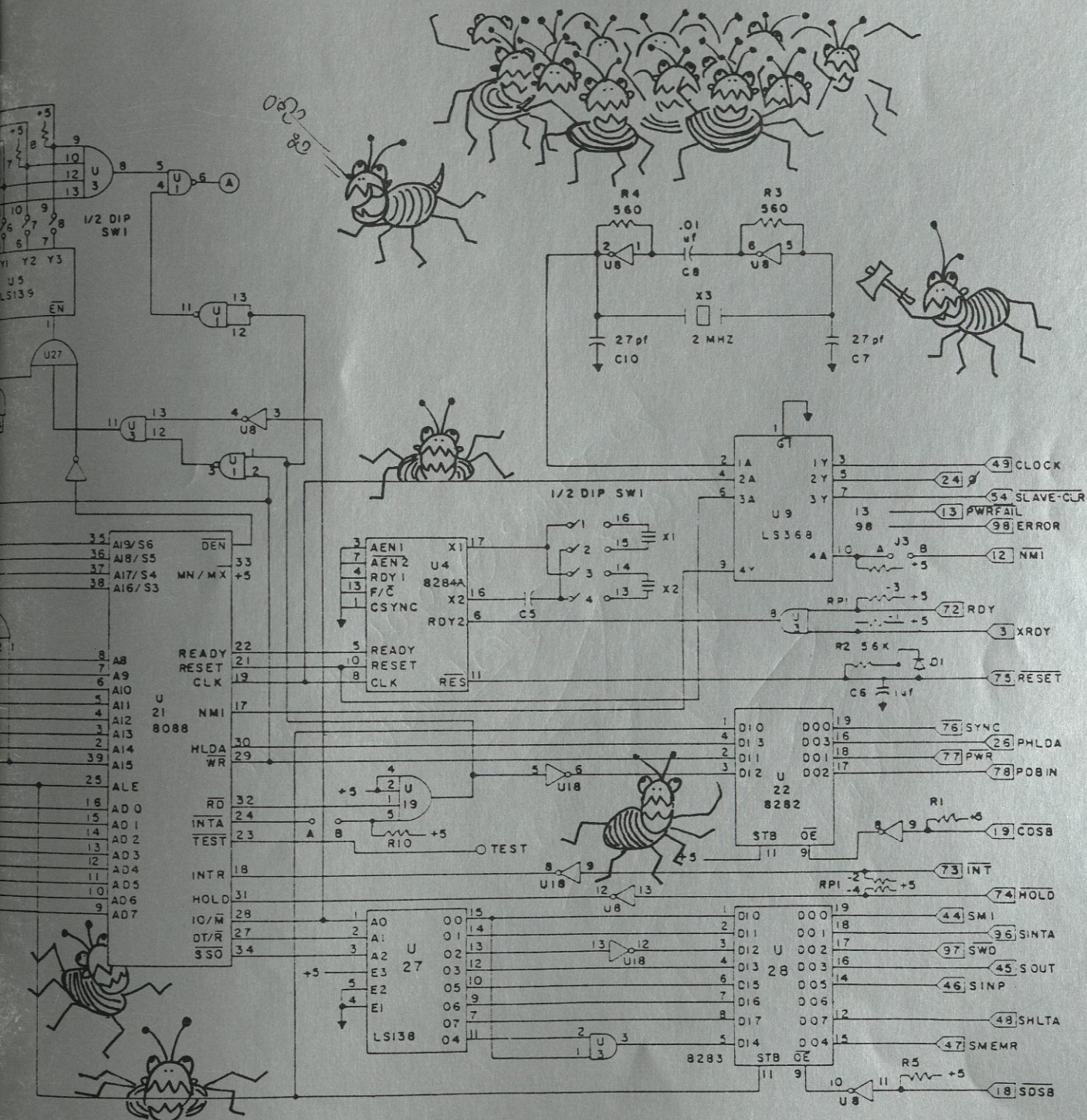


COLORADO ENGINEER



Deadly Computer Viruses

Fall '88



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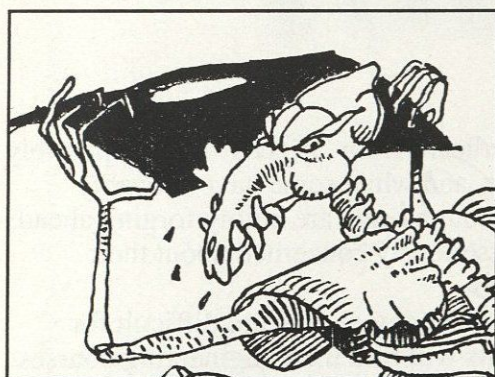
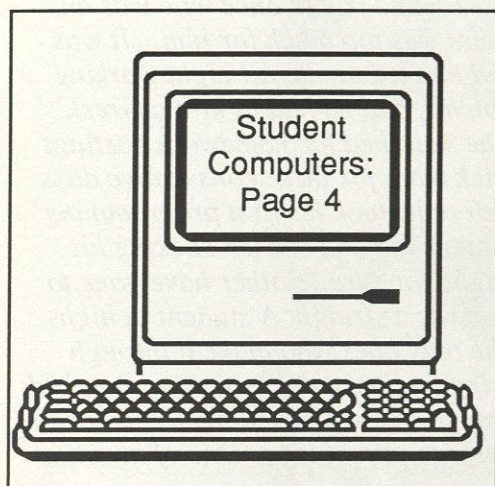
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For more on this dreaded computer virus, turn to page 8.

On the Cover:

Contagious electronic viruses invade computers' operating systems, destroying files and wreaking havoc.

Cover design by Margit Lund and Intel Corporation.

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STAFF

Editor

Ian McEwen

Production Manager

Stephanie Fortune

Business Manager

Anne Kadlec

Circulation

Brian Walker

Jeff Wieland

Special Projects

Lynn Konecne

Robb Young

Writers:

Kirsten Abrahamsen

Ken Fischer

Brian Glach

Nguyen LeDinh

Mike Moran

Chandra Peer

Production:

Tony Apuzzo

Chandra Peer

Jeff Wieland

Artwork

Mike Descour

Margit Lund

Photography:

Scott Merkle

ASIDE

"You're an -- engineer?? Oh. I'm so sorry. I had a friend once who was an engineer, but he... well, let's just say the stress was too much for him. It was the nights, you know. The professors forced him to stay up all night working ambiguous and unsolvable homework problems, and he had to hire a Greek tutor to help him with his calculus! Once he searched for homework postings somewhere in the EE wing of that giant brick maze for three consecutive days and nearly starved. Of course, that was before he took his first programming class, when he moved his bed into the computer lab and started sticking his eyes open with duct tape. It was an ugly sight, for sure. Rather have gone to 'Nam, myself. Funny thing, too, because he was a straight A student in high-school, a real bright boy. But you know, the only ones who make it through engineering are geeks; over half the entering freshmen engineers are knocked off sometime before graduation. Luckily, my friend was saved before it was too late, and he only suffered having to transfer into psychology. One of my other engineering friends didn't fare so well..."

Many engineering freshmen have heard from "friends" how impossibly difficult engineering classes are, and while some have probably shrugged aside these taunting thoughts and are boldly forging ahead, others (I know several personally) may be seriously concerned about their ability to handle college engineering classes.

There is cause to be concerned: engineering classes are difficult for most students. It is quite likely that students will find their engineering courses much harder and more time-consuming than the social humanistic classes they take.

However, this point is easily exaggerated, and often is. Some students must apply themselves more than others to learn the material, but *most students who really wish to become engineers and are willing to work for it can make it through the school of engineering.*

Really! Many of the students who drop out of engineering signed up originally for the wrong reasons. Perhaps they didn't know what engineering entailed, or maybe well-meaning relatives pushed them into engineering even though it wasn't in their hearts, or they just might not have wanted to work as hard as is necessary. Those who are truly interested in the subjects they are studying will almost always fare better in their classes than the ones who secretly (or openly) find their engineering curriculum boring, or useless, or sickening.

So take heart! If an engineer is what you want to be, and if you are willing to work hard, harder than you did in high school, then an engineer you can be... Then you too can spread horror stories among subsequent freshman classes about the nightmares of becoming an engineer.

Ian McEwen

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COMMUNICATIONS 

Personal Computers...

By Nguyen LeDinh
and Ian McEwen

Thirty years ago, an engineering student used the slide rule to do basic calculations. Ten years ago, the calculator enabled him to do more complex calculations faster. Today, he has a computer to do all of that plus a whole lot more. Word processing, file management, spreadsheets, computer aided design (CAD), and games are examples of applications and uses of computers.

Do you need a computer?

Engineering students use computers in many courses and throughout their careers. If you do not already own a computer, you may be wondering if the time has come to purchase one. Will you be at an unfair disadvantage if you do not have your own computer, when so many other engineers do? After all, there are many public computing sites on campus where you can accomplish most of your computing jobs at no cost. However, labs are not always open, and are often crowded. If you wish to use programs not offered at the computing site, you will need to bring them on your own floppy diskettes. During inclement weather the extra treks to the Engineering Center can become unpleasant nuisances. The luxury of having a computer in your own room can be well worth the initial expense.

If you want the convenience of owning a computer, it is important to choose one that will suit your academic needs and budget. Major choices must be made when shopping for a computer: first select a basic system, which includes a CPU (Central Processing Unit), keyboard, and monitor. Then decide on specific features, such as graphic cards, software, and extra memory that may be needed. Lastly, consider supplementing the system with additional hardware such as a printer, modem, or mouse.

Basic system

The first decision to make is which system to buy. According to David Clough, Associate Dean of the College of Engineering, for engineering students the decision is whether to buy a Macintosh computer or an IBM PC or compatible.

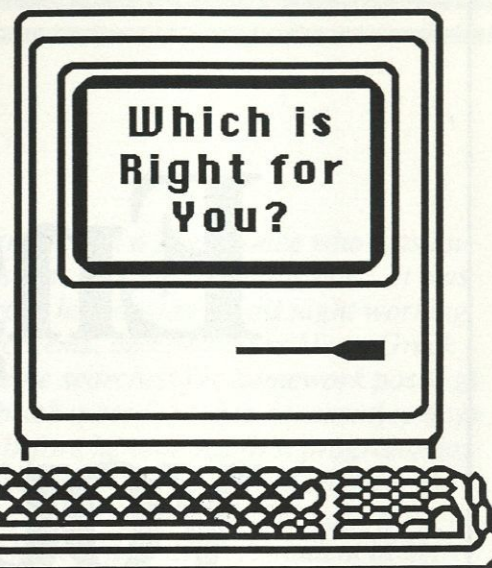
"That seems to me to be one of the hardest decisions for students to make right now. The Apple Macintosh is in many ways a wonderful computer. It is very attractive, friendly to use, and easy to learn. It has in its presentation of software a very efficient way of doing things.

"The IBM types (IBM or compatible), in general, have technical software that is at a higher level of development than the software for the Macintosh."

Should you buy the system you like best, and then find programs that are available for it? Or should you first choose the specific application programs you want to use, and then buy the system that will run those programs? This decision can be simplified by determining exactly what the computer will be used for.

Most college students will be typing long formal papers, so having a word processor that you like and access to a quality printer is likely to be a major factor. The specific area of engineering you are entering will also help determine the types of programs you will be using. Electrical and computer engineers can expect to spend many hours writing programs, especially in Pascal, while students in the other engineering disciplines generally work with FORTRAN.

Check into the computing require-



ments for classes you will take. Will you be using high-resolution graphics applications, such as computer aided design? Will you be number-crunching, with a need for fast floating-point arithmetic? Will you be using spreadsheets and graphs? What, if any, work will you do on the main-frames?

Clearly, computers and their applications go hand-in-hand, so it is important to consider the hardware and software together.

IBM PS/2

A new forerunner in today's micro-computer technology is the IBM PS/2 line of computers. These computers offer many advantages over the old IBM PCs. All the models feature at least one 3 1/2 inch disk drive. These compact diskettes store more data and are less susceptible to damage than the 5 1/4 inch floppy diskettes. The PS/2 Model 25 and Model 30 use 720k (kilobyte) diskette drives, while all the other models (50, 50z, 60, 70, and 80) have a 1.44 megabyte diskette drive. The Model 30 and Model 50 each offer 20 megabyte hard drives; the Model 50z has a 30 or 60 megabyte hard drive, and the Model 60 comes with a 44 or 70 megabyte hard drive, which is probably more than most students will ever need. These higher-end models are geared towards businesses, not students.

PS/2 Models 50 and up also offer 'multitasking' of applications, which means that users can access several programs at once. For example, two differ-

ent spreadsheets may run alongside a word processor program, and the program in the "background" can process data while the user works on other programs. This is an efficient way of doing many things at once. However, to use the multitasking capabilities of PS/2 computers, they must be run with Operating System/2 (OS/2). Each multitasking application will need at least 1/2 megabyte of RAM (Random Access Memory), and a hard disk with at least 1 1/2 megabytes. The PS/2 computers can also run DOS programs and are compatible with any of IBM's software already used in today's market. OS/2 is still not readily available and few applications use it yet.

Apple Macintosh

The Macintosh Plus is the most affordable Macintosh and is good for spreadsheets and database applications, and it is excellent for word processing. The Mac Plus has 1 megabyte of memory, expandable to 4 megabytes. With an internal 800k floppy disk drive, up to 400 pages of information can be stored on one 3 1/2 inch disk. The high-resolution black and white monitor can display many different type styles, sizes, and images.

The Macintosh SE has room for two internal floppy disk drives or a floppy disk drive and a 20 megabyte hard disk drive. The SE also offers an internal expansion connector to which you can add cards for running MS-DOS software, running Macintosh applications faster, communicating with other types of computers, or connecting to large screen or color monitors.

The Macintosh II is both a high performance computer and an advanced function work station that uses two powerful processors which allow Macintosh II applications to run four times faster than on the original Macintosh. It comes with 1 megabyte of memory, expandable to 8 or more megabytes. It also can run MS-DOS through expansion cards (sold separately) and offers high-resolution color and high quality stereo sound capabilities. Communications features are included

to permit the Macintosh II to communicate with campus networks.

Memory

Dean Clough tells students to get a lot of memory because many programs require it. These days, most of the IBM clones come with 512k or 640k of RAM. The practical limit of memory for IBM PC machines is 640k, and for those clones that offer only 512k, it is worth an extra \$30 to \$50 to have a dealer put in the extra 128k. The PS/2 may be packed with more memory than the PC's. The standard Model 25 comes with 640k of RAM, the Model 30 with 512k, but the Model 50 comes with 1 megabyte of RAM, expandable to 7 megabytes. All the other models have RAM expandable to 16 megabytes.

Most of the Macintosh computers come with 1 megabyte of memory, which is sufficient for most student needs. However, the Macintosh also has memory expansion options: the Macintosh SE can be expanded to 4 megabytes, and the Macintosh II will hold up to 16 megabytes.

Floppy Disk Drives Vs. Hard Disk Drives

Many users are realizing the advan-

tages a hard disk drive can give them -- convenience, fast operation, and high storage capacity. A hard disk gives you quick access to your applications and data without the hassle of switching diskettes back and forth, which can quickly become frustrating.

A two floppy disk IBM-type system might cost \$800, whereas a setup with a 20 megabyte hard disk costs around \$1100. You will be investing \$200 to \$300 more, but it may be worth it to have the extra memory.

Speed

For many purposes, speed is an important consideration. The original IBM PCs ran at 4.77 MHz (megahertz). Today, most IBM-types offer a 4.77/8 MHz (or higher) mode switch which increases the speed of most programs, and this "turbo" mode is useful for dealing with large spreadsheets or word processing documents, where speed can make a big difference.

In addition, a math-coprocessor chip may be added to your IBM-type system for under \$200. This expansion greatly reduces the amount of time necessary to execute floating-point calculations, which become a major factor in number-crunching applications such as SPICE, the circuit analysis program



The compact Macintosh SE is shown here with 20 megabyte hard drive, 800k floppy disk drive, mouse, and extended keyboard.

which electrical engineering students use.

The Macintosh Plus and Macintosh SE both run at 7.8 MHz, while the Macintosh II has a 16 MHz clock. Be aware, however, that the speed of programs is not a linear function of the computer's clock rate. For example, the Macintosh II offers at least a fourfold increase in performance over the Macintosh Plus, while the Macintosh II's built-in floating-point coprocessor allows number-crunching applications to run up to 200 times as fast.

Graphic Cards

What is EGA, VGA, CGA, MDA, and Hercules? No, it's not some new method for remembering ROY G. BIV, but all this terminology can spell confusion for novice computer users. These acronyms refer to the graphics and text capabilities of the IBM-type machines.

MDA (monochrome display adapter) is needed to use a monochrome TTL monitor to get text display without graphics. A Hercules board will give you a combination of high-resolution text and high-resolution monochrome graphics.

To implement color graphics, you have several choices. The CGA (color graphics adapter) card will give you four-color graphics when used with a color monitor or a RGB screen. EGA (enhanced graphics adapter) circuitry gives crisp, readable text and graphics in color. Its higher vertical resolution makes displays clear and perceptible. The EGA offers 16-color graphics and should be used with an enhanced color monitor. This is ideal for those students who will use CAD, play games, or use the graphics capabilities of many application programs such as Lotus 1-2-3.

VGA (video graphics array) gives better graphics resolution than the EGA card and is a newer technology. An enhanced VGA card provides 800 x 600 resolution in 256 colors, which is higher than the Macintosh's.

The standard Macintosh comes equipped with a built-in 512 x 342 resolution black and white monitor. Letters and pictures are sharp, crisp, and easy to read since it uses a black-on-white dis-



This IBM Personal System/2 Model 50 offers a high-density 3 1/2 inch floppy disk drive and a 20 megabyte hard drive.

play. The Macintosh II comes with a high-resolution 640 x 480 monitor, in either black and white or color.

Software

As was mentioned earlier, software and hardware go hand-in-hand, so it's important to consider which programs you want to use, and then see if those programs are available for the computer you plan to buy. IBM has a larger base of software than the Macintosh, and most compilers for IBM machines (such as C, Pascal, and FORTRAN) are more advanced than those available for the Macintosh.

For an engineering student, word processors, spread sheets, and programming language programs are important considerations. Dean Clough suggests software products that are in the "text book" price ranges: college version of Wordperfect (\$19.95, comes with 30 pages of documentation; Spelling Checker is sold separately at \$19.95); student version of Lotus 1-2-3 (\$40); Turbo Basic (\$39.95); Turbo C (\$45); Turbo Pascal (\$40-\$60); MicroCap II (\$27, a great circuit analysis program).

Many of these programs and others are available for the IBM and the Macintosh computers and can be found

at the Buffalo Chip, located inside the CU Book Center.

Extra Hardware

A printer is certainly an important part of any system. Most computer retailers add the price of the printer into the total cost, but you have the option of not getting one with the basic system. In fact, it is usually more cost efficient to shop around for a printer that you like at a reasonable price. Otherwise you could end up with a good computer system and an expensive printer that only gives adequate printouts. Printers range in quality from cheap dot matrix printers up to high-resolution laser printers. A good choice for students is a dot matrix printer which may be switched between a faster-printing draft mode and near letter-quality mode.

For students who will be using the CU computer networks, a modem can be a wise, time-saving investment. It can be extremely frustrating to go all the way to the engineering center to work on a program, only to discover that there are no available terminals, or that there is a class in the computer room, or that the machine you wanted to use is down. In addition, as long as you will

be staying up all night working on a program, why not do it in the comfort of your own room? Students living in the dormitories can, for a nominal fee, have the ISN connection hooked up so that they will not keep their phone line busy while they work on the computer networks.

Don't forget the cost of cables that are required to connect hardware to the main unit.

Tips on Buying

No matter which computer you decide to buy, you will need to do a lot of planning as well as price comparison shopping. Misleading advertisements, uninformed sales people, and "cheap"

worry about hidden flaws that some IBM clones have. However, you will usually find much better prices for clones than for true IBM machines. It is better to stick with the more famous compatibles than to go for some obscure brand that you found in a magazine ad. Zenith and Leading Edge computers are two of the best IBM compatibles for their quality and price. Also, if possible, look inside the computer for the Chips and Technologies "Chipsets", a sign of a good clone.

Service

Be sure to find out what kind of warranty the computer has, how long the warranty period is, and what kind of ser-

vice comes with the warranty and after it expires. Also find out where you can get repairs. If the nearest repair shop is 2000 miles away, then you waste time waiting for the repair.

Quality

If you opt for an IBM clone, be sure to test and use the computer, on site if possible. You will spend many hours typing in front of the computer, so make sure you feel comfortable with the monitor and keyboard, the layout and feel of the keys, and the durability of the computer. Find some literature and reviews on the computer by reading computer magazines. This will help determine which computers are of good quality.

Store or Mail

Going to a computer store is the best place to start. There you can talk directly with a knowledgeable sales person

with the computer in front of you. Try out the various computers and hardware to make certain you feel comfortable using them. In department stores, low prices take precedence over service. The sales people there are generally less-knowledgeable about the equipment, so you receive less help in exchange for a bargain price.

One of the advantages of shopping by mail is in getting the products cheaper than through a store. You can look for the famous brand name computers for a good price and save money this way. One drawback to this is not being able to test out the computer before you buy it, and another is that you will have to wait for weeks before you get it.

Peers

One of your best sources of information is your friends. If you know someone who owns a computer, ask that person if you can use it for a few hours. That way your friend can tell you about the good and bad points of the computer. When you have problems with your computer, your friend might have had the same problem before and he or she can help you resolve it (it's also helpful to have a friend who has a good quality printer for you to use once in a while, if you can't afford one yourself).

Recommendations

Take note that there are many systems and software items which cover a wide price and performance range. For basic system prices and information on the IBM PS/2, the Macintosh, and the Zenith computers, visit the Buffalo Chip computer store, where you can get detailed information on each particular computer model. *

One of your best sources of information is your friends...

brands are aggravating barriers you may stumble over. Become informed about the computer that you want to buy. When shopping around, here are some things to consider:

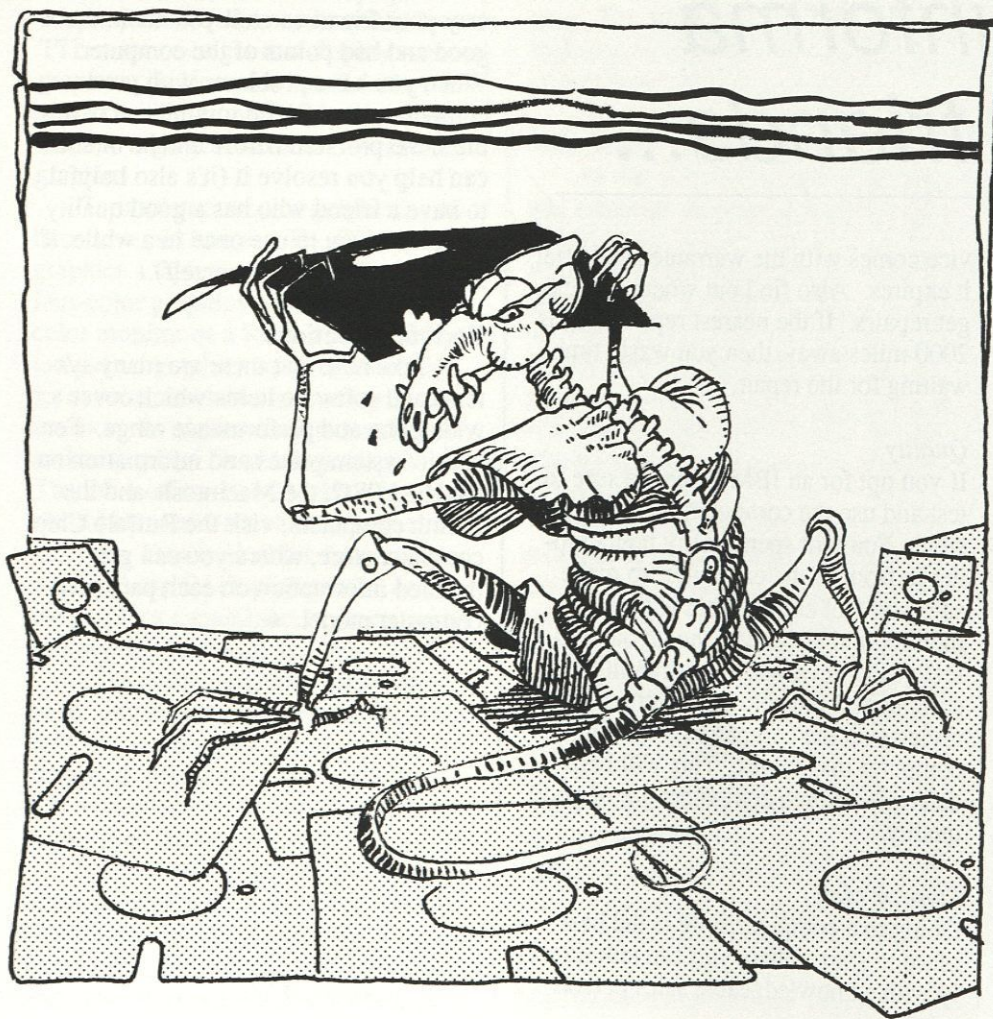
Compatibles

Make sure that the computer you choose is compatible with a standard model. An IBM compatible may not run all IBM software perfectly. If you consider buying a clone, ask the salesman about its compatibility with the software you plan to use. If possible, test the computer with any of the applications you have or know you will need. While this method is not fool-proof, it should determine if there are any major compatibility problems.

There are no compatibles for the Macintosh, so with these machines you will be dealing with a computer that has been well tested, and you won't have to

Computer Viruses

Worse than mere bugs, these malicious electronic diseases are contagious and deadly



Computer viruses present a significant threat to users of micro-computers, especially those who exchange public domain programs and information with other computers, either by modem or disk transfer.

What is a virus? Over the years, a few mischievous and malicious hackers have developed various ways of sabotaging other machines, and have released their programs into the public data stream, primarily through electronic bulletin boards.

Some of these creatures include the Trojan horse, an apparently normal program, usually a game or utility, that destroys files as its host disk is used; and the time bomb, which waits until a certain time before destroying data. Most recently, we have seen a number of cases of a new type of saboteur program - the virus.

Like its biological cousin, a computer virus embeds itself within a host to replicate itself. Viruses are often not well understood, partly because of their name association with human diseases, and partly because they inhabit the arcane world of machine

language programs. Disks do not infect each other in the storage box, but rather, the virus program must take control of the computer in order to infect other disks.

Currently, the most common approach is for the virus program to be hidden within the operating system program (COMMAND.COM on PC machines). Once loaded into memory, the virus program instructs the operating system to copy itself onto any disk accessed by the computer (such as with DIR, TYPE, or COPY), if that disk already has the operating system file on it. Then typically, after replicating itself a certain number of times, the virus proceeds to trash all the disks available to it at the time.

Actually, the virus mechanism is benign by itself. According to an article by Tom McBride and Nick Szabo in the March 1 edition of *Info-Mat*, "a 'pure' virus has survival as its only goal." But any kind of "payload" can be attached to the virus, enabling it to print a message on screen, improve its survivability, avoid detection, or even destroy disk data. The payload can also be benign, but destructive or obstructive payloads seem to be the rule among the viruses reported recently.

Case history. Although the concept of virus programs has appeared in the literature for several years (see "Computer Recreations" in *Scientific American*, March 1985, for an interesting discussion), only in the last year have many actual virus outbreaks been reported. Recent accounts cite infections within several user groups, in computer networks at IBM and Hewlett-Packard, and at the computing centers of several universities.

One of the most widely publi-

cized occurrences was at Lehigh University, where late last fall a COMMAND.COM virus infected PC's throughout the campus. The virus most likely escaped the campus and is now spreading itself around the world. Its characteristic is to copy itself four times, then trash every disk in the host system by erasing their

lic site disks have been gonged by this virus in the last couple of days."

What is the degree of danger?

Obviously, the potential for damage by viruses (and other sabotage programs) is very serious, although there are some who argue that the whole issue may be a hoax or urban legend,

the computer-age equivalent of the Kentucky Fried rat story. I doubt that anyone at Lehigh University would buy the hoax theory, but to the millions of users who have not come into contact with a virus, the whole thing certainly has a science-fiction ring to it. In fact, similar scenarios appeared in stories by several authors long before actual virus programs were created.

So far, viruses that use the operating system as a host are fairly easy to detect, and detection is the prime requirement for prevention. Szabo, who has made a hobby of designing (but not releasing) virus programs, feels that greater dangers may lie ahead. To put viruses into bina-

ry files other than the operating system is possible, he says, and would make detection much more difficult. The virus discovered last fall at Hebrew University in Jerusalem is reportedly of this type. Because of its ability to propagate itself to other disks, a virus hidden in a program file would be much more destructive than earlier vandal programs, which depend on people for distribution.

A few simple precautions can usually protect against the known types of viruses. We can only hope that if more virulent types are developed, they will also be detectable and

The virus most likely escaped the campus and is now spreading itself around the world...

boot records, FAT tables and directories. Meanwhile, the virus' four children will repeat the process somewhere else as soon as they are booted into another PC.

In a memo circulated at Lehigh University, Kenneth R. Van Wyk of the Computing Center stated that "all Norton's horses couldn't put it back together again," referring to the inability to recover data even with the Norton Utilities, one of the most powerful PC data repair programs available. He went on to say that both floppy and hard disks were affected, and concluded by saying, "This is not a joke. A large percentage of our pub-

Continued on page 16

Career Services: More Than Just Finding a Job

by Chandra Peer

A job? A real 9 to 5 job? Out in the real world? Without summers off? And here I thought that dear old CU would save me from just such harsh realities.

It may take more than four years, but eventually you will acquire enough credits to graduate. In the meantime, you may even want to gain experience in your chosen field. CU's Career Services can help with both post-graduation jobs and summer internships. And Career Services offers many other services, most of which are free.

For seniors and first-semester alumni, on-campus recruiting brings around 400 companies with job openings to campus. These are mostly the larger, Fortune 500-type companies, because they know months in advance that they will have certain jobs to fill. The cost of the service is \$20/semester and around one third of the participants receive offers. Many of those who received offers reported that their starting salary offers were at or greater than the national average.

Students interested in finding internships or cooperative education (coop) employment can register with the service for \$20/year. The coop program also brings many companies to campus. An average of 40% of students who pursue internships get offers.

For the services to be successful, the student must make a conscious effort. Finding a job takes a time commitment and a willingness to keep on top of the incoming job offers. As Gordon Gray, Director of Career Services says, "Jobs don't find people, people have to go out and find jobs. Career Services will give you all the help it can, but will not do it for you."

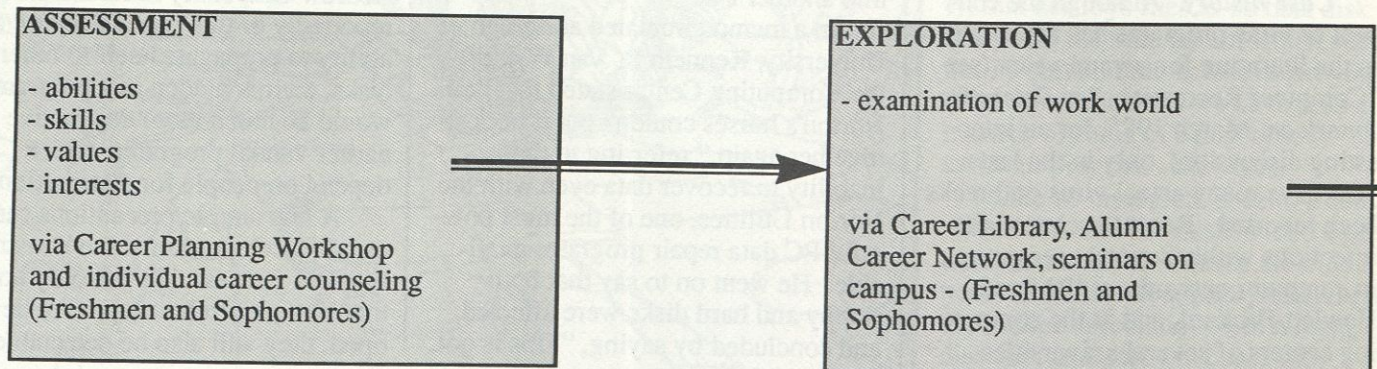
Placement and coop/internship programs require registra-

tion and an orientation workshop. This may seem like just an extra problem to take care of, but the companies say that orientation is very important to the program because of the information on resumes, interviewing skills, and company research that is part of the orientation process. Also, the student is instructed on precisely how to fill out the registration materials, and on what needs to be done to get interviews. There are many orientation workshops each semester; contact Career Services for dates, times and places.

For those students interested in finding jobs with smaller or local companies, Job Match is a computer database which matches students' skills with employers' needs. This service has a faster turn-around time than recruiting does because the companies come in looking for employees to start immediately. This allows smaller and local companies access to the large numbers of qualified graduates without having to know the job openings months in advance. Seniors within one month of graduation and alumni may use the service. The cost of Job Match is \$30 for three months.

All of the other services are offered at no cost. There are workshops on a variety of subjects, including career planning and changing, choosing a major, and a pre-placement workshop for those who have found an internship. All job search skills can be enhanced with workshops on skills analysis, resume writing, job search strategies, interviewing skills, and researching employers.

CAREER DEVELOPMENT SEQUENCE



The Career Resource Library has occupational information, employer information, and job vacancy notices. There is information on over 1,000 occupations and also computer programs to help you decide what career to pursue, as well as literature on almost 500 companies, including those recruiting on campus. Last year the library logged more than 26,000 visits and was expanded by 3,400 new resources.

For students who have problems with interviews, a video-taped practice interview can be used to point out where improvements are needed. This is a good way to discover what your particular problems are in a situation where the mistakes won't matter.

The Alumni Career Network is a list of 2,000 alumni who have volunteered to answer students' questions. Alumni in Colorado and around the United States can tell you what someone in your field actually does for 40+ hours a week, what the average salary is, what the job market looks like, and can give you tips on job hunting.

Career Services has many services to offer, but most students don't set foot in Willard Hall until their senior year when they are desperate for a job. For freshmen and sophomores, help in choosing a major

An Engineering Career: Procter & Gamble and You

Procter & Gamble is interested in talking with engineering graduates who have a record of achievement and leadership in their academic backgrounds, work experience and extracurricular activities.

We are looking for engineering graduates interested in Manufacturing Management. One of our representatives will be on campus for interviews this Fall and next Spring.

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could make the transition into college easier. All students have job search skills which could use improvement. Gray feels at Career Services the students can either "sit down to a full course meal or a smorgasbord" by using all of the services, or just a few of them.

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Joint Center for Engineering Management

by Mike Moran

Although the energy crisis of the 1970's is behind us, even greater problems are likely to arise as petroleum reserves dwindle and as pollution of the environment from energy conversion reaches toxic levels. In response to these concerns, the university-based Joint Center for Energy Management is making efforts to prepare for this scenario.

New to the University of Colorado College of Engineering, the Joint Center for Energy Management focuses on reducing energy consumption and energy payments, improving efficiency, and training energy engineers. The JCEM office was opened in 1987 on the first floor of the CU civil engineering wing.

The Center was established with \$1.35 million of Colorado's share of a refund from the regulated oil industry in money it overcharged its customers. The State of Colorado allotted that money to the University of Colorado and Colorado State University to work jointly on programs designed to improve the state's energy efficiency. The state grant is meant to sustain JCEM for the three-year period from 1987 to 1990. In addition to the state funds, the dean's office provided \$50,000, and the department of Civil, Architectural and Environmental Engineering chipped in \$66,000 for equipment and faculty support.

JCEM is targeting the design of cost-effective energy-efficient buildings and industrial processes as well as the application of renewable energy resources in its research and education activities. The Center combines the expertise of CU and CSU to meet



A JCEM graduate energy assistant installs one of the Center's weather stations, used to collect climatic data useful to building designers.

business, industrial and government needs.

Since Colorado spends about \$2 billion per year in energy, the incentive for consumers, industry, and government to improve energy efficiency is quite substantial. According to Dr. Jan Kreider, director of JCEM, "A 10 to 20 percent savings in energy consumption could be made without major capital investment. Just a one percent savings would return about 20 million dollars to consumers." He adds, "Decreasing consumption would also decrease air pollution by as much as 500 tons per year."

Manufacturers may expect a rate of return of over 400 percent by implementing recommendations made by JCEM's Energy Analysis and Diagnostic Program, which is managed by CSU engineers. The Center conducts free energy audits for manufacturers and commercial building owners and makes recommendations for energy savings. As of December 1987, over 100 facilities had been audited, and those firms which implemented recommended measures realized an average savings of \$30,000 per company per year.

Part of the Center's program is to offer professional development seminars in building sciences and energy engineering. Four seminars will be offered in the next year. The topics to be covered include cogeneration, HVAC computer-aided design, building design tools and industrial and commercial energy auditing.

Each semester the Center enhances opportunities for undergraduate and graduate students to get experience in the field of energy with undergraduate and graduate energy assistantships. As many as 10 students per year may assist graduate students or faculty of JCEM. Dr. Chuan Feng administers the selection, which is based on the student's interest in energy, as well as grades and recommendations. Aside from working as energy assistants, students can get independent study credits for individual projects. There are also a number of faculty members

in the department linked with JCEM who can help students.

Peter Curtiss, a first-year graduate student at JCEM, enjoys the work he does on the center's weather data retrieval network: "I get lots of hands-on work. It's refreshing to do a variety of things rather than sit at the computer all day," says Curtiss.

The weather data network includes eight stations around Colorado that monitor temperature, wind speed and direction and solar radiation. A computer at JCEM gathers and processes data from the photovoltaic-powered stations daily to help designers of buildings and energy systems.

"We would like to have about 50 stations," says Curtiss. Private land is volunteered by farmers, businesses or whoever wishes weather information in return. The aim is to obtain co-sponsors in industry. "Utilities, agribusinesses and even enterprises like the ski industry could use better weather data," says Karen George, who is in charge of program development for JCEM. "We can provide information that will predict irrigation needs, crop yields, and other valuable data. Energy is our primary focus, but this has wide application."

Research facilities at JCEM include a heating, ventilation and cooling (HVAC) laboratory; a lighting

laboratory and an energy training and teaching laboratory. The HVAC lab, unique in control capabilities and scale, is slated for completion in late 1988. The laboratory will be used for research and testing of controls and system performance under different climate and load conditions. In order to maintain practical relevance to industry, it is being designed in partnership with industry co-sponsors.

The energy training and teaching lab, located at CSU, includes three houses with active solar heating and cooling, a passive solar test building and a greenhouse/residence. The lab tests phase-change materials and solar systems, desiccant cooling systems, and plans to conduct research with photovoltaic systems.

"Energy is a volatile commodity; its availability is dependant upon political agreements. Further, non-renewable fuels are limited resources which have to be used with care so that environmental damage is minimized," points out George. The Joint Center for Energy Management hopes to make cheaper, safer, and more effective use of energy resources in order to provide cost effective energy alternatives for industry, and to create practical applications for future energy resources. *



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Engineering Library: On the Horizon

by Ken W. Fischer

One year ago, the University of Colorado College of Engineering and Applied Science was visited by a group known as the Accreditation Board for Engineering and Technology, Inc. The goal of this board was to determine whether or not seven of the college's academic programs should be reaccredited. One of the major concerns of the board and college administrators was the lack of an adequate engineering library.

Recently, the board's decision was made public: all of

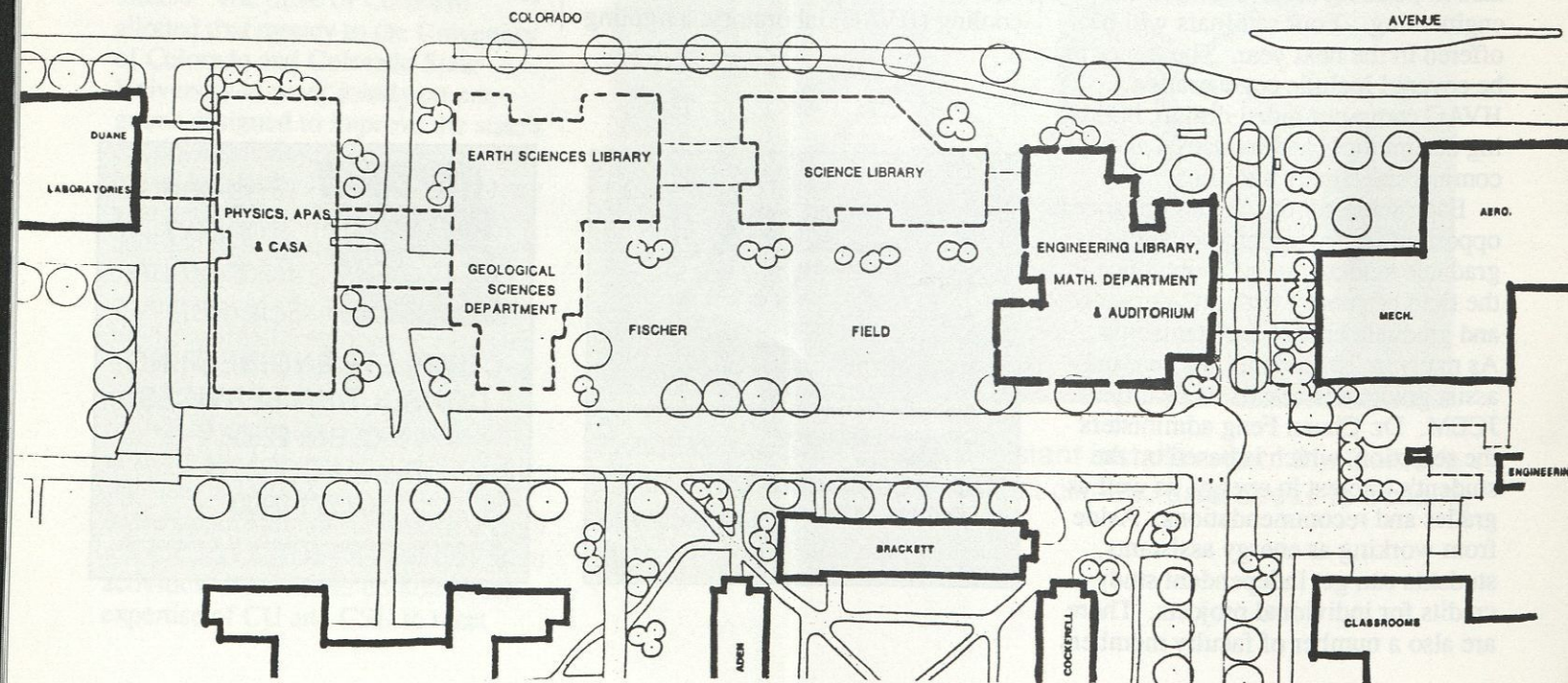
the programs which were reviewed were certified for reaccreditation.

This decision came as no great surprise to Engineering College Dean Richard Seebass who expressed last year that he would be "very, very surprised if (the library problem) caused our programs to lose their accreditation."

The recommendations of the board have yielded some results, however, in a \$53,000 renovation and expansion of the current engineering library. Some of you may have noticed this expansion when you ran into a brick wall on the zero level of the classroom wing of the Engineering Center where there was a hallway when you left last spring.

The total library space was expanded from 4,500 to 6,000 square feet. Most of the expansion space was devoted to increasing student study space and making room for recent periodicals. Some of the periodicals from before

...it is conceivable that a new engineering library could be ready for occupation in about three and a half years.



"It's exciting to see that the campus has developed the commitment to do this project." -- Dean Clough

1980 have been moved out of the engineering library and are currently being stored in Norlin.

According to Dean David Clough, however, this renovation had very little to do with the reaccreditation of the degree programs. The current library was expanded simply because "it was the right thing to do at this time." On the other hand, according to Dean Clough, if the accreditation board were to return in six years (their next scheduled review) to find that nothing had been done about the library situation, the college's accredited degree programs might be in serious trouble.

If all goes well, however, by the time the accreditation board next visits the CU Boulder campus, they will find a new engineering library located at the east end of Helen Fischer Field, next to the mechanical engineering wing of the Engineering Center.

While the new library is only in the program planning stage at this time, it is conceivable that a new engineering library could be ready for occupation in about three and a half years.

Before this can happen, though, the proposal must clear several hurdles. The program plan is expected to be completed later this fall by the Boulder Campus Planning Commission. Boulder Campus Chancellor James Corbridge will then present the completed program plan to the Board of Regents for their approval.

If the regents approve the proposal, it will be submitted to the Colorado Commission on Higher Education (CCHE). If their approval is gained, the plan will move on to the state legislature sometime next spring. If all of those necessary hurdles are cleared, an architectural planner could be contracted sometime next summer. From that point, it would be approximately three years before the building could be occupied.

The new library is expected to be financed entirely by the university. According to Chris Zafiratos, Associate Vice Chancellor for Budget and Planning, those involved in the project planning are "exploring the possibility of borrowing the money on the university's own assets." By borrowing money, the university will avoid the lengthy delay of having to wait for the state legislature to appropriate funding for the project.

University administrators are enthusiastic about the project and expect the new library to be built as planned. In the words of Dean Clough, "It's exciting to see that the campus has developed the commitment to do this [project]."

In addition to a new engineering library, the proposed building would contain a 400 to 500 seat lecture hall and office space for the Department of Mathematics. At this stage, the building is shaping up to contain at least 15,000 square feet of new library space as well as about 16,000 square feet of office space. The lecture hall, roughly the size of Chemistry 140 or Muenzinger Auditorium, is anticipated to take up an additional 6,000 feet of floor space.

The entire project is expected to cost roughly \$7 million. Planners have been considering the idea of including a second story bridge which connects the library to the mechanical engineering wing of the Engineering Center.

"The architectural challenge of designing this building will be huge," according to Zafiratos. Because of the unique architectural style of the CU Boulder campus, the challenge of making the new library building fit in with the buildings around it will be very great. The main part of campus is designed in the Klauder "Italian rural" style. The physics and biopsychology buildings are somewhat of a transitional style between the main campus and the Engineering Center.

The style of the Engineering Center itself is what has jokingly been called "early Colorado mine shaft." The new library must fit in architecturally with the physics building and with the Engineering Center but still have enough of its own style that it doesn't become dwarfed by the presence of the massive Engineering Center.

Since Fischer Field is currently used for recreation, construction on this space would limit the outdoor recreational space available for students on campus. To counter this problem, Business Field (the field just east of the Business School) will be landscaped and converted to a high quality recreational area.

The new library building would be the first in a series of buildings to be constructed on Fischer Field. It is currently being proposed that a new geological sciences building be constructed at the west end of Fischer Field. That building would contain an earth sciences library. Later, if all goes as planned, a science library would be constructed between the engineering library building and the geological science building.

Finally, a fourth building would be constructed where the faculty parking for the physics building currently exists to house the Astrophysical, planetary, and atmospheric sciences department (APAS). The whole complex is only in the early planning stages, but one might expect it to be completed around the year 2000. *

Continued from page 9

preventable, and that the threat of viruses will not put telecommunication and the public exchange of software in the deep freeze. It seems likely that as the complexity of the virus programs required to foil existing security precautions increases, the interest in creating such programs will wane. Of course, who knows what some maniac will come up with next?

How to protect yourself: Single-user systems are pretty safe from viruses, because of minimal disk sharing. Every disk exchange, new program coming in, and modem or network communication link is a potential avenue of entry for viruses and other vandal programs. An isolated machine with a bootable hard disk, that is never booted from a diskette, should be safe from operating system viruses. But the potential presence of viruses of other vandals in executable

program files suggests the need for more care to be taken. New programs from public-domain or unknown sources should be tested in isolation first; several runs may be necessary to guard against a Trojan horse.

Sound backup procedures and conscientious handling of disks are very important elements in protection against virus programs. Important data and programs should be stored and backed up on disks without the operating system, and write-protect tabs should be used whenever possible. (Covering the square notch in the edge of the diskette shell prevents data from being written onto the disk.) Keep "clean," write-protected copies of operating system and program disks in archive.

Detection of suspected viruses is essential. The Lehigh virus was easily detected: the COMMAND.COM file on infected disks carries a more recent write date than the original file, although the file size remains the

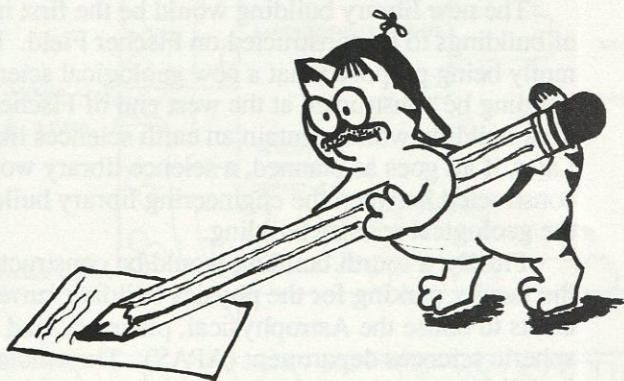
same.

Another test is to boot up with the suspect disk (it would be wise to first back up the hard disk or use a diskette-only machine, since the program may be ready to do its dirty work), then ask for the directory (DIR d:) of another diskette, with a known "clean" operating system, with its write-protect notch covered. Getting a directory is normally a read-only operation, but if the virus is in control of the system it will try to write itself to the clean disk, generating a write-protect error. It seems reasonable to assume that similar tests will work with other operating systems.

Another reported virus can inhabit any executable (.COM or .EXE) file. Each time the program is executed the virus increases the size of the file (normally by 1808 bytes), which eventually causes the program to overflow the disk space, memory space, or both. Also, shortly after infection, the virus will slow the host program by as much

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as a factor of five. This particular virus will erase any infected program that is executed on a Friday the 13th. To test for this virus, compare the program file size before and after running the program, or compare it to the size of the file on the original program disk (write-protected!). If the file size has increased, the program, and others on the same disk, are most likely infected.

If a virus is found, copying the system file or executable files from a "clean" disk onto the infected disk will eradicate the virus (first make sure the computer is not infected by booting from a "clean" disk). Disks do occasionally lose data, but any time one of your disks is scrambled for no apparent reason, you should begin a careful check for viruses of other suspect programs. Above all, be aware that these things exist, and be on the lookout for them.

Several anti-virus programs have been developed that may offer attractive benefits to users whose systems are especially vulnerable to attack (network installations or semi-public sites), or who are in the vicinity of a known virus infection.

If you are concerned and want to know more about viruses read the *Info-Mat* news magazine, available on-line through the PC-TRANS-port electronic bulletin board. *Info-Mat* has done a terrific job of covering the virus story as it developed over the past few months, and because it is a BBS magazine, they will no doubt continue to provide in-depth information on the subject. *

Transcribed from "Watch Out For Viruses" by Carl Thor, in *PC-Transmission*, Vol. 2, No. 7, April 1988.

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Computer Scheduling Problems Run Deeper Than Long Drop/Add Lines

by Brian Glach

There's been enough talk (as well as cursing) lately about CU administration's monster goof-up with the new computer scheduling, so I won't bore you with the painful details. I'm sure everyone saw, or had the unfortunate luck of being in, the ridiculously long lines that wrapped two- and three-fold around the Events Center and the UMC.

However, besides the seemingly utter incompetence and inconvenience which took place August 31, a more important problem that affected some computer science undergraduates and their professors a few years ago has again raised its head. This is a problem from which many students and teachers will, and should, take offense.

It seems that about five or six years ago, a group of CU computer science undergraduates designed a program which could be used to schedule classes for a university. Their program was not dissimilar to the program CU used this year. However, these undergrads, with the help of their professors, took a couple of years and just tested the hell out of their system. They invited groups of students to take their best whack at the system, to try to find something wrong with it. They even awarded prizes to students who found bugs in the system.

Needless to say, the students' scheduling program became very tight and very sturdy, and a good back-up system was firmly installed as well. (I am even aware that the system handled some small-scale scheduling for a couple of departments and performed quite well.) The next step was to offer the program to CU. The students' offer was for \$50,000 to get the system started on campus, scheduling a small percentage of the student body. Then, for additional funds each semester, the program would eventually be expanded to schedule the entire campus.

Sounds pretty good, doesn't it? CU students get some real on-the-job experience along with some notoriety--administration gets their scheduling system--the plan

seemed perfect.

But the administration turned the system down.

Now, things like security and official matters notwithstanding, CU had a chance to get a darned good, inexpensive, and, most importantly, tested system and they chose to pass it up. Instead, CU went off-campus and bought a "sophisticated", "security-tight" scheduling program for almost \$7 million. Call me naive, but it seems that with a system as good and as inexpensive as the students' system, CU would have worked out security problems and things of that sort. But they didn't want to try.

They didn't even want to try.

I find this a little staggering--and to some students and professors this will also be insulting. CU likes to brag that their students, especially in engineering and computers, are some of the best-trained students in the world in their respective fields, but when it comes down to the real nitty-gritty, CU doesn't seem to trust their students' judgment and work any farther than they could throw your average PC.

This is a very hypocritical angle that CU has displayed. After all, giving praise to someone's work and then refusing to employ the work that was just supposedly praised is the definition of hypocrisy. Without question, the students who produced this program that was carelessly cast aside, as well as all students, should be very offended at this callous negligence on CU's part.

Moreover, this insincerity also affects the professor who taught these students. By refusing to accept a student's work, one is also refusing to accept the source of a student's ideals and discipline, the student's professor (who CU is also very quick to praise).

What this entire issue boils down to is that CU made a very large mistake in more ways than one. However, the problem cuts deeper than just forcing students to wait for

hours in stagnant lines to fix mistakes created by a faulty computer program.

The real problem here is this university's shameful neglect of its obligation towards its students and faculty. It would seem correct for a university to try to keep money working within the university. However, CU does not seem to subscribe to this position. This issue has not been raised (as far as I am aware) until now, and hopefully CU will take this opportunity to re-think their philosophy about what is really important in furthering the education of its students. *

*Author's Note: Information in this article was obtained in an interview with Evi Nemeth, a computer science professor here at CU.

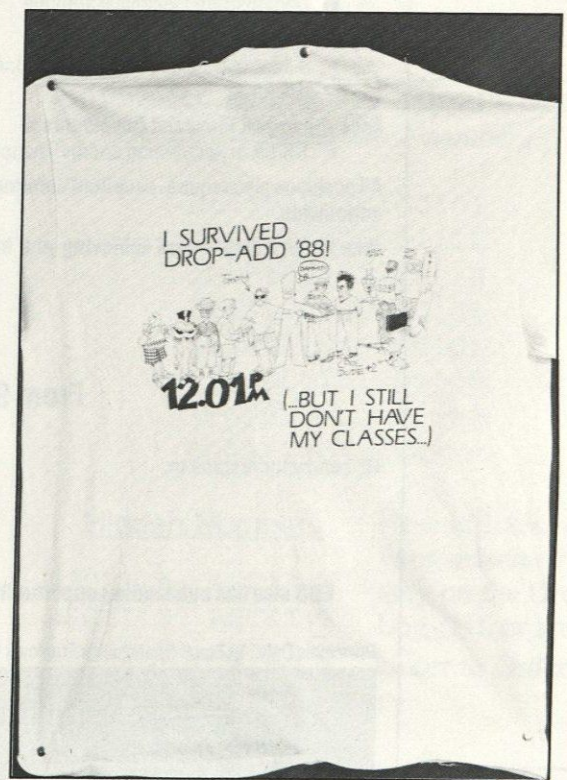
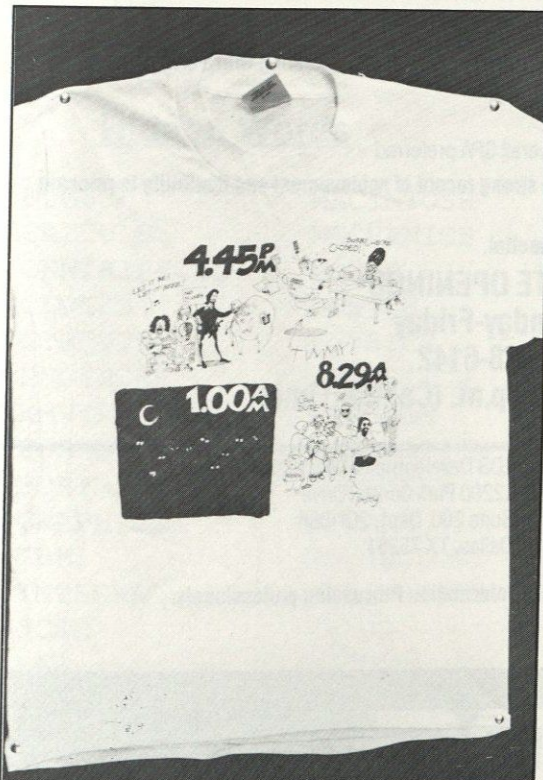


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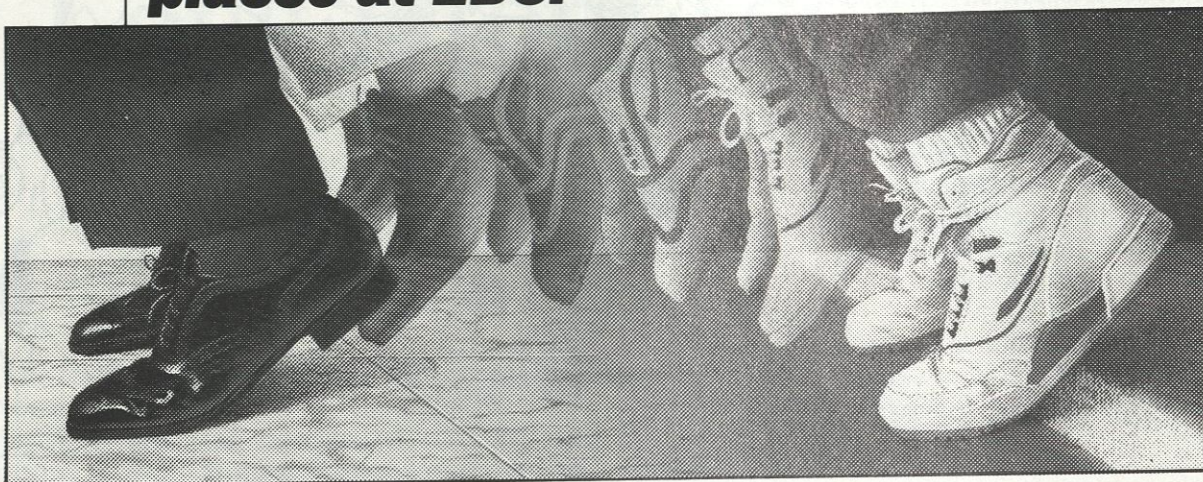
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by Kirsten Abrahamson

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 N T I T O I R C R R N W G S H T I O F L I O N E R A E
 Y R O O I R U O D T T C I N T E G R A L T A O I T N E
 B G G L A P D M H R R E N N A S C C D N F T I A H A N
 M U E S D E D P L O O S E I C F H E I R E I T K O T V
 O D O I C O L U R F P M E R G I S C W C U I U H C E K
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Hidden Words

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CALCULUS	MECHANICS
CENTRIPETAL	MOUSE
CLONES	NEWTON
COMPUTER	PHYSICS
ENGINEER	POLLUTION
ENVIRONMENT	PROGRAM
FORCE	RENOVATION
FORTRAN	SOFTWARE
GRAPHICS	SYSTEM
IBM	TECHNOLOGY
INTEGRAL	TRAJECTORY
JCEM	TURBO
LAB	VECTOR
LIBRARY	VIRUS
LIMIT	WORD PROCESSOR

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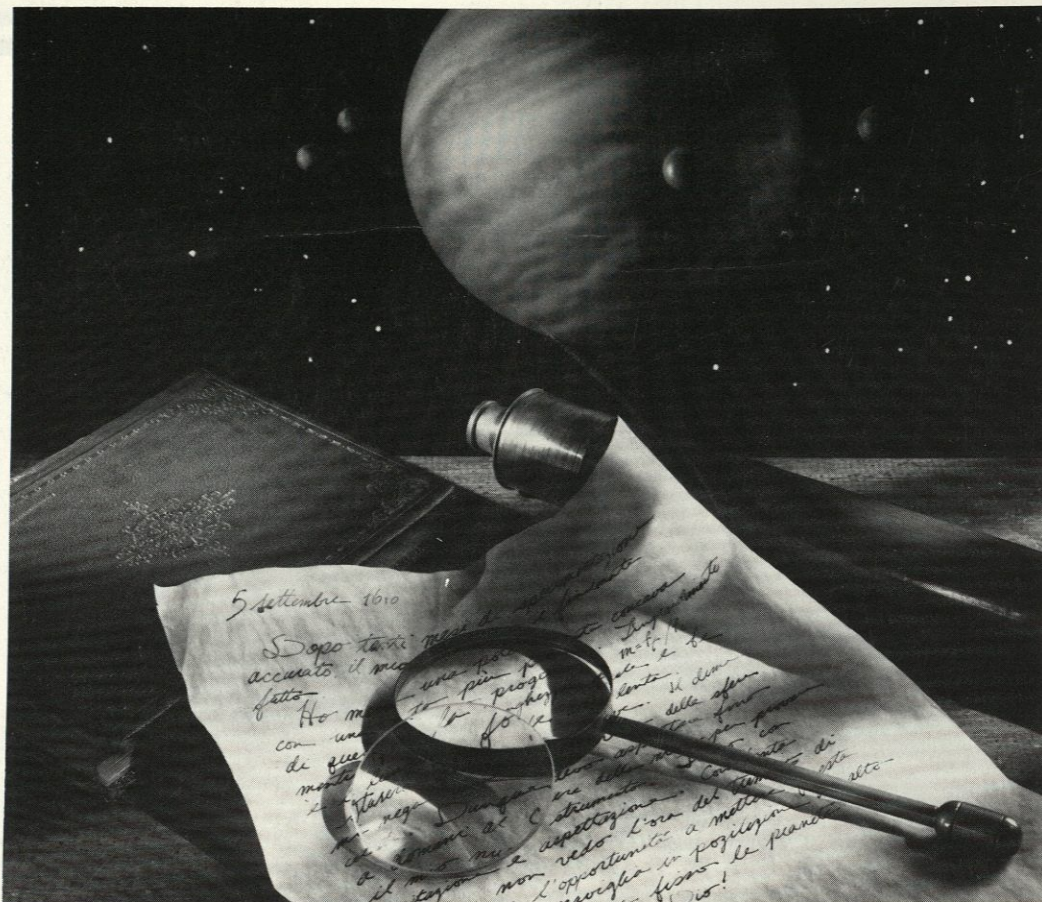
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 1010010000101111
 1000100100110010
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 0110101001000101
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Hidden Numbers

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