access to Web-hosted material is at the request of the user. In a least-efforts situation, the supplier of the content does not even have to know that the content has been obtained by a user. Modifications are easy to make and can be distributed almost automatically. For products that contain a great deal of content, a combination of CD-ROM and HTML files with pointers to the content can provide a viable solution.

- **Access to global resources and markets.** The Internet is increasingly global, now reaching the majority of countries. This means that the resources upon which producers can draw are global. Further, if the potential market for NAI software includes all Internet nodes, the market is already enormous, and will continue to grow. Large markets can yield profits at low prices, assuming that there is a pricing algorithm that the market will accept and that can be levied on material delivered over the net.

Safeguarding intellectual property and obtaining economic returns from its use by others are potentially greater problems with NAI than with CAI, since in a networked environment nothing tangible need be exchanged between suppliers and users. The problem of charging for micro transactions and for transactions in electronic information is the subject of intense work, but it has not yet been solved in general. We need these new charging systems in order to provide market environments in which providers of intellectual property are willing to participate; we do not have them yet.

The jury is out on the extent to which NAI will improve education and will meet our expectations. I believe, however, that the prognosis is good, and that networks such as the Internet will in retrospect be seen as one of the fundamental innovations that have changed the way we teach and learn. Through the Internet, access to both globally distributed resources and global markets will help to make this environment more appealing for authors and more compelling for users than any we have yet seen.
Grey Gallery: Closed for Repairs on the Square, Open for Business on the Web

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As a result of renovations to NYU’s Main Building, the Grey Art Gallery and Study Center suspended its normal gallery season this year, closing down its public space for the entire 1995–96 academic year. Given the renovation plans, the Gallery faced the unsettling task of dismantling a schedule of exhibitions and publications that was already in place, and of rethinking the season. On the one hand, we had to take into account the burden of a darkened exhibition space; on the other hand, we now had time to undertake new initiatives.

One such initiative was the design and production of a Grey Art Gallery Web Site. This article reviews the Gallery’s thinking about the site that preceded its initial foray onto the World-Wide Web.

Innovation to Do the Things We Do

I sometimes think that new technologies develop against all odds. Early adopters embrace the new technology, yet tend to exaggerate its impact or, at least, the speed with which its impact is felt. “Forget about books, forget about CDs,” they gush; “all information will now come over the wire.” Once the alarm has been sounded, enter the naysayers who prefer to dwell on what they perceive to be technology’s darker side — the lack of human interaction, abuses to the holders of intellectual property rights, the damaging effects of information overload, and, yes, Big Brother. After the technology has been embraced and championed, ridiculed and belittled, a shake-out occurs. Perhaps it is all the others who, now aware of the new technology and all the positive and negative thinking surrounding it, see it for what it really is and begin to apply it to do the things they do.

Helping us to “do the things we do” is the raison d’être of the Grey Art Gallery Web Site, soon (as I write this) to be completed.

How Much Work Is a Web Site?

As the Gallery’s associate director, I am responsible for the managerial aspects of the Gallery. As a graphic designer, I have for the past six years designed most of the Gallery’s printed matter — everything from art catalogues to exhibition invitations. Wearing these two hats, I began to explore, early last year, what it would take to design, produce, and manage a World-Wide Web site for the Grey Art Gallery.

In many ways, the Gallery was better suited than most to tackle such an assignment. For years, we have been using desktop-publishing applications to design printed matter, and are proficient users of PageMaker, Photoshop, Corel Draw, and Adobe Illustrator. We are experienced in dealing with intellectual properties, and we know how to manage production schedules, print or otherwise. And, by the very nature of museums, we are in the business of aesthetics, of presenting ideas, providing instruction, and telling a good story within a visual context. Most important, we are replete with juicy content.

Given our strengths, I considered what additional knowledge and skills were required to do the job. First, we needed to acquire a basic understanding of client-server networking as it related to the Internet, and we needed to get ourselves hooked up, so that we could begin to survey, critique, and learn from...
sites on the Web. Learning HTML (the relatively easy markup language of the Web) was another task that had to be accomplished, and we wanted the ability to incorporate video, audio, and multimedia elements into our pages.

Coming up to speed in these areas would require a substantial amount of work, but more important was the commitment that was required to maintain the speed. The Web is a dynamic environment, as is an art gallery. HTML becomes more sophisticated week by week, it seems; new browsers, editors, and converters that increase production efficiencies are rapidly coming to market; the results of CGI scripting (which allows a server to offer things beyond the level of the basic HTML protocols) are being achieved with procedures that are more easily implemented; the practices and technology of commerce on the Web are evolving; and hardware requirements never cease to be more demanding. Thus, we considered serious commitment to be an essential ingredient to our recipe for success.

Why Should a Gallery Go on the Web?

Before making such a commitment, the reason for doing so became our primary focus. What was the purpose of the site, what were our goals? I remember reading an article about corporations putting up Web sites. Everyone was doing it, but no one knew quite why. It appeared that Web sites were finding advocates within organizations who had the wherewithal to get a site up and running, but the sites were being established in something of a vacuum. That is, they were not being scrutinized the way other new ventures or initiatives were; they were not being looked at in terms of their cost or their impact within the organization as a whole; nor were they a part of any strategic planning process. In short, they were merely providing the company with “a presence on the Web,” needed or not.

For the Grey Art Gallery, we wanted more than a presence on the Web; we wanted the new technology to “help us do the things we do.” For instance, take the task of product research that precedes the purchase of a new piece of equipment. I now find that by going to the manufacturer’s Web site, I can sometimes save myself many phone calls and many delays in reaching the people with the right information, as well as delays in waiting for information to arrive by mail. In this case, the Web has, in addition to providing me with information, increased my productivity as it directly relates to my job.

More and more museums are making their collections available on the Web. While this provides an educationally rich experience for the public, it also can directly affect the productivity of a museum’s registrar. Registrars often receive calls from other registrars requesting information about works in the collection that are being considered for exhibitions. Do you have a particular painting? Is it in condition to travel? Could a photograph be made available? If we decide to include the work in our show, would your museum agree to the loan? What are the costs associated with the loan? Can you send me the paperwork? These are the questions typically asked, all of which could be answered by a Web site.

Can the Web or some other form of communications technology help the Gallery’s director-curator with the formulation of exhibition ideas, with the actual process of planning an exhibition? In short, can it be a tool applied to the art of curating?

Can the new technologies help us to sell art catalogues and place traveling exhibitions, to generate earned income? Can they help us generate contributed income through enticements such as acknowledging sponsors and donors? Could constituent groups be developed around the Web?

Without belaboring the point, it is these kinds of uses of the new technologies, the kinds that have a (continued on page 6)
In departments and offices all over NYU, people are eager to become part of the Internet. Suddenly it seems that nothing less than full Internet connections will do. Such a connection allows members of the NYU community to view information on NYU Web and contribute to it, perhaps one of the strongest reasons to get connected.

Among many benefits, a direct connection, as opposed to the slower NIU or modem access, enhances the speed at which you currently use NYU-NET services. With NIU connections, you are limited to text-based applications such as e-mail and Telnet. A direct connection provides a variety of services for more advanced e-mail and graphical World-Wide Web access via Netscape Navigator. These services will dramatically improve the way your department handles the flow of information among its faculty, staff, students, and the NYU community in general.

If you are interested in being a part of NYU-NET, contact us — the ACF Distributed Computing Group. Our aim is to help departments planning to join NYU-NET and to serve as their central point of contact with ACF, coordinating and following up on each project.

What Do You Need?

Before your department connects to NYU-NET, it should assess its current hardware and its network needs. That’s the first place where the ACF Distributed Computing Group can help you. We’ll be glad to discuss your situation with you and help you assess your needs:

• Is a direct connection to NYU-NET available in your building? The NYU-NET II program is progressing steadily, with the aim of having direct connections to all NYU buildings. (For more details, see the Summer 1995 issue of Connect.)

• What computer programs do you now use? What developing software will you benefit from? The ACF will supply all the software you need for managing the NYU-NET connections and browsing the World-Wide Web, while other applications may help manage your information better.

• Does your department already have a local network (LAN)? Most are compatible with NYU-NET; some are not.

• Do your computers have Ethernet cards? Your computer needs Ethernet capability before it can connect to NYU-NET. Some newer machines have this capability built in; in most cases, a card has to be inserted.

• Do they have enough memory (RAM) and hard-disk space? Typically, NYU-NET software requires between 4 and 8 megabytes of RAM and 10 to 15 megabytes of free hard-disk space on either a PC or Mac. All PCs should have 486 processors or higher, and must be running Windows 3.1 or Windows 95.

• Will new machines be necessary?

• What will it cost to get the department connected to NYU-NET?

• How will the faculty and staff be trained in the use of NYU Web and e-mail?

• Does everyone in the department have individual Internet accounts? They will need them if they are to take full advantage of the Internet.

At ACF, we have specialists in the areas of hardware, networking, software, operating systems, Internet applications including e-mail and World-Wide Web, computer security, software training, and computing in the sciences, social sciences, and arts. We can assemble the team you need to advise your department and ensure a successful transition.

Getting Started

The first step is to fill out a Request for ACF Distributed Computing Services. This form can be obtained at the Help Center, the Innovation Center, (continued on page 7)
“The Internet: Transforming Our Society Now” is the theme of INET ’96, the sixth annual conference on international networking, hosted by the Internet Society in Montreal from June 22 to 25.

The World-Wide Web has reaped more headlines than the Internet lately, but the two remain intimately intertwined: the Internet undergirds the Web (see “Where Are We Now?” in the Fall 1995 issue of Connect for more about how the two are related). Both depend on voluntary adherence to various standards and protocols that are essential if one computer is to communicate with another. The Internet Society (ISOC) is the diverse collection of individuals, corporations, nonprofit organizations, and government agencies that seeks to promote and improve the Internet. It performs a variety of functions including assisting technologically developing countries, disseminating information, and maintaining and evolving effective Internet administration practices.

One of the most important activities of ISOC is to educate new users and administrators. It will sponsor a weeklong workshop before the conference (June 16 to 22), geared to the needs of people from developing countries who are setting up networks. Dr. George Sadowsky, Director of ACF at NYU, is the Internet Society’s vice-president for education. “In the past three years,” he reports, “ISOC has trained almost 500 participants from 100 countries.

From 1993 to 1995, all of the new-country connections to the global Internet were accomplished through the efforts of participants in these workshops.”

The main conference offers several dozen sessions on everything from security and payment on the Internet to questions of education, politics, and languages on the net. For more information, contact Lynn O’Keefe-Grabe at okeefe_l@mediasoft.net or go to the Internet Society Web pages at http://www.isoc.org/conferences/inet96

Grey Gallery (continued from page 4)

more direct impact upon the Gallery’s day-to-day operations, that capture at least our managerial imagination.

As for our aesthetic imagination, on the other hand, it is captured by the creative potential implicit in the medium — one that has failed to be explored by American museums. As Robert Atkins writes in the December 1995 issue of Art in America, “most museums seem to regard their Internet outposts as vehicles for the dissemination of publicity and programming information . . . Few contemporary-art curators have shown electronic — much less online — art works.” Atkins goes on to say, “The most stimulating exception to the U.S. museum world’s lack of imagination in Internet programming is the interactive examination in text form of the ethics of bioengineering (http://www.exploratorium.edu).”

Just as museums turned a part of their attention to the existence of special requirements of photography, conceptual art, performance art, and video, at different times in the development of these art forms, so too will attention turn to this new electronic medium. How the Grey Art Gallery responds to the new territories now being explored by artists will depend on what the Gallery finds in its own explorations. After all, “independent art works created to run on a computer,” as the New Voices/New Vision competition recently defined the medium, are relatively new. Much work will be required to review and survey, to compare and analyze — in short, to study and understand this new art form so that an informal critical structure evolves, the existence of which prefaces informed critical opinion.

Constantly posing questions like these, we venture onto the Web. We are both early adopters and naysayers, and we look forward to the shake-out.
Multilingualism on the World-Wide Web

As more and more people around the world discover computer-mediated communication such as e-mail and the World-Wide Web, the horizons of communication are steadily expanding. However, people who speak languages other than English often find their options limited in the digital age.

On February 9, François Yergeau spoke on “Characters, Unicode, and Multilingualism on the World-Wide Web” at one of a series of NYU colloquia on computers and communication, sponsored by the ACF and several departments. Dr. Yergeau’s talk focused on technologies that allow people speaking different languages to communicate using computers and networks. One stumbling block to communicating in, say, Hindi is the dominance of ASCII — the American Standard Code for Information Interchange. It contains a limited set of characters in the Roman alphabet, roughly comparable to a basic American typewriter. Though extensions include accented letters for most Western European languages, it cannot support any other languages or alphabets. Computer users who wish to work with a different script often find themselves struggling to find the appropriate software. Two persons who wish to communicate must ensure that they are using similar software and fonts if their documents are not to show up as gibberish when they reach the other end.

The Unicode character set solves some of these difficulties. Unicode now supports 24 different character sets and will allow users to communicate using more than 34,000 individual characters. If Unicode is adopted as a standard, it will mark the advent of a truly world-wide Web.

Unicode in Context: NYU and Abroad

You can find more information on Unicode at http://www.stonehand.com/unicode/standard.html and on Alis at http://www.alis.com/

If you would like to examine such programs, the ACF Innovation Center (ie@nyu.edu or 998-3044) has obtained several Web browsers and other programs that use either Unicode or other means of rendering non-Roman character sets.

Future issues of Connect will have more on Unicode and the problems of international character sets and communications. Faculty members who have related experience, solutions, and opinions are urged to join the discussion by getting in touch with me at connect@nyu.edu or 998-3038.

—David Frederickson

Distributed Computing (continued from page 5)
or the ACF Business Office (Warren Weaver Hall, 2nd and 3rd floors).

While you are filling out the form, you may want to call us for clarification at 998-3100 or send e-mail to distributed@nyu.edu. Once we have your form, we’ll send you a packet of information about the services provided by ACF. A member of our Data Technician Group will install the hardware and software necessary for access to NYU-NET. On the first Wednesday of each month, we offer sessions in which faculty and staff of newly connected departments can get instruction in using our services.

We hope the new Distributed Computing Group will ease your transition onto NYU-NET. Instead of leaving each department to deal with technical issues involving several ACF groups, the Distributed Computing Group will now help you deal with these complexities, freeing you to concentrate on your department’s current and future needs.

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Let Your Digits Do the Sailing: Sending Your Art Out on the Internet

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The use of the Internet has been growing enormously over the last few years. It is a tool *par excellence* for communication. Like any communications medium, it can be used by artists to exhibit, exchange, or create art. Fortunately, there are a number of ways that this can be done on the Internet.

The table below describes a number of Internet tools. The table is not meant to be exhaustive, but points out the features that would be of interest both to the artist and to the general user.

Three of the most important properties for the artist to consider are what in this table are called *media*, *resolution*, and *audience*.

*Media* is fairly obvious: text, image, audio, and so forth. Here, *resolution* refers to the amount of data sent to represent a work of art (visual, sound, etc.). Images are described in pixels, the individual dots on the screen that make up the picture. With sound, resolution refers to sound samples per second, and with video, to frames per second. The more dots (or samples or frames), the better the final results.

So, then, why not send a very large number of dots for the very best image? You could, but this would limit the number of people who could see the work. Many people have only modem connections. Although a modern modem is fast enough for text and small images, even a moderate-sized image could take minutes to download. High-speed direct network connections are needed for large full-color images and motion. Until everybody has the *bandwidth* offered by a high-speed connection at home, resolution is the most important area to be clear about when presenting art on the Internet.

In the table, *audience* is about how many people will see the work. Some involve individual connections, so the audience is inevitably small. On the other end of the scale are programs that broadcast to a very large audience — thousands, potentially millions. Other programs reach medium audiences, either because the programs are designed for such connections, or because the technology is not yet available to large numbers of people.

It’s helpful to think about who initiates the transaction: is it the sender, or is it the person who wants to receive a work that’s being broadcast or is available for downloading?

A *realtime* program allows a performance or conversation to be sent out over the network as it is take-

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**Internet Tools for the Artist: Programs to Get Your Work**

<table>
<thead>
<tr>
<th>Program</th>
<th>Media and Resolution (in pixels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-mail</td>
<td>text; binary data encoded only</td>
</tr>
<tr>
<td>Mailing Lists</td>
<td>text; binary data encoded only</td>
</tr>
<tr>
<td>News</td>
<td>text; binary data encoded only</td>
</tr>
<tr>
<td>Talk</td>
<td>text only</td>
</tr>
<tr>
<td>Internet Relay Chat</td>
<td>text only</td>
</tr>
<tr>
<td>Gopher and FTP</td>
<td>text and binary data</td>
</tr>
<tr>
<td>CU-SeeMe</td>
<td>text, stills, audio, video; b&amp;w 160x120 &amp; 320x240</td>
</tr>
<tr>
<td>Apple Media Conference</td>
<td>video, audio, whiteboard; color: 160x120, 320x240</td>
</tr>
<tr>
<td>MBone</td>
<td>video, audio, whiteboard; color: 640x480</td>
</tr>
<tr>
<td>WWW/Netscape</td>
<td>text, stills, animation, audio; color</td>
</tr>
<tr>
<td>RealAudio</td>
<td>audio; single channel FM quality</td>
</tr>
<tr>
<td>VDLive</td>
<td>video, audio; color: 160x120, 320x240</td>
</tr>
<tr>
<td>The Palace</td>
<td>text, text-to-speech, audio, whiteboard; color: 640x480</td>
</tr>
</tbody>
</table>

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The Programs

Without a doubt, the most popular artistic medium on the Internet today is the World-Wide Web. Let’s take a look at some of the more basic tools that the Web is built on.

The earliest and most basic group is the text-only tools. This includes e-mail, mailing lists, and News. E-mail and mailing lists are both the key to one-to-one and one-to-many communication and the model for News. E-mail is the basic tool for two-way communication on the Internet. You send out some text, and somebody sends you back a response. Mailing lists are different. (They are often called Listservs – without the final e, because the first popular program to maintain mailing lists ran on computers that limited program names to eight letters.) You send a message that gets distributed to a group of people, some of whom you may know and some not.

This brings up the question of who may participate. E-mail requires nothing other than access to a computer that can send e-mail and an address to send mail to. Many of the other types of communication have a specific way to join. With a mailing list, you would send e-mail to list-maintaining software, which would add your name to those of the other people interested in discussing the topic of the list. In some cases, a list has a moderator who must okay each member and can drop people from the list, and who may choose to moderate the discussion as well. When you send a message to the list address, the software automatically resends it to each person who has joined the list. Thus you don’t have to maintain the whole mailing list yourself — a job that is time-consuming, tedious, and error-prone, and one that computers can do better.

News (or Usenet) seems very much like a mailing list. The difference is that you don’t need to join, and you need a special program called a newsreader to read it and contribute to it. Each newsgroup has a name that reflects the topic of discussion, the parts of the name becoming more specific from left to right — rec.arts.dance or rec.photo.technique.art.

FTP (file transfer protocol) and Gopher are used to gather files from across the Internet. FTP allows the artist to place either text or binary files in a public place, where a member of the audience can retrieve them at will. FTP is somewhat primitive; the viewer must know the Internet address, the name of the file, and the type of file in order to retrieve it and properly view it. Gopher is similar, except that it can display in logical menus in plain text, listing items to be viewed, and can automatically display some of the files retrieved. Both FTP and Gopher are built into all Web browsers. You can recognize FTP and Gopher resources because their URLs (uniform resource locator) start with ftp:// or gopher://.

Several types of tools provide a realtime communication stream. You can have a conversation, using text, or audio and video, with one or more people over the Internet. A program called Talk is the oldest of this type. The interface is a screen with your typing in the top half and the respondent’s in the lower half. IRC (Internet Relay Chat) allows groups of people to meet in a chat room. The topic may be unspec-
The many faces of videoconferencing: the author in (l. to r.) the CU-SeeMe screen, the Apple Media Conference screen (both about actual size), and in the palette of facial expressions available in the Palace (enlarged).

ified or specified by a moderator, who may also control who may attend.

The most popular video teleconferencing software is CU-SeeMe, developed at Cornell University. It is available free for both PCs and Macs. It allows you to have a video teleconference between two or more people in small black-and-white windows. The similar Apple Media Conference presents the image in color. Both programs offer a means of showing digital images at the same time: CU-SeeMe can send single slides and large black-and-white images; Apple Media Conference has a “whiteboard” that participants can draw or write on.

At first glance, Mbone video and audio resembles these teleconferencing programs. It has a video window, a shared whiteboard, and an audio controller. The crucial difference is that with packages like CU-SeeMe, each participant receives a separate connection on the network. So if two people at the same location are watching a performance, they each get a duplicate stream. With Mbone, which stands for Multicasting Backbone, the originator sends out only a single stream of data, and anyone who wants to watch can tune in — very much like television or radio today. Transmitting video takes a lot of network space; if only a single stream is being sent, it can be of higher quality without increasing the network load.

Netscape and other graphical World-Wide Web browsers can present text, static images, animations, and audio all in a single interface. A Web browser also has the more traditional Internet tools, such as FTP, e-mail, Gopher, and News, built in. You can add plug-ins — outside programs that can extend the Web browser’s capabilities in such areas as text-to-speech conversion and MIDI. You can also configure your browser to call up helper applications when you select a link that returns, rather than a new Web page, a pointer to a resource that the browser cannot display by itself. Two examples are RealAudio and VDOLive. RealAudio send a stream of audio information in real time over the Internet as requested. VDOLive does the same with a video stream.

Time-Warner describes its Palace as “an Internet-based multimedia chat architecture, kind of a cross between IRC and HyperCard, yet unique in many respects.” It functions as a Web browser, and it also has the ability to control the visual and spatial environment — the default is a palace with a number of rooms that can be visited. You can visit other “palaces,” or you can create an environment on your own computer, which others can visit. Visitors take on any visage and expression they choose and can pick up objects that are in the rooms and carry them around. The visitors’ comments are portrayed cartoon-style in balloons. There is a one-time $20 registration fee; until you are registered, you appear as a yellowish globe with a face on it.

The Internet provides the artist with a place to exhibit works and to create new ones. Also, it provides a tool for research via access to library catalogs and the ability to interview people who are the primary sources. The artist of today cannot afford to ignore this opportunity.
This article focuses on issues relating to input and output techniques used in the creation of two-dimensional digital art. The steps between input and output — the artist’s personal formula of software and techniques for manipulating digital images — are just that: personal. The discussion here, however, refers to choices made at the beginning and end of the digital process, which determine the behavior of the final object and the way it will be seen.

Scanners

The first consideration for making digital images is input — the techniques that set the foundation any image is built upon. Collected subject-matter — existing as film, flat art, or objects — can be captured and translated into a digital format through the use of various input devices. The ACF Arts Technology Group maintains three models of scanners for film and flat art, as well as video frame-grabbers and support for handheld digital cameras and Kodak Photo CDs.

- The most notable of these models is the Leaf-45 Film Scanner, supporting a variety of film formats, from 35mm slide and strip film to 4x5". The Leaf-45 offers the highest optical resolution of any desktop film scanner, allowing users to capture either color or black-and-white images, from positive or negative film.
- The Nikon Coolscan 35mm Film Scanner also supports 35mm slide and strip film, in either color or black-and-white, positive or negative film. The Coolscan is the smallest of the ATG desktop scanners, yet is extremely reliable, offering decent resolution input capability for film and a balanced tonal range.
- The Hewlett-Packard ScanJet IICx flatbed scanner is the third type, used for capturing flat art or small objects on a scanning bed that has a maximum dimension of 8.5x14". The ScanJet offers respectable imaging results for photography, illustrations, drawings, line art and halftones, for either color or black-and-white art.

These scanners are included in the Input table, where they can be compared with other devices for

<p>| Scanners and Other Input Devices |</p>
<table>
<thead>
<tr>
<th>Device</th>
<th>Media Size</th>
<th>Max. Res. (dpi)</th>
<th>Max. Image (pixels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf-45</td>
<td>35mm film</td>
<td>5080</td>
<td>5080x6985</td>
</tr>
<tr>
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<td>2540</td>
<td>5715x5715</td>
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<tr>
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<td>4800x6000</td>
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<td>Nikon Coolscan</td>
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<td>2400x3600</td>
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<td>8.5x11&quot; flat art</td>
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<td>3400x4400</td>
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<tr>
<td>HP ScanJet IICx</td>
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<td>400</td>
<td>3400x5600</td>
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<tr>
<td>Video Frame Grab</td>
<td>NTSC</td>
<td>72</td>
<td>640x480</td>
</tr>
<tr>
<td>Photo CD - Base/16</td>
<td>Thumbnail</td>
<td>72</td>
<td>128x192</td>
</tr>
<tr>
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<td>Snapshot</td>
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<td>256x384</td>
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<td>TV-Comparable</td>
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<td>Full Detail</td>
<td>288</td>
<td>2048x3072</td>
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<td>Kodak Digital Cam 40</td>
<td>CCD Still Frame</td>
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<td>756x504</td>
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</tbody>
</table>

Shelly J. Smith is a Senior Arts Technologist with the ACF Arts Technology Group.
capturing digital images. Important issues to be considered when preparing to scan are the resolution required for the final output format (print, film, or monitor display), the overall dimensions of the final image, and the image file size as it relates to memory and storage considerations. All of these factors are fixed when the image is captured, and become constraints that are carried through to final output.

Output: Printers

After the image file has been constructed, determining the work’s physical form or output format is the final phase before completion. Each of the following digital printing processes offers different physical results:

- **Inkjet** — On an inkjet printer, special inks are sprayed from a series of individual nozzles or inkjet guns. The ink droplets are deposited on a variety of papers, canvas, or film, depending on the quality of the printer. The process may end with the application of heat.

- **Thermal wax transfer** — Another class of printers uses wide ribbons thinly coated with successive areas of colored wax — either a 3-pass CMY ribbon (with areas of cyan, magenta, and yellow) or a 4-pass CMYK ribbon (adding black to the other three). The paper is passed under each color section of the ribbon in turn, and heat transfers the colored wax to the paper.

- **Phase-change** — A phase-change printer combines thermal-wax and inkjet technology, by using wax pellets (resembling crayons) which are melted, liquefied, and sprayed onto paper.

- **Dye sublimation** — Dye-sublimation printers use a gas-diffusion process whereby a CMYK ribbon is heated until the pigment deposit on the ribbon turns into a gas. The gas particles are then absorbed by the special coating of the dye-sublimation paper.

- **Electrostatic** — Laser printers (and some others) use an electrostatic process, whereby special toners or pigment compositions are deposited onto paper through the use of a photosensitive drum and fused to the paper with heat.

The two tables on these pages organize the information about the details of the printers and the services offered by several ACF sites and service bureaus in Manhattan to which an artist might take work for output. It is important to note, however, that the dimension range, paper stocks, color representation, and general print quality may vary between service bureaus. Preparation for output should include an investigation of all the service bureaus offering the desired output type. Output samples should be offered by the bureau for customer examination, including all in-house paper stocks. If the digital printing process allows the artist to supply the printing support, as with Iris printers, suggestions of paper, canvas, linen, and film should be offered. A printed guide should also be available, detailing the correct procedures for preparing the image file for print.

Output: Film Recorders

Film recorders offer artists an alternative in pursuit of the physical print. As output devices, film recorders are equipped with internally seated high-resolution monitors and removable camera backs. The camera backs themselves are a special design, intended for film recorder use and able to accommodate distinct film formats ranging from 35mm, 120/220, 4x5, 8x10 or greater, depending on the model. The process of recording a digital file to film is straightforward. The file is translated from a computer workstation to the connected film recorder, where the image is displayed and exposed onto a positive or negative film base. The resulting film, color or black-and-white, can be developed and used for traditional photographic printing.

The Arts Technology Group has added the Lasergraphics Mark III Digital Photography Model Film Recorder to its Innovation Center Bay. This film...
**Service Bureaus**

Here are some ACF sites and nearby Manhattan service bureaus where you can get high-quality prints of your digital images. The list will be continually expanded; for the most up-to-date version, see our Web page at http://www.nyu.edu/atg/.

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Phone and Internet</th>
<th>Printers</th>
<th>Notes</th>
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<td>Education Site</td>
<td>212/998-3421</td>
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<td>Electrostatic</td>
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<td>Inkjet</td>
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<td>Dye Sublimation</td>
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<td>Electrostatic</td>
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<td>Warren Weaver Hall</td>
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<td>Big Apple Color &amp; Graphics</td>
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<td>119 W. 23rd St.</td>
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<td>Digital Exchange</td>
<td>212/929-0566</td>
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<td>Digital Mega Output</td>
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<td>X(+C) Color Space</td>
<td>212/366-6600</td>
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<td>Inkjet</td>
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<td>200 Varick St., no. 600</td>
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</tbody>
</table>

The film types recommended for 35mm SmartBack Imaging are: Vericolor III; Kodak Gold 100; Fujicolor 100; Fujicolor REALA; Ektachrome 100; Fujichrome 100; Fujichrome Velvia 100; Polachrome 100; other ISO 100 films. The film types recommended for 4x5" Imaging are: Vericolor III; Kodak Gold 100; Ektachrome 100 films.

The Mark III's interface software supports the following image file formats: Adobe Photoshop, PICT, TARGA, and TIFF. In addition, Visual Business Systems’ Professional Output Manager software can be used.
Computer mapping — more technically known as GIS (geographical information systems) — is one of the hot computer fields. Another, of course, is the World-Wide Web.

By this time we all know that the Web is entertaining and makes masses of information available. But it can also be a serious tool. The single interface of the graphical Web browser now serves as a front end for numerous applications, and the Web’s CGI (common gateway interface) scripting offers the possibility of using that interface to control many other applications. The potential to do complex computing through a Web browser makes the Web page a serious platform-independent computing tool.

At ACF, a prototype Web page is being designed that allows an Internet visitor to act as a planner using GIS to find a politically and financially acceptable route for an oil pipeline.

What’s the Point?

This GIS Web page has two goals. The first is to allow guests to analyze a mapping problem using two commercial GIS packages and to compare the results with those from a package developed at NYU. The second goal is to allow users on the World-Wide Web to perform the job of utilities planners or their usual adversaries, community activists.

The problem at hand is to select a route for an oil or gas pipeline — in this case to connect two towns in the mountains of western South Dakota, an area for which a wealth of detailed data is freely available. This is a real-life land-use problem fraught with political snares, roadblocks, and pitfalls. Favoritism becomes an issue as land values are suddenly distorted near the route; economic development has to be weighed against damage to the environment, scenic devastation, and health concerns — the real issues are far-reaching and complex. Anyone from a concerned citizen to a government official to a utility engineer might be involved in such decisions and would be affected by the outcome. Ideally, a tool like this Web page will allow infrastructure to develop to the benefit of all.

The Tools

A geographic information system is considerably more than what most people would think of as a single computer program: it is in fact a whole system that organizes the various activities of acquiring, storing, manipulating, and displaying spatial data. (For articles introducing GIS, see earlier issues of Connect — September and November 1994, and January 1995.)

What, briefly, makes up “spatial data”? Two things — a map of whatever places are of interest, and data attributable to the places on that map. A place might be a whole state or a ZIP code area or a single house. The attribute assigned to a given place might be virtually anything — population or water-table depth or sale price or altitude or election district. A GIS uses the location references to reveal relationships within the data.

Most importantly, then, a GIS is a place to store and manage a warehouse of data on a map. Usually, the data are arranged in layers — tax structure on
one, addresses on another, rivers on another, and so on — and the GIS can display any number of layers together. (Most printed maps display several layers of data, in fact; a common road map displays routes, rivers, populations, borders, etc.) A GIS will also provide functions to answer questions involving the relative locations of the data. A few examples:

- Select and report all students living within five miles of each school on the map.
- Draw “plumes” of land threatened by a fire — areas downwind where the vegetation is ready to burn.
- Select the “best” route — where “best” means cheapest — from point A to point B across a grid of cells, where each cell in the grid has a cost for crossing it and the sum is the cost of the route from A to B.

These relationships are difficult to calculate with traditional computer tools (programming languages, spreadsheets, databases), and the answers to the questions are more meaningful when the solutions are displayed on a map.

The focus of the GIS research being done at NYU has been on finding the best routes for linear surface-transportation objects, such as oil pipelines.

What Is “Best”?

Let’s look at what “best” means — “optimal within a given set of criteria.” But what criteria?

We all do route-planning all the time, figuring out how to get from home to work, or from one building on campus to another. And we set criteria: we may try out various alternatives and settle on the one that’s quickest, or most pleasant, or cheapest, depending on our criteria.

Any route calculation is subject to debate: one that’s best under one set of criteria (cheapness, say) won’t be by another (time spent); and factors that are ignored in one calculation (environmental impact, political fallout) may have to be factored into another. Projects of this kind can become incredibly complex. In finding the best place for a major construction project like a pipeline, an enormous number of variables come into play. Environment, wildlife, maintenance — any such factors might ultimately make a selected location seem questionable.

The traditional method of designing these routes has been for an expert to interpret any data and maps available and then to choose the route for a corridor. In order to find an optimal route, one has to keep in mind countless bits of information, such as soil types, slopes, forests, maintenance facilities. And how can someone decide on one route if he has to consider which is better — to destroy a fragile ecosystem or ensure a long-term energy supply?

Managing Masses of Data

This problem becomes more manageable with the introduction of computers and programs that are now powerful enough to manage these vast amounts of information. But still one has to tackle the problem of comparing apples with oranges — profit with environment, energy with noise. How do you compare the incomparable?

Until greater minds than ours attack the problem, a common measure of cost must be assigned to every factor being considered. Any other approach leads to warfare — spiking old-stand trees to stop loggers, or endless court battles to enrich lawyers. Agreeing to assign dollar costs allows us to come to mathematical solutions and to determine a unique “best.” Let’s examine this very important conclusion.

As we worked on the best-route problem here at NYU, we came to agree with the literature — that dollar costs could often be assigned to even the most unlikely situations. Two opponents can’t rationally debate the cost to the beauty of a valley when a cor-

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**GIS Programs Available at NYU**

ArcInfo is a commercial product used around the globe, developed by Environmental Systems Research Institute (ESRI). It is powerful, well-documented, and well-supported, and its cost reflects that. ESRI also make a smaller version called ArcView. Both are available at the ACF.

GRASS (Geographic Resources Analysis Support System) was developed by the U.S. Army Construction Engineering Research Laboratory. It was designed for managing federal land, and provides management tools to military land managers and environmental planners. It is free to anyone who has a Unix system and enough patience to download and install it.

MapInfo (not used in the Web project described here) is also available on ACF servers. At NYU, this user-friendly PC program is used in the Wagner School GPA program and in SCE courses; it is also used in many government agencies.

Atlas GIS and a new product, ER Mapper, are also available at NYU.
An X-Windows interface developed, using GRASS xgen, by Dr. Yakov Smotritsky for his EARL (Environmentally Acceptable Route Location). On a Unix machine, the full power of the suite of programs can be brought to bear on the route-planning problem.

ridor is cut through the hills. But once alternative routes are costed out, opponents can agree on how much it costs to protect the valley’s beauty — that is, the increase in the project’s cost if the less direct route is used. If the county planning team is committed to preserving bird habitats, the cost of using open land in one area can be calculated as the cost of acquiring and “wilding” adjacent farmland.

Contentious issues can be resolved only if a common ground is found. If the common ground is a decision to use dollars as the common metric, to find or assign costs for every variable, the discussion can become more rational. And then both sides win.

The GIS Best-Route Project at NYU

Dr. Yakov Smotritsky has been working in the field of computational mapping since his graduate-school days at the Moscow Physics-Engineering Institute. In 1980, Ralph Grishman brought Dr. Smotritsky into a research group at CIMS. Later, Ed Friedman made the ACF high-performance scientific computers available for him to continue his work on what became EARL (Environmentally Acceptable Route Location). In 1993, Smotritsky joined the Statistics and Social Sciences group, which supports GIS at Academic Computing. The same year, he was awarded a National Science Foundation SBIR grant to help further his research. With this funding, he was able to bring students and other researchers, including the authors of this article, into his project. An in-house internship underwritten by Brooklyn Union Gas has supported the Web programming done by two CAS computer-science seniors, Kirill Karpelesn and Igor Zheleznyak.

The initial focus of the EARL project was on improving the computational methods used by commercial GISs to compute a unique “shortest path.” All GISs contain functions or modules that find the “shortest” or “least-cost” path, but existing solutions ignored certain problems that EARL addressed.

How Route Costing Is Done

Hundreds of construction steps can be identified when planning an oil pipeline, from grading the route to building pumping stations and anchoring structures. Each item may be further identified as involving several specific attributes of the land.

The cost of grading depends not only upon the slope of the land but also upon the soil type and the hydrology. The frequency of anchoring structures is affected by the slope of the land too, but it is also a function of the number of streams the pipeline crosses. Thus the slope of the land contributes to the cost in many ways.

A GIS sees a map as many transparent layers, each involving one mappable attribute, such as slope, existing roads, rivers, or soil type. For our problem we used “grid” maps, in which the map layer is a grid of cells, each 30 meters square. The attribute data for a slope layer would be the average slope of each cell. Each of the several costs derived from a knowledge of the slope can be calculated on a copy of the slope layer. A table is used to assign the cost of grading the 30x30-meter cells for each slope value. If we add up the slope costs for each cell, we have the total construction costs derived from slope data.

And the sum of all the individual cost layers gives a “total-cost” layer, whose data can be used by the GIS “least-cost” function in its calculations.

Two GISs — ArcInfo and GRASS (for more details, see the details in the box on GIS programs available at NYU) — calculate these total-cost layers. They then each calculate a “best” path between the two towns. But their calculus is too simple — probably written for a slower generation of computers. The path goes from the center of one grid cell to the center of one of eight adjacent cells (four at the sides plus four at the corners), so each vector crossing a cell is limited to eight directions. The paths therefore become jagged (at a micro level), and the results have more error built in than necessary. Smotritsky's
work allows the vectors to take any direction, and the results may be as much as five percent better than those of the established packages. In extreme cases, completely different routes may result.

Spearfish Data Set
Very few large areas are mapped with enough detail for this experiment. The Spearfish dataset was a specially prepared, highly detailed sample released by the US Army Corps of Engineers, which developed GRASS (Geographical Resources Analysis Support System), a major GIS package. Spearfish covers two US Geological Survey topographic quadrangles of western South Dakota — Spearfish and Deadwood North — an area of mountains and canyons falling away to plains. The two USGS quadrangles give a 14x19-kilometer rectangle. Each cell on the map is 30 meters, or about 100 feet, on a side, so the area contains about a quarter of a million cells. (Higher resolution would be desirable for precise calculations — the higher the resolution, the better the results would be, assuming that the data improved as well. Images for resolutions of roughly 3 to 5 meters are on the market now from both Russian and American suppliers, and resolutions of 1 meter have been announced. But the datasets become huge: if we increase the resolution to 5 meters, we multiply the number of cells by 36.)

Creative Costing with GIS
Engineers involved in constructing a particular type of corridor will be able to assign costs derived from each layer relating to specific corridor type. For example, if you were building a pipeline, a road layer would have a cost associated with crossing the road. Not so, though, for a powerline. However, both types of corridors, pipeline and powerline, would share a second cost layer derived from the road layer: an existing road should attract a corridor, since a road is needed to build and to maintain a corridor. If a road is there already, the savings of not having to build one become an attractor.

But creative planners can include costs other than buying and building into a cost layer. Giving weights for environmental or aesthetic factors is, of course, more difficult; yet the problems are not insoluble. For example, in the case of wetlands, we may be mandated to follow a rule that there may be no net loss of wetlands within a state, so we assign the value of a wetland to be the cost to replace it elsewhere in the state. And if an area is absolutely untouchable, it can be assigned an infinite cost.

Maintenance costs can also be included in the calculations. One projected route may have a low initial cost but higher maintenance costs than another. Another may be expensive at first but bring benefits to the area in the long run. For example, routing a roadway around a visually valued site would preserve the beauty, which in turn might well bring an increase in tourism or traffic that support new jobs.

Second only to the cost of collecting data, assigning weights to different factors and translating the weights into dollar costs are the most difficult portions of computerized route selection.

Some Cost Problems Can’t Be Solved on a Grid
There are some costs that cannot be assigned to cells on a grid, so other ways must be found to bring these into the equation. Each map will have a parcel layer, which would provide the cost of individual parcels of real estate. These can be determined by a group of experts. Under most circumstances, and certainly when you are doing early estimates on a planned route, either you buy the whole parcel of land the route crosses or you avoid it completely. Conversely, if you buy a parcel, you should then utilize it as fully as you can before you go onto a neighboring parcel. This rule could not be programmed by pricing individual cells, since a parcel might contain several whole cells and parts of others. Also, the

Summer Institute on the Applications of Geographic Information Systems
If you want to learn more about GIS, you might be interested in a series of intensive hands-on workshops offered by Professor Zvia Naphtali at NYU’s Robert F. Wagner Graduate School of Public Service in May and June.

The workshops are designed to help professionals in any field learn the skills necessary for implementing GIS to improve the analysis of data in their organizations. Past participants have come from a wide variety of agencies, organizations, and businesses such as city planning, environmental protection, museums, and political consulting, to name a few.

Professor Naphtali is a Clinical Assistant Professor at the Robert F. Wagner Graduate School of Public Service. For more information on the workshop, please send e-mail to naphtali@is2.nyu.edu or call her at (212) 877-1475.
Finding the Best Path
Interactive Route Location Using EARL and Other GIS Packages

This is a map of an area near Spearfish, South Dakota. Different colors correspond to the different soil types. If you assign new statistical weights to these categories in the table below, the optimal path will probably change in response.

You can add another overlay to this demonstration map, showing the borders of real estate parcels that make up that area.

<table>
<thead>
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<th>Category</th>
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<td>110</td>
</tr>
</tbody>
</table>

You can add another overlay to this demonstration map, showing the borders of real estate parcels that make up that area.

Operating the Web Page

Now all these solutions are being incorporated into a single interactive Web application that allows planning sessions to occur anyplace, anytime. In an NSF report, Professor James Mellet, an NYU geologist, wrote that this method might allow participants in a town meeting to see the issues more clearly. They could immediately see whose backyard the route was traveling through, and what it would cost to make any changes. This could democratize the whole planning process: no more decisions made in smoke-filled back rooms.

The visitor to the Web page can get a feeling for this with a protracted session. Economic, ecological, and quality-of-life concerns may be changed by manipulating the data grid between the two towns. The illustration shows the table used to change the data in a specific layer—in this case, the layer showing soil types. Each soil type has an associated cost for constructing a pipeline across each 30x30-meter cell; a different value can be assigned to any of the soil types, modifying the input to the algorithm, and thus the ultimate “best” path. Other layers can also have costs assigned and reassigned, also affecting the end results: put a wetland here, a mountain there, a historic Native American site in the line of the shortest path. The user may choose to increase the cost of crossing specific land types, say old-stand forests, to infinity, in order to see how much it costs to act on our concerns (that is, Can we afford to put our money where our mouth is?).

Then the visitor runs the route-selection program. Three different answers are returned: three “least-cost” or “shortest-path” routes are computed and displayed, using GRASS, ARCInfo, and EARL. The costs for the three pipelines may then be compared if the visitor is interested in computational differences between the packages. More likely, visitors will be more interested in changing the costs again, in acting like participants from various interest groups. They pose economic and ecological questions that can be answered by manipulating the data grid between the two towns.

Projects of this type can reach hundreds of miles in length and have a significant impact upon the environment. They represent enormous capital investments—and political minefields. Perhaps GISs and EARL offer a way to clear the fields and arrive at mutually acceptable solutions.
In Scientific Computing, Taking RISCs Can Yield Better Speed and Performance

Edward Friedman  
edward.friedman@nyu.edu

Over the past five years, RISC technologies have emerged as an important force in scientific and engineering computing. RISC (reduced-instruction-set computing) systems have benefited from both the economies of scale in the mass production of microprocessor chips and the relative ease of programming them. Advances in computer science and software engineering, along with the ubiquitous use of the Unix operating system, are providing scientists, researchers, and students with more powerful computing environments.

Technical advances in materials research, circuit design, and fabrication have increased the density and speed of the components of RISC computers, most importantly the central processor. A consequence of these innovations is that the computing systems scale easily — that is, they can be made faster or larger, or used in multiples, without the need to redesign the basic components. These advances not only enhance existing efforts of users by making the work easier to accomplish and faster, but allow them to consider and solve more interesting and complex problems.

RISC systems have fewer and simpler instructions, whose execution times are directly proportional to the clock speed of the processor. The latest RISC processors can also issue and execute several instructions simultaneously, resulting in parallel processing within a single processor.

Two kinds of scalability are then possible, increased speed and larger problems. Having several RISC systems working concurrently on a problem decreases the real time needed to accomplish the work. It also offers researchers the potential to increase the size and complexity of the scientific investigation.

RISC technology is not new, but only recently has it become widely available. This is in part due to the introduction of the Motorola Power PC chip set developed jointly by Apple, IBM, and Motorola, and by the rapid development and deployment of the Alpha processor by DEC (Digital Equipment Corp.). Silicon Graphics, Inc., has used RISC chips from its MIPS division for the central processors of its workstations and servers for nearly ten years, and is working on specialized RISC processors for high-end graphics. SGI also supplies RISC processors to majors of electronic games and networking devices, which need relatively large numbers of calculations per second for their effects and functions. Hewlett-Packard, a leader in engineering workstations, has continued to develop its PA systems, which have been used in both American and Japanese supercomputers. IBM has integrated Power PC chips into workstations and will likely be offering them in the successor to its SP-2 multiprocessor systems.

RISC systems range from the single-processor desktop units to very large multiprocessor systems configured into a variety of architectures.

Most of the major manufacturers of workstations and desktop systems have incorporated RISC technology into their systems. These include Apple, DEC, IBM, Intel, HP, SGI, and Sun. Larger RISC systems made up of clusters of individual workstations interconnected by high-speed networks and highly
RISC and CISC: When Slower Is Faster

The central processing units (CPUs) of early computers were relatively simple: a few circuits capable of performing a few functions, such as get, a figure, put it somewhere, add it to another, and so on. The speeds of the calculations seemed phenomenal then; what was slow was the process of getting the data and the instructions to the CPU so it could do its work. The solution was to hard-wire more and more instruction sets into the CPU itself: multiply, divide, square root, or whatever; once a set of figures was in the CPU, the complex instruction set was run at blazing speeds, and the CISC (complex-instruction-set computing) machine was born, and kept getting more complex. More and more instructions were hardwired into the chips, and the CPUs got hotter and hotter — both figuratively and literally.

Ultimately, though, chip designers began to see a point of diminishing returns: as more and more functions were added, the chip as a whole was gaining less speed. Since some of the complex functions were only rarely used, the designers figured that it made more sense to leave them out, to be handled by the software. Those rare functions would be handled more slowly, but the reduced-instruction-set computer (RISC) could perform the simpler operations faster, and the system as a whole would operate faster.

— Editor

integrated multiprocessor shared-memory systems have been rapidly incorporated into research, industrial, and commercial enterprises. These developments probably hastened the demise or merger of several major computer manufacturers within the last few years: Cray Computer Corporation, Convex, Cray Research, Thinking Machines, and KSR all relied on proprietary rather than commodity components, leaving them at a competitive disadvantage.

Systems based on the Intel 80x86 CISC technology, currently the Pentium and Pentium Pro, have also improved performance. Many researchers are running variants of Unix (such as Linux or BSD/OS) on systems with one or more of these processors. The computational power of these systems compares very well to RISC-based systems, and their price-performance ratio is attractive.

Processor clock speeds of over 100 megahertz (MHz) are now common on both the RISC and CISC processors. Speeds of over 300 MHz are now being offered by DEC, and it is likely all the other vendors will soon follow. However, clock speed is only one characteristic of a computer system, and performance can be measured only by running an application on several systems and comparing the results. Performance measurements of so-called benchmarks are published both by the vendor and by several independent organizations, and are readily available from sources on the World-Wide Web.

The latest Linpack Benchmarks report can be obtained by going to the Netlib home page — http://www.netlib.org/. The Linpack Benchmark makes an attempt to measure floating-point CPU performance of a single linear-algebra problem which is of interest to scientists. It should be used only as a rough comparative measure of different computing systems, and must be used in conjunction with other measures to obtain an evaluation of overall system performance.

RISC Systems at the ACF

The ACF has been using RISC-based systems for several years. All of the Silicon Graphics workstations and servers are based on chips from SGI's MIPS division. All of the IS systems for the NYU-Internet accounts are using DEC Alpha processors.

The ACF plans to replace most of its older shared servers with RISC systems from either DEC, IBM, or SGI. Sparc RISC-based systems from Sun Microsystems are in use at the Courant Institute and at the Center for Neural Sciences, and these systems are being upgraded with new RISC offerings from Sun.

In this rapidly evolving technology, any comparison of the characteristics of RISC processors is quickly out of date. For those interested in making their own comparisons, the box below lists the World-Wide Web sites for the major producers of RISC systems.

<table>
<thead>
<tr>
<th>Major Makers of RISC Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple Computer <a href="http://www.apple.com/">http://www.apple.com/</a></td>
</tr>
<tr>
<td>DEC <a href="http://www.dec.com/">http://www.dec.com/</a></td>
</tr>
<tr>
<td>IBM <a href="http://www.ibm.com/">http://www.ibm.com/</a></td>
</tr>
<tr>
<td>Silicon Graphics <a href="http://www.sgi.com/">http://www.sgi.com/</a></td>
</tr>
<tr>
<td>MIPS <a href="http://www.mips.com/">http://www.mips.com/</a></td>
</tr>
<tr>
<td>Motorola <a href="http://www.mot.com/">http://www.mot.com/</a></td>
</tr>
<tr>
<td>Hewlett-Packard <a href="http://www.hp.com/">http://www.hp.com/</a></td>
</tr>
<tr>
<td>Sun Microsystems <a href="http://www.sun.com/">http://www.sun.com/</a></td>
</tr>
<tr>
<td>Intel <a href="http://www.intel.com/">http://www.intel.com/</a></td>
</tr>
</tbody>
</table>
CD-ROM periodical indexes are among the most popular resources in Bobst Library. With CD-ROMs and other electronic databases, researchers can quickly and efficiently locate citations to magazine and journal articles in a wide variety of subjects.

Bobst's three reference centers specialize in different subjects. Humanities and general reference resources can be found on the main floor; government documents, social-science and business materials are housed on the sixth; science, medicine, and technology resources are located on the ninth. Relevant electronic indexes are available in each of these reference centers. For example, the MLA International Bibliography, which focuses on literature and linguistics, is on the first floor, while social-science titles like Psychological Abstracts are available on the sixth (for the record, abstracts are brief summaries). In addition to these specialized items, each reference center provides access to a few multidisciplinary indexes, including Periodical Abstracts and Dissertation Abstracts.

In this article, we’ll explore some features common to most databases, and outline techniques which can be applied to a wide range of databases, from online library catalogues like BobCat to the myriad CD-ROM and online systems available in the Library’s reference areas.

Database Lingo

Databases are made up of records (see example), and records are made up of fields. Fields in our

A database record from Periodical Abstracts as it appears onscreen; individual field names appear in bold type.

example include title, author, abstract, and subject, among others. If we simply enter words at the search screen, we’ll retrieve a list of records containing those words anywhere they appear in the record. If our terms are very general, we’ll retrieve far too many items, and many will not be relevant to what we’re researching. There are two important techniques for refining our database searches: first, we’ll limit our search to certain fields, and then we’ll combine terms using the Boolean operators and and or (that’s it for the jargon, promise!).

Claire Gabriel is Librarian for U.S. and World History at Bobst Library.
Limiting a Search to Specific Fields

Although the specific commands differ from index to index, it is always possible to search for words within fields. If a word appears in the title of an article, or is identified as the article’s subject or descriptor (see the glossary sidebar), it is more likely to be relevant than the chance inclusion of the same term within the article’s abstract or other less relevant field.

We can improve the accuracy of a search in Psychological Abstracts and eliminate many “false hits” by limiting our search to the descriptor field. Let’s say we’re researching the psychological correlation between job satisfaction and salary. At the search prompt, we might type (using either capital or small letters)

\texttt{salaries in de and job satisfaction in de}

This will yield citations that address both facets of our research. The phrase in \texttt{de} specifies that both terms must be located in the descriptor field.

Periodical Abstracts uses the term subjects rather than descriptors. To find articles on water pollution and legislation, we would enter

\texttt{su(water pollution) and su(legislation)}

being sure not to leave a space between \texttt{su} and the parentheses around the terms we’re searching for.

Both \textit{Periodical Abstracts} and \textit{Psychological Abstracts} provide an online list of subject headings from which you can select terms for your searches. In \textit{Periodical Abstracts}, press the F6 key, select subjects and begin typing possible search terms; in \textit{Psychological Abstracts}, press the F9 key for the online thesaurus.

The \textit{limit} feature is also useful for locating articles by a particular author. In \textit{Periodical Abstracts}, the code \texttt{au} is used to specify the author field — as in \texttt{au(chomsky, noam)}. If you’re not sure of an author’s name, press F6, select authors, and begin typing the last name. In \textit{Psychological Abstracts}, press F5 and type in the author’s name (again, last name first). Then press s for select and f for find to identify articles by that author.

Combining Keywords

To make an even more precise search, combine keywords using and; to broaden the search possibilities, combine keywords using or. With some care, you can use both and and or in one search. Let’s look again at our \textit{Periodical Abstracts} example about water pollution. If we want to locate articles that deal with both legislation and government regulation, we can formulate the search as follows:

\texttt{(continued on page 24)}
Software for Training; Books on Programming for the Web

*Heather Hacker and Brian Kress*

*computer.store@nyu.edu*

The face of education is rapidly changing with the advent of new software programs to help both students and teachers integrate teaching and technology. Even the definition of a classroom is expanding to include everything from the classic chalkboard and chairs to the computer on your desk at home. Although it will be some time before we reach the point where we’ll never have to take off our pajamas again, there are a few software products and books that can start you down the road to bringing the classroom into your bedroom. Of course that doesn’t mean you don’t have to go to class on Monday morning.

**Training with Software**

Transparent Language’s Now! series, including French Now! and Spanish Now!, are computer-based learning tools that help students bring the language lab home with them. The Now! packages combine software and audio tapes to create an interactive language tool that allows students to read native literature, listen to native speakers and record their own voices to perfect their pronunciation. The program is packed with grammar tools, vocabulary lessons, and articles that not only immerse the student in language but teach the culture and current affairs of the native country. The inclusion of interactive language-learning games makes these software packages entertaining as well as educational for everyone from the beginner to the advanced language student. You can bring the language lab home to your Mac or PC for about $40.

Princeton Review has added a new dimension to its test-preparation courses with software. The software, bundled with the company’s popular test-preparation guides, includes practice exams and online support for more thorough preparation. Study aids cover the type of questions that will appear on the test, give the correct answers, and explain why they’re correct. The guides help students identify their strengths and weaknesses on the tests and focus their study efforts to best prepare for the exam. Princeton Review software and guides are available for the MCAT, GRE, GMAT, and other tests. Princeton Review software, available for both PCs and Macs, starts at about $23.

Truby’s Writers Studio has created Storyline Pro, an interactive writing tool that walks the user step by step through the writing process. Storyline Pro identifies the twenty-two building blocks of every great story, the necessary depth of well-rounded characters, and the elements needed for a gripping plotline.

Storyline Pro separates your novel, script, or play into tracks of visual components, action components and dialogue components, and helps you coordinate all the elements of your piece. Also included in Storyline Pro is script formatting for basic screenplay commands and a unique rewriting system which allows you to import stories you’ve already written to restructure and polish. Examples of over twenty successful screenplays and short stories are also included, with complete analysis of what makes them work and why. Storyline Pro is available for both the Macintosh and the PC at $110.

Heather Hacker is the software buyer and Brian Kress the book buyer at the NYU Computer Store.
Finding the Needle (continued from page 22)

**Books on Java**

Many new books on Java have been published in the past two months. Java is an object-oriented programming language that enables you to build Web pages incorporating live video, animation, and interactive 3D images. If nothing else, it will make Web browsing more visually exciting. Here are some titles for those interested in learning more about this new technology.

- *Hooked on Java*, by Arthur van Hoff, Ami Shaio, and Orca Starbuck (Addison-Wesley, $29.95).
- *Java!,* by Tim Ritchey (Macmillan, $35.00).
- *The Java Application Programming Interface*, by James Gosling (Addison-Wesley, $44.25).
- *Java, by Example*, by Jerry Jackson and Alan McClellan (Prentice-Hall, $34.95).
- *Just Java*, by Peter van der Linden (Prentice-Hall, $34.95).

**Finding the Needle**

In this case, the keywords **legislation** and **regulation** (linked by **or** broaden the search to citations concerning either legislation or regulation that also deal with **water pollution**. But note that when using both **and** and **or** in one search statement, parentheses must be included to indicate the intended relationship between keywords.

Similarly, our search for materials on **salaries** and **job satisfaction** can be expanded. If we want to expand our search to include materials on **salaries** and **job performance**, we would formulate the search statement in this way:

**salaries in de and (job satisfaction in de or job performance in de)**

This will yield citations to articles and other materials dealing with both job performance and job satisfaction as related to salary.

**A Few More Details**

In many databases, including *Periodical Abstracts*, citations are displayed in reverse chronological order; that is, the most recent citations appear first. Keep in mind that just because these sources are electronic does not necessarily mean that they offer up-to-the-minute information. Like printed indexes, CD-ROMs are generally updated only periodically. Online databases, by contrast, are often updated much more frequently. In news-related databases where timeliness is essential, some in fact are updated daily.

Most databases allow truncation of words. This simply means that we can look for anything that begins with a certain “root” word. Some databases use the asterisk, others the question mark, and still others the pound sign (#) as a truncation symbol. As an example, in *Psychological Abstracts* we would type `addict*` to retrieve citations dealing with addicts, addiction, or addictive behavior. Since most databases are designed to be user-friendly, if we look around the screen there is usually some way to find out these specific details without too much trouble. *Help sheets* for each database are located near the computer networks in each reference center.

Since most of Bobst’s periodical indexes on CD-ROM are produced by just a few electronic publishers, skills learned in one database will easily transfer to another. For instance, searching techniques learned in *Periodical Abstracts* can be used in *Dissertation Abstracts* and the *New York Times Ondisc*, since all are produced by the same company. Similarly, the *MLA Bibliography* and *Psychological Abstracts* share a common search interface. With a little practice, you can become an expert searcher of the databases you’ll need to use regularly.
### 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. 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, call the Helpline or see page 28.

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**— Vincent Doogan**

doogan@nyu.edu

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**Vincent Doogan is the ACF Associate Director for User Services.**

### Listing by Date

#### Monday, May 20
- Using a Mac at an ACF Lab  
- Using a PC at an ACF Lab  

#### Tuesday, May 21
- Using a Mac at an ACF Lab  

#### Wednesday, May 22
- Using a Mac at an ACF Lab  
- Using a PC at an ACF Lab  

#### Thursday, May 23
- Using a PC at an ACF Lab  

#### Tuesday, May 28
- Using a Mac at an ACF Lab  
- Using Unix at the ACF  
- Intro to SPSS  

#### Wednesday, May 29
- Internet and E-mail  
- Using Unix at the ACF  
- Using a Mac at an ACF Lab  
- Using a PC at an ACF Lab  

#### Thursday, May 30
- Using a PC at an ACF Lab  
- Advanced SPSS  
- Using a Mac at an ACF Lab  

#### Friday, May 31
- Using Unix at the ACF  
- Using a Mac at an ACF Lab  

#### Saturday, June 1
- Using a Mac at an ACF Lab  
- Using a PC at an ACF Lab  
- Using Unix at the ACF  

#### Tuesday, June 4
- Using a PC at an ACF Lab  
- SPSS on IBM RISC System  

#### Wednesday, June 5
- Internet and E-mail  
- Using Unix at the ACF  
- NYU-Net Software  
- Intro to SAS  

#### Thursday, June 6
- Using a PC at an ACF Lab  
- Using a Mac at an ACF Lab  
- Intro to SAS  

#### Friday, June 7
- Choosing Your Computer  

#### Wednesday, June 12
- Internet and E-mail  

#### Thursday, June 13
- Intermediate SAS  

#### Friday, June 14
- Getting Started on Your Mac  

#### Friday, June 21
- Getting Started on Your PC  

#### Monday, July 1
- Using a Mac at an ACF Lab  
- Using a PC at an ACF Lab  

#### Tuesday, July 2
- Using a Mac at an ACF Lab  

#### Wednesday, July 3
- Using a Mac at an ACF Lab  
- Using a PC at an ACF Lab  

#### Monday, July 8
- Using a PC at an ACF Lab  
- Using a Mac at an ACF Lab  

#### Tuesday, July 9
- Intro to SPSS  
- Using a Mac at an ACF Lab  

#### Wednesday, July 10
- Internet and E-mail  
- Using Unix at the ACF  
- Using a Mac at an ACF Lab  
- Using a PC at an ACF Lab  

#### Thursday, July 11
- Using a PC at an ACF Lab  
- Advanced SPSS  

#### Friday, July 12
- Using Unix at the ACF  

#### Saturday, July 13
- Using a Mac at an ACF Lab  
- Using a PC at an ACF Lab  

#### Thursday, July 18
- Using a PC at an ACF Lab  

#### Wednesday, July 31
- Internet and E-mail  

#### Wednesday, August 7
- NYU-Net Software  

#### Friday, August 16
- Getting Started on Your PC  

#### Friday, August 23
- Getting Started on Your Mac  

#### Wednesday, September 4
- NYU-Net Software  

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**Connect: Academic Computing and Networking at NYU Summer 1996**
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.

Friday 12:00–1:30
June 7

Getting Started on Your New Computer
(Mac and PC)
This introductory talk will help you learn your new 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.

This talk will be particularly helpful to recent or prospective purchasers of computing equipment. Taught by staff from the NYU Computer Store.

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

1. For Mac Owners
Fridays 12:00–1:30
June 14
Aug 23

2. For PC Owners
Fridays 12:00–1:30
June 21, Aug 16

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
May 21, 28
July 2, 9

Saturdays 11:00–12:00
June 1
July 13

3rd Avenue No. Res. Hall, level C-3
Seating capacity: 15; first come, first served; hands-on class.

Mondays 11:00–12:00
May 20
July 1, 8

Wednesdays 11:00–12:00
May 22, 29
July 3, 10

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 (12 on Thursdays); first come, first served; hands-on class.

Saturdays 11:00–12:00
June 1
July 13

Thursdays 11:00–12:00
May 23, 30
July 11, 18

3rd Avenue No. Res. Hall, level C-3
Seating capacity: 15; first come, first served; hands-on class.

Mondays 11:00–12:00
May 20
July 1, 8

Wednesdays 11:00–12:00
May 22, 29
July 3, 10

Using Unix at the ACF
(Unix machines)
An introductory class on using the Unix operating system, variants of which run on several different types of computer 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. ACF staff. ACF Unix account required.

Tisch Hall, room LC8
Seating capacity: 24 (12 on Fridays); first come, first served; hands-on class.

Wednesdays 11:00–12:00
May 29
July 10

Fridays 1:00–2:00
May 31
July 12

For More Information:
Call the ACF HelpLine, 998-3333.
E-Mail and Network Services

Introduction to the Internet and Your ACF E-Mail Account (NYU-Internet Account)
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 313
Seating capacity: 30; first come, first served.

Wednesday 12:00–1:30
May 29
June 12
July 10, 31

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.

Wednesdays 12:00–1:30
June 5
July 3
August 7
September 4

Statistics, Databases, and Spreadsheets

SAS Lecture Series (Windows, Unix)
This series will progress from the basic operations of this statistical package to intermediate concepts and usage. Robert Yaffee.

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

Thursdays 4:15–6:00

1. Introduction to SAS
June 6

2. Intermediate SAS
June 13

SPSS: SPSS for Windows (Windows, Unix)
SPSS (Statistical Package for the Social Sciences) is a comprehensive, integrated system for statistical data analysis. While these hands-on presentations will use either the Windows or the newer Unix version of SPSS, 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

Tuesdays 6:00–7:30
May 28
July 9

2. Advanced Topics in SPSS
Elementary statistical procedures for the analysis of data will be covered. Knowledge of SPSS and Windows basics required. Frank LoPresti.

Thursdays 6:00–7:30
May 30
July 11

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 the 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
June 4

ACF HelpLine Q&A

Q: Is there someplace I can find out about these ACF classes and workshops online?

A: Yes, indeed.

On NYU Web, you can see the schedule at http://www.nyu.edu/acf/pubs/Sched/
It’s updated each semester with the latest offerings, often before the print version is available.

— L. Barnett

Call the ACF HelpLine at 998-3333

Connect: Academic Computing and Networking at NYU Summer 1996 27
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 for limited hours without charge as general users. There is no application procedure; simply come to a lab with your valid NYU ID.

Getting an ACF Priority or Class Account

For priority access to the labs at all times, and to use most other ACF computers and special equipment, you will need to have an ACF priority account. There are two kinds. Faculty, staff, and students working on faculty-sponsored projects can obtain individual accounts. Instructors can obtain class accounts that cover all the students in a course section. To apply for a priority account, please contact the ACF Accounts Office (room 305 Warren Weaver Hall, 998-3035). For hours of availability to general users and to holders of priority accounts, see the schedule on the opposite page.

The ACF recommends that instructors obtain a class account whenever a course requires students to use computers. These accounts give students priority access to ACF computers, and the application procedure helps the 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 (100 computers)

- 33 PowerMac 6100 computers, with CD-ROM drives, color monitors
- 21 Macintosh Quadra 700 computers, with 20 MB memory, 80-MB hard drives, 16-in color monitors
- 2 Macintosh Quadra 800 computers, with CD-ROM drives, color monitors
- 14 Macintosh systems in the New Media Center, dedicated to special projects and classes in the arts
- 6 Macintosh IIfx computers, with CD-ROM drives and color monitors
- 1 media transfer station, based on a Macintosh Quadra 800, with a 100-MB Iomega Zip drive, a 270-MB APS Syquest drive, a 135-MB Syquest EZ drive, and an APS Syquest drive for 44-, 88-, or 200-MB media

other peripherals

- 1 Mitsubishi 35" display monitor with a 270 MB APS Syquest drive and 1 JVC VCR
- 33 APS 270 MB syquests drives
- 17 Iomega 100 MB Zip drives
- 2 JVC VCRs
- 8 Hewlett-Packard flatbed scanners (1 IIC and 7 IICX)

- 4 Hewlett-Packard laser printers (3 IIfx 300 dpi and 1 IIfx 600 dpi)
- 2 Hewlett-Packard Paintjet printers
- 1 Apple ColorLaser printer
- 1 Xerox multiple-paper-size printer

Third Avenue North Residence Hall, basement (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 IIci computers, with color monitors
- 16 Macintosh IIfx computers, with 17 MB of memory, color monitors

Tisch Hall, room LC-8 (72 computers)

- 1 IBM-type computer with Accent Text-to-Speech Synthesizer, Vocal-Eyes Screen Navigation Software, Zoom-Text Screen Magnification Software
- 47 IBM PS/2, 555X, with VGA color monitors
- 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

14 Washington Place (64 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
- 7 Gateway 486 DX computers, with 8 MB of memory, Super-VGA color monitors
- 4 IBM PS/2 386 computers, model 70, with 6 MB memory, VGA color monitors
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 campuswide network, set your modem to 8 data bits, 1 stop bit, full duplex, no parity, and dial one of these numbers.
Modem Speed (bps) Dial
300-2400 995-3600
9600 or 14,400 995-4343
DIAL accounts only 253-4698

For More Information:
Visit us on NYU Web at http://www.nyu.edu/acf/ or call the ACF HelpLine at 998-3333.

Summer Hours at the ACF (effective May 18 through September 3):

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*These labs are open to general users Monday through Friday from 8:30 am to noon and 8:00 pm to closing, and on weekends during all hours of operation; open to priority access account holders during all hours of operation. At all hours, holders of priority accounts have priority use of the equipment in the labs.
**Available to general users during all hours of operation.

Holiday schedules and other special announcements will be posted via the NYU Web at http://www.nyu.edu/acf/nyu-events/. ACF offices at 251 Mercer Street are closed on University holidays.
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Mountains, valleys, roads, and real estate: in GIS, all are keyed to a map made up of 100-foot-square cells, each with a numerous values attributed. Through it all, EARL finds a way. page 14