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PUBLISHED BY THE STUDENTS OF THE UNIVERSITY OF WISCONSIN-MADISON, MAY 1990

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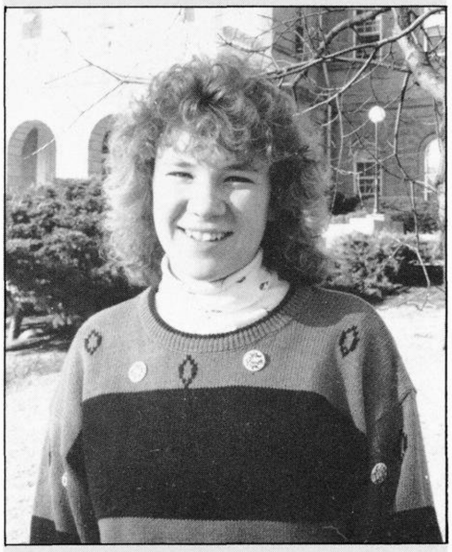
EDITORIAL



Nancy Hromadka, Co-editor, *Wisconsin Engineer* magazine

As the world continues to progress and technology rapidly expands, we find ourselves increasingly dependent on computers. For example, sea, air, and space control systems, medical supervision, corporate finances, and military defense rely heavily upon computer technology. No one can deny that computers have made our lives easier, more comfortable, and more productive. Perhaps it is not so evident that these time-saving, modern conveniences can also cause their share of problems. Despite their benefits, these electronic marvels have developed a darker, often hidden side that has proven damaging and costly to society.

In the pre-computer days, important information was stored on paper, and when that information became obsolete, it was destroyed to make room for new information. Today, however, much of this same important information is stored on tiny computer chips. These small wonders are great for saving paper and storage space, but they also save outdated, irrelevant information. Old information, which because of the ease in storing it, has been left unchanged. What does this prolonged storage mean?

It means that our privacy may be invaded without our knowledge. Medical files, insurance records, and financial data may all be stored on a computer. We have no idea how many people are supposed to have access to this information, let alone how many people actually do have access to this information. We, the subject of these records, don't even know what information these files contain. How in-depth, accurate, and up to date are they?

Hospital records can serve as an example of failure to update information because of the ease of computer storage. Two years after an elderly patient dies of cancer in a particular hospital, that hospital continues to send him flyers and brochures inviting him to attend senior citizen programs. The patient's name and address are on a computer list and no one has taken the time or effort to remove that information. Such an occurrence can be an embarrassment to the institution, but on a more personal level, it can be a painful reminder to a sensitive widow or family.

In many large corporations, important confidential data is stored on computers. Unless the corporate owners are very trusting, they have invested in security systems to prevent the wrong people from accessing these files. But it's not always clear just who the wrong people are. A suspenseful TV mystery movie may show an evil computer hacker breaking into a locked office late at night to access a computer account. He may re-route large sums of money to himself or stumble upon personal information that can potentially be used for harassment or blackmail. However, here in the real world, the wrong people are merely nosy or careless employees. The greatest losses result from carelessness and mistakes by company employees or "insiders." In fact, the FBI says that 60-90% of all office equipment thieves are employees.

A typical scenario is as follows. An employee makes backup copies of an important data file containing confidential client information on a floppy disk. Quitting time comes and the employee slips the disk into an unlocked desk drawer. The computer itself may have three different levels of security, limited access, and confidential passwords, but all these safeguards serve no purpose when the vital information is accessible through an unlocked drawer.

Computers are vulnerable, too. Occasionally, vengeance-seeking former employees or over-zealous practical jokers install damaging programs into computer systems, designed to activate in a few days, a few months, or even in a year. Viruses, Trojan Horses, and worms are all deadly enemies to a computer that have the power to tie up computer resources and destroy vast amounts of data.

Although computers have permitted us to make great strides and improve the quality of life, we must realize that with every benefit, there is a trade-off, and in the area of computers, we must determine whether that tradeoff is in our best interest. In general, the benefits outweigh the detriments, but we must nevertheless remain alert to problems that accompany new technology.

Dean's Corner

Every day we see additional evidence of the globalization of our economy. With technology and capital flowing freely around the world, no country can remain an island. The April 9 *Wall Street Journal* reported that in 1990, U.S. companies plan to invest $55 billion in plants and equipment overseas. This capital investment is up from $33 billion in 1986. In addition, American companies in 1988 made corporate European acquisitions valued at $15.2 billion, twice the level of 1987. At the same time, foreign holdings in the U.S. are now valued at $390 billion. The largest auto manufacturer in America will soon be a Japanese company. What does this all mean for a young engineer trying to plan his or her career?

With business becoming truly global there is increasing need for engineers who can move comfortably from one country to another, living and working in a variety of cultures and societies. There is a need for flexibility, sensitivity, understanding, and, above all, communication skills. Development of these attributes may be just as important for many engineers as the acquisition of strong technical skills. In our large, multinational corporations, it is common for engineers and managers to be posted overseas as part of their career path. Even smaller companies are seeking overseas markets and entering into joint ventures abroad for sharing of technology and access to markets. Their engineers are called upon to travel and to collaborate with their foreign counterparts.

The College of Engineering is working actively to prepare our graduates to be leaders in this new global economy. We are offering a variety of programs to provide our students with international experience. Among the possibilities are individualized junior-year-abroad programs, summer work-abroad programs, and programs that include specialized language training.

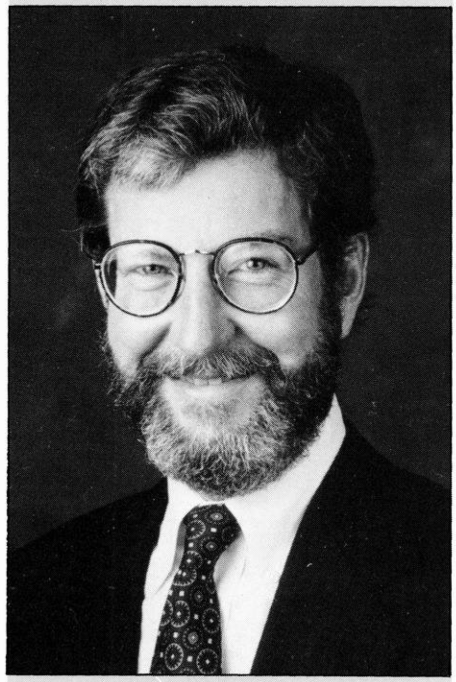
The college has always maintained a strong international orientation, evidenced by our large foreign-student population and by the active research collaboration of our faculty with workers overseas. The legacy of this orientation is a strong network of contacts at universities around the world. These contacts facilitate placement of Wisconsin students who wish to study abroad. Study-abroad programs can be structured such that transfer credits will count toward U.S. degrees. Next year we expect as many as fifteen engineering students to study abroad. We hope that the number will grow in future years.

We cooperate with two organizations that provide summer jobs abroad for engineering students: IAESTE (International Association for the Exchange of Students for Technical Experience) and ASF (American Scandinavian Foundation). In 1990, we have placed seven students through the former and three with the latter. Our experience with these summer jobs has been very favorable.

The countries involved in these study and work-abroad programs include Germany, England, France, Norway, Denmark, Finland, Poland, Hungary, Mexico, and Japan. Many of these programs require working knowledge of a foreign language. The new foreign-language entrance requirement at UW should result in better preparation of our students for such programs.

A key area of concern to business today is the Pacific Rim, especially Japan. A major issue is the small number of American engineers who speak Japanese. The college is addressing this problem through several programs. The UW/ Japan Engineering Leadership Program is a corporate-sponsored scholarship program for outstanding engineering students who choose to learn Japanese. After three years of language study, along with the regular curriculum, these students are placed in a Japanese university for a term to do a research project. They also spend some time in an industrial internship. Another initiative is the EAGLE program, which is providing language training to senior engineers followed by a one-year industrial internship in Japan.

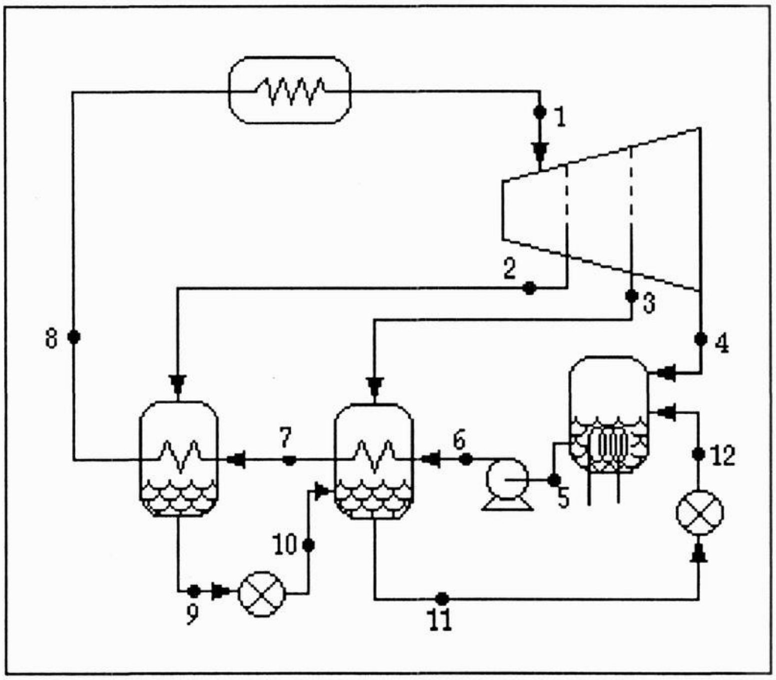
Engineering students are encouraged to visit the International Engineering Programs Office in 1018 Engineering Research Building to discuss these opportunities with Mrs. Carole Foster or myself.



Thomas W. Chapman, Associate Dean-International Relations

Computer Software Makes Problem-solving Easy

Problem: A steam power plant operating on a regenerative cycle, as illustrated at right, includes two feedwater heaters. Steam enters the turbine at 6,000 kPa and 500°C and exhausts at 10 kPa. Steam for the high pressure feedwater heater is extracted from the turbine at a pressure such that the feedwater is heated to 180°C, with a 5°C approach to the steam-condensation temperature in the feedwater heater. If the turbine and pump efficiencies are both 80%, and if there is also a 5°C approach to the steam-condensation temperature in the low pressure feedwater heater, determine the optimum pressure (if any) at which steam should be extracted for the low pressure feedwater heater, and determine the corresponding overall thermal efficiency of the plant. *Professor McMahon (ChE)*



This problem is part of a typical chemical engineering assignment for ChE 310, a.k.a. Thermodynamics. To solve this problem with traditional methods, it is necessary to create approximately 51 equations with 51 unknowns, to locate the values of 15 pieces of data in a steam table, solve the resulting system of equations, and determine a final numerical answer.

However, with the introduction of a new computer software package called EES (pronounced "ease"), the above problem is reduced to merely determining what values are required, entering the given data into a computer, and waiting a couple of seconds for an answer. Output can then be generated in the form of tables, graphs or variable solutions. EES stands for Engineering Equation Solver and was created by UW-Madison Professors Sanford Klein and Fernando Alvarado. The main purpose of EES is to solve non-linear sets of algebraic equations. In addition to this capability, there are certain features which set it apart from other equation-solving software like Solver-Q, Mathematica, Eureka, TK-Solver, and Mathcad.

EES has over 30 built-in mathematical functions, optimization capability, and a parametric table that lends itself to parametric studies and plots of relationships between variables. EES also permits the user to define his or her own functions to aid in the problem-solving process. Thermodynamic and transport data for steam, CFC refrigerants, air, and many ideal gases are built into the program as well.

Some of the other equation solver packages available allow the user to enter data from steam tables or other sources, but because EES has this data built into the program itself, there is no need for this additional step.

One important difference between EES and programs such as Solver-Q and

Mathematica, is that EES does not solve symbolic equations. All of its calculations are performed with, and result in, numerical data; whereas, the two previously mentioned equation solver programs can perform the same algebraic manipulations symbolically.

The code for Klein and Alvarado's program is written in Pascal and formatted to run on Apple Macintosh Computers configured with a minimum memory of one megabyte.

According to Klein, the primary author of EES, "The program was distinctively written to eliminate the need to solve equations." Klein, a professor in the Mechanical Engineering

"The program was distinctively written to eliminate the need to solve equations"

Department, notes that the idea for EES stemmed from his experience in teaching classes like thermodynamics and heat transfer. A significant portion of learning in these classes requires repeated problem-solving. Valuable time, for students and instructors, was lost looking up property information and solving for routine, repeated algebraic equations. Klein comments, "I was tired of doing it myself, and it unnecessarily burdened students."

"Once you learn how to look up values in tables, you don't learn anything by continually repeating the process,"

"It just removes the burden of having to do the mathematics, and lets the engineer do the engineering"

says Klein. As an instructor, he was faced with the dilemma of choosing appropriate problems that were mathematically simple yet conceptually stimulating. He felt that the students needed more updated, practical problems to solve, yet the extensive, overwhelming mathematical operations prohibited such assignments.

Referring to EES, Klein says, "It just removes the burden of having to do the mathematics, and lets the engineer do the engineering."

As far as disadvantages of the computer program, Klein believes the most difficult part is finding a computer. He compares the software to the use of the first hand-held calculators, "Now you do things you couldn't do before—you have more power. Now I can assign problems I wouldn't have given before because I felt guilty making students stay up all night."

EES has not been required in any classes yet, but most students choose to use it simply because it's easier.

Work on the program began early last February, and it became available for student use in September of the same year. Presently, EES is available only to students and faculty of the University of Wisconsin-Madison and can be found at the Computer-Aided Engineering Center.

Eventually, the software will be made available to other universities. Klein's plan is to sell the program to various universities so they can make it available to their students free of charge. Klein expects the program to be ready for distribution early this summer with approximate prices of $800 for a licensed copy sold to universities for network use, and $400 for an individual copy sold to industry for commercial use.

Computer graphic by Dawn Stanton.

AUTHOR

Nancy Hromadka is a sophomore in electrical engineering. Nancy ***hates*** it when she has a Comp. Sci. program due at 9:55 and cannot get the printer to work at 9:30–after she worked on the computer all night!

Computerized Music:
Taking a Byte of Bach

Since the beginning of civilization, people have had the insatiable desire to create music. Through generations of frustrated, would-be musicians, only a small percentage of the population has actually expressed personal musical feelings. Now, with recent developments in computerized music, even the musically illiterate can produce music. In fact, the computer music revolution allows people with absolutely no instrumental skills, as well as those with physical handicaps, to create beautiful music.

History

The computer music industry has made significent progress in the last decade. The development of Musical Instrument Digital Interface has changed the countenance of music around the world. MIDI allows computers to interact with electronic musical instruments for ease in music production. In MIDI's short history, enormous changes in the music industry have occurred.

It began in the late 1960's and early 1970's with the development of new musical instruments. In the late 1970's, The Oberheim Company introduced the polyphonic synthesizer, a four-voice analog keyboard that was capable of producing multiple notes simultaneously. Soon after, other companies, such as Roland, Moog, Yamaha, and Sequential Circuits, produced similar polyphonic keyboards bearing their individual names.

The next big step in synthesizers, after polyphony, was the development of built-in programmable memory. This made it possible for one synthesizer to be used for many sounds during the course of a performance or recording session. Prior to this, it took hours to set up a synthesizer to play only one sound.

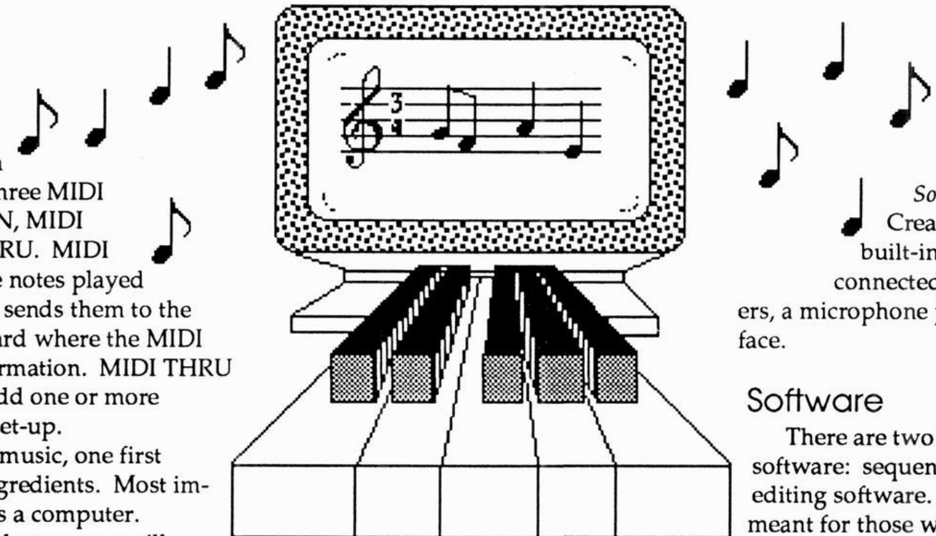
Soon after programmable memory, keyboards with built-in computer interfaces arrived. Oberheim and Rhodes developed synthesizers that could be connected to similar synthesizers. This adaptability allowed sounds to be layered. At the same time, Roland and Oberheim introduced the first digital sequencers, which could record and play back music from an instrument.

To move up yet another step, the synthesizer industry merged with the personal computer industry. In 1982, the National Association of Music Merchants proposed setting a standard for the interchange of digital music signals between different types of instruments. The proposal, originally called UMI for Universal Musical Interface, was revised numerous times before becoming the MIDI standard. In 1983, Roland and Sequential Circuits introduced the first MIDI keyboards.

The popularity of MIDI has increased steadily since its beginning in 1982. MIDI has made it easier for musicians to produce higher quality music. The ease of music production with MIDI has been an inspiration to composers and musicians, and has increased the creativity level at which music is made.

How MIDI Works

MIDI uses serial transmission to send music from the instrument bit by bit to the computer, where it is then reassembled. The instrument and computer are connected with a Deutch Industrie-Norm (DIN) plug, a five-pin plug developed in Germany. The DIN connector keeps MIDI simple and inexpensive because it needs only one wire. Since there is only one wire, and signals can only travel one direction at a time, multiple connectors are needed. A common practice is to have three MIDI connectors: MIDI IN, MIDI OUT, and MIDI THRU. MIDI OUT transforms the notes played into MIDI code and sends them to the computer or keyboard where the MIDI IN receives the information. MIDI THRU allows the user to add one or more instruments to the set-up.



To make MIDI music, one first needs a few vital ingredients. Most importantly, one needs a computer. Almost any personal computer will suffice; however, it should have a broad base of computer music software. Next, one will need an electronic musical instrument that is MIDI compatible. Finally, one will need a MIDI interface and appropriate software. Once one has the above, a user will be ready to cook up some steaming tunes.

Instruments

To create MIDI music with a personal computer, one will need an electronic musical instrument: a keyboard, synthesizer, expander, or drum machine. If the choice is a keyboard or synthesizer, it may be one of many; however, it must be MIDI compatible. In other words, it must have MIDI IN and MIDI OUT jacks. Keyboards and synthesizers have become amazingly inexpensive in the last few years. They are basically less expensive than pianos, and an expandable synthesizer can now be purchased for less than $2,000. Keyboards are even less expensive, and it's possible to find one that will do the job for well under $1,000.

One may also choose to set up a MIDI with an expander. An expander, or Synthesizer Module, is a synthesizer without a keyboard. One can use the computer keyboard or any other instrument with a keyboard to play. The expander, like the synthesizer, may have numerous pre-set instruments and voices.

Finally, one may use a drum machine to make MIDI music. A drum machine creates a variety of percussion instrument sounds, from bass drum to snare drum and triangle to timpani.

Interfaces

To complete the connection between instrument and computer, one will need a MIDI interface or converter. These allow the computer and instrument to relay signals. They may come in different forms. The Apple MIDI Interface is simply a small box with three jacks: one to connect the interface to the Apple serial port, and a MIDI IN and MIDI OUT to connect the interface to the instrument.

Another type of interface comes in the form of a card that is installed in your computer. An example is the Ad Lib Music Synthesizer Card. This sound card is capable of playing as many as eleven different instrument sounds at a time. Another example, the *Sound Blaster* by Creative Labs, Inc., boasts a built-in amplifier that can be connected to any set of speakers, a microphone jack, and a MIDI interface.

Software

There are two basic types of MIDI software: sequencer software and note editing software. Sequencer software is meant for those who want to edit their compositions made with the MIDI keyboard. The sequencer software will record music into MIDI files that can be opened and played. Sequencer software came about immediately after MIDI was introduced. It allows the user to record with the quality of a professional studio.

The editing software, or editor/ librarian software as it is often called, can program synthesizer sounds with a computer. This type of software is geared more toward the serious, traditional composers. It displays the notes on the screen, and acts as a "music-processor" for a composer as a word-processor works for a writer. The edit application is used to edit the notes on the screen, and the librarian is used to order and store the file into the computer's memory.

MIDI software is also designed for people who simply want to have fun and not worry about composing symphonies. One example is Broderbund's *Jam Session,* which is made for the Apple IIGS. With *Jam Session,* all a person must do is choose the type of music he or she would like to play: classical, pop, rock, reggae, or rap. The next step is to choose an instrument and play along with the animated band on the screen. *Jam Session* has won *Best Sound, Best New Use of a Computer,* and *Best Entertainment Program* awards from the Software Publishers Association.

Resource Groups

With the growing popularity of computerized music, organizations have been formed to support the computer musician. These groups offer many useful services to both the novice and the professional. One such group is the Center for Electronic Music, a non-profit organization in New York. CEM offers frequent workshops and seminars on topics ranging from introductory MIDI to advanced production. Private instruction and consultation are also available, as well as the use of recording facilities for pre-production and production stages. Companies demonstrate their latest technologies at CEM's monthly manufacturer clinics. CEM also has an extensive outreach program, consisting of outreach to the disabled, as well as to the area elementary, middle, and high schools.

Another type of resource for the computer musician is available only if a modem is accessible. There are many user groups for computer musicians with a modem. Two of these groups are CompuServe and Performing Arts Network.

CompuServe covers many areas of musical interest. Via a modem one can order records, tapes, and compact discs from RCA Music Service and Express Music. One can also get special deals on musical equipment (synthesizers, keyboards, etc.) from Music Alley OnLine. Other features include MCS MIDI Forum, which consists of six data libraries and message boards, and RockNet, a forum for happenings in the world of rock music.

The Performing Arts Network is another on-line resource group for computer musicians. PAN offers databases, electronic mail, classified ads, and on-line conferences to its patrons.

The development of these groups shows the impact that computerized music has had on the world of music, as well as on the world of computers. Music has taken on an exciting new look that changes every day. With the amazing developments that have occurred in the last decade, you can't help but wonder where music will be in the twenty-first century.

Computer graphic by Dawn Stanton.

AUTHOR

Amy Damrow is a freshman in engineering. Amy's worst computer nightmare is Computer Science 302.

The Computer-Aided Engineering Center Evolves

Every engineering student knows about it. Eventually every engineering student must face it. Yet for new engineers and even for some experienced engineers, the three letters which represent the College of Engineering's computer facility strike fear in their hearts. The letters evoke visions of the constant battle of human against computer — a battle which the relentless computer will invariably win. How could a mere human be any match for a place that contains machines which never make mistakes, yet can sense when people using them are fearful? The place I am talking about, of course, is CAE, the College of Engineering's Computer-Aided Engineering Center.

The first time I saw CAE was during the 1985 Engineering Expo when I was a senior in high school. The site impressed me as having all the elements of the typical engineering computer facility. It was in a basement. It had drab walls. It had a raised floor which, presumably, hid a massive entanglement of wires. This certainly was a sight after a computer hacker's heart.


Engineering students Kari Tyne and Leslie Simdon work together at the College's Computer-Aided Engineering lab.

The next contact I had with CAE was almost two years later, and this time it was a strong dose. First, two of my classes required me to battle the Data General computer to do circuit simulations and logic simulations. Second, I applied for a job as a consultant there. For better or worse, I was hired. Looking back, I'm not actually sure why I became a consultant. Maybe I thought that the little people sitting in the office (as one of my L&S friends once described the consultants) knew everything. Maybe it was because deep down I was terrified of computers and yet hoped to conquer them. Maybe I just wanted a job.

At that time, the main computer on the Engineering campus was the Harris 800—a computer which remained valuable to Engineering long after it was shunned by the Computer Science Department. There always seemed to be a certain mystique surrounding the Harris. This sense of the unknown was probably due in part to the fact that it sat

Students must be registered for engineering classes to be allowed to use the CAE facilities.

far above everyone who used it - on the tenth floor of the Engineering Research Building. Only the operators and the system staff actually saw the Harris up close. The rest of us, at best, could just stare through the small window to its cage and watch its lights endlessly blinking.

The main CAE site back then was known as CAE East. It consisted mainly of Mime terminals which were principally used to connect to the Harris. There were also about 20 PC computers connected to a file server on which was located a minimal amount of software. Finally, hiding in a far corner of the site were two lonely Macintosh Plus computers flanking a single Imagewriter printer. For the majority of the time the Macintoshes sat idle - nobody even wanted to touch them. The other site, known as CAE West, was used mainly by mechanical and industrial engineers.

Looking back, CAE as it was then seemed simple. But as should be expected, particularly with high technology, things change. CAE was certainly no exception. The changes may have seemed minor at first. Mime terminals began to be slowly crowded out by the ever-increasing number of PCs. Switch boxes which were used to control printing from the PCs were replaced by network queues. More applications, both written in-house and purchased, were made available on the PC network. More Macintoshes began to appear and people even began to use them. The tide was shifting, ever so slowly away from the Harris and toward the personal computers. Even the powerful Data General was falling out of favor as simulation programs began moving to more friendly personal computers.

It seemed CAE was on the verge of a major change. That major change came in August, 1988 when CAE moved one block east and one floor up (or two floors down if you preferred CAE West) to the Highway Lab. With the move, I moved

"The Harris is down - forever."

to a new job. I moved from being a consultant and explaining how things were, to being a system staff member setting things up as they would be.

The newly built addition of the Highway Lab also provided CAE with a chance for a new image — an image

WHAT IS CAE USED FOR?

The purpose of the CAE is to provide as much computing as possible to as many users on the engineering campus as possible. The facility currently has over 100 computers for 350 average daily users. What is this computer facility actually used for?

Consultants say that the engineering students and faculty use the computers primarily for papers and lab reports. There are also many engineering projects which require students to make use of various special computer programs available at CAE. Consultants see a large number of resumes pass through the printers also. Although each engineering student with an account at CAE is permitted up to 200 free laser copies each semester, only about 40 to 50 laser copies per user per semester are actually printed. Approximately 2,500 students use the CAE each semester.

-by Wendy Weinbrenner

"The professor said CAE was around here somewhere..."

which did not involve the Harris. The Harris was now a dinosaur compared to new workstations which were beginning to dominate the computer scene. Harris use had decreased so much that when the switch was actually flipped hardly anyone noticed. The only reminder of

How could a mere human be any match for a place that contains machines which never make mistakes, yet can sense when people using them are fearful?

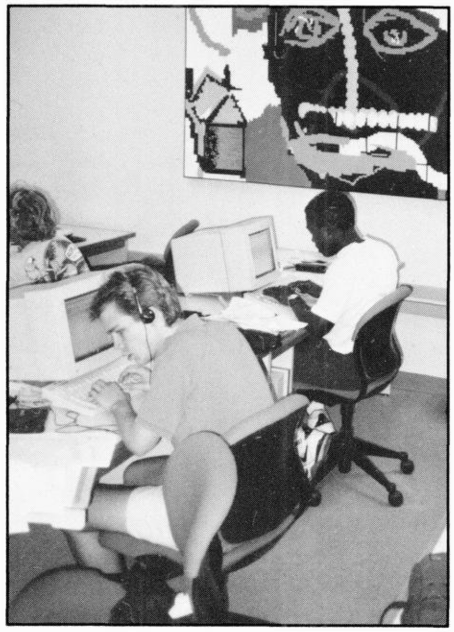
the Harris was a message scrawled on one of the white boards in the new site: "The Harris is down - forever."

As with many changes, there were negative aspects. In a very short time CAE's computer resources, which previously had been based mainly on the mainframes were now based mainly on networked PC and Macintoshes and workstations. CAE had to face entirely different problems than it had in the past. Macintosh computers were in such great demand that people had to wait in line just to use one. The unexpected increase in use strained the capabilities of the file servers to the point where they became reliably unreliable. To users, it seemed systems changed on a daily basis. The procedure one used to get a print-out one week may have been entirely different than the one used the previous week. CAE was no longer a model of reliability and consistency.

Along with changes in the makeup of CAE came changes in the uses of CAE. CAE's use was now mainly for canned application programs. Gone were the days when a consultant would have to sort through a stack of someone's FORTRAN code trying to find an elusive bug. Questions now concerned issues such as which is the best word processor to use, and how can I make my lab report look better.

At the present time, almost two years after the move, CAE has become a decidedly more stable entity. Things no longer change rapidly. Servers have become much more stable. People can feel comfortable that things tomorrow will be pretty much the same as today. But change is still occurring and will, undoubtedly, continue to occur. The trend is toward still smaller and faster computers meaning Unix workstations will have an increasing role in the future of CAE.

Graduating this year, of course, will mean the end of my long association with CAE. Over the past six years I've seen CAE go through a lot of changes. The next years promise to bring even more changes. Nobody can say for sure what the next six years will bring for CAE, but one thing is for sure, CAE will continue to change to meet the needs of UW students and faculty in the best way possible.



Students work in one of the Macintosh classrooms at CAE.

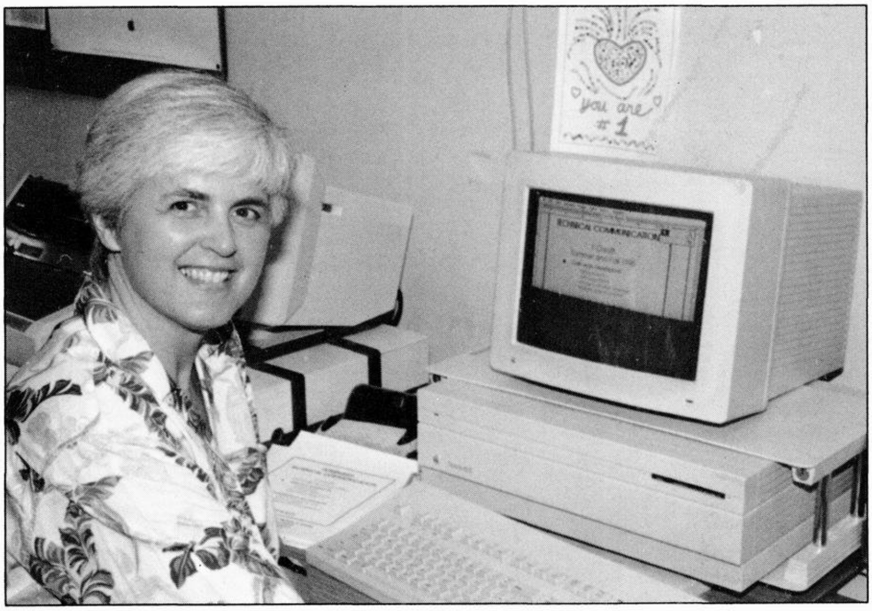
Above photo by Sharon Chen. Other photos by Kelly Weisheipl.

AUTHOR

Larry Magnuson is a guest writer from the ECE 350 technical writing class. Larry says his worst computer nightmare is Computer Science 302.

FACULTY PROFILE

Professor Kutzbach
Meteorologist Turns Desktop Publisher



Assistant Professor Kutzbach teaches EPD 395, computer-assisted publishing.

"Desktop publishing is a revolution."

Adjunct Assistant Professor Giesla Kutzbach worked furiously creating examples for her computer-assisted publishing class which met later in the day. But she wasn't always interested in using computers to create graphics.

A native of Berlin, West Germany, Kutzbach received her undergraduate B.S. degree in meteorology from the Berlin Free University. "I originally wanted to pursue a career in weather forecasting at the Berlin airport, but decided instead to continue my education," she says. She applied to six colleges in the U.S. which offered research assistant grants to finance graduate study. She picked the University of Wisconsin even though no one in Berlin knew where Madison was. She finished her master's degree in meteorology studying Antarctic weather with a

The Totally Automated Publishing Center

by Dawn Stanton

Text is written on one of the machines on the network. This is available to everyone.

Like text, graphics are also computer generated and available on the network.

minor in the History of Science, and then took a Ph.D. in the History of Science.

She spent many years writing publications and developed an interest in computers when her family bought an IBM computer when personal computers first came out. "After we got the computer," Kutzbach says, "I vowed never to type and re-type my papers on a typewriter again."

Tired of the solitary life of writing, Kutzbach set out to find a job at the University in order to have more contact with people. "At first I thought of going into administration, but chose a job in the Department of General Engineering in the Fall of 1983 teaching a technical writing course. I enjoy teaching writing and computer-assisted publishing because I use everything I've learned — writing, computers, science, etc."

"Desktop publishing," as defined by Michael L. Kleper, author of *The Illustrated Handbook of Desktop Publishing and Typesetting*, "provides the user, usually the text originator or author, with the capability to produce reader-ready or camera-ready originals without the need (necessarily) for successive pre-press operations."

Kutzbach sees computers as an important tool in the future, not just for writers but for engineers as well. She explains, "Computers have changed the roles of engineers, expanding their positions to include more communications functions." Written communication has become more of a dynamic writing process where people don't use just the text functions in the software packages. In addition, a design sense and editorial judgement are needed to produce better reports.

"Computers provide many advantages over the traditional publishing process," says Kutzbach. With current software, users have total control over the page and can easily edit and revise their work. With the capability of quick revisions, computers also can provide the opportunity for people to make more timely publications.

"...I enjoy teaching writing and computer-assisted publishing because I use everything I've learned — writing, computers, science, etc."

She also notes that design is becoming an integral part of the publications process. No longer do graphic artists need to integrate the design work at the end; instead, the design process can be incorporated into the whole schedule, which, in the long run, means better publications.

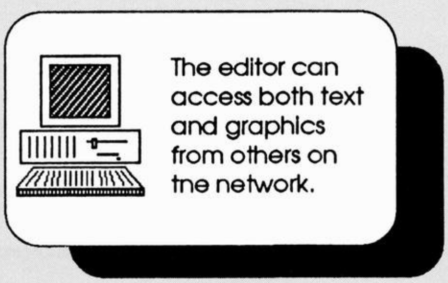
"Many people become concerned that the abundance of desktop publishing equipment will mean many more bad design works," says Kutzbach. "What companies need to do is create corporate design standards in the form of electronic style sheets and templates. These style sheets help ensure consistency and ease of use."

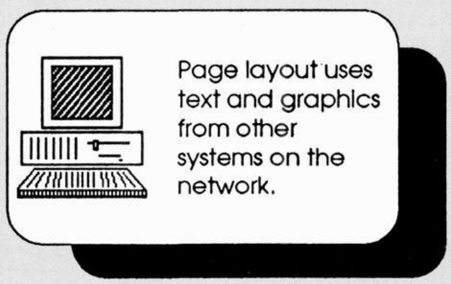
Kutzbach has found her true vocation teaching technical writing and computer assisted publications in the Engineering Professional Development Department. She affirms, "I love the contact with the students. I never want to leave."

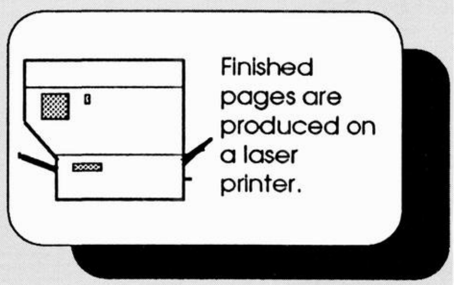
Editor's note: The staff of the Wisconsin Engineer uses desktop publishing techniques to design the layout of every issue.

AUTHOR

Linda Enders, a graduating senior in English and Communication Arts, remembers losing a paper in transit to the printer, at 2:00 a.m.







Students Find Harmony (and Rewards) in Engineering

In honor of the College of Engineering's centennial celebration, Dean John Bollinger recognized four engineering students for their scholastic achievement and participation in the UW Marching Band. Douglas Dallman (ECE), Jeffrey Hodgdon (IE), Andrew Reynolds (ME), and Nichole Wolf (IE) were awarded $1000 in scholarships by Bollinger who himself played in the band while studying engineering at the UW.

wisconsin engineer

Professors Elected to NAE

Two members of the UW College of Engineering faculty were recently elected to the National Academy of Engineering. Mechanical engineering professor Gary L. Borman was cited for his pioneering analytical simulation of internal combustion engines and verification with advanced experimental techniques. Nuclear engineering professor James D. Callen was cited for his work in the development of models of neutral beam heating, tokamak discharge macroscopics, and anomalous (turbulent) transport in plasmas.

Engineering Briefs

by Mike Waters

New Dual-Degree Program

The UW College of Engineering and Lakeland College of Sheboygan will begin a new dual-degree program this Fall. According to UW Associate Engineering Dean Donald L. Dietmeyer, the new program will combine the strong liberal arts tradition of Lakeland with the intense technical instruction of the UW College of Engineering. Under the new program, students would spend their first two years of college at Lakeland to fulfill basic liberal arts requirements. These students could then transfer into any one of ten engineering degree programs at the UW. Students who complete the new five-year program will receive two degrees, one from the UW and the other from Lakeland. The reason for the new program, Dietmeyer says, is to create a new pathway into the engineering profession by giving students more alternatives.

Students Honored by Alumni

In connection with Alumni Weekend, May 11-13, four engineering students will receive scholarships from the Wisconsin Alumni Association. Each year the association honors 10 students in recognition of their academic achievement, financial self-support, and extracurricular activities. Craig Baldwin (ECE) will receive a $500 Catherine E. Klein scholarship. Ann Redsten (MS&E) and Jane Walters (Technical Communications) will each receive a $1,000 Imogene Hand Carpenter scholarship. Thomas Wuttke (ECE) will receive a $500 David Wayne Langer scholarship. This year's recipients were selected from a total of 235 nominations by various departments and student organizations. Other special events include continuing education programs, the alumni awards banquet, class reunion gathering, and an open house at the chancellor's residence.

Thank You for Your Support!!

Alumni and friends of the UW College of Engineering increased their financial support in 1989 by donating over $6.9 million to engineering funds at the UW Foundation, up from $4.9 million in 1988. Gift-funded programs in 1989 included new computers for student computer labs, new state-of-the-art equipment, visiting lecturers, new faculty awards, and support for student organizations. The Society of Women Engineers, Expo, and Wisconsin Engineer were the primary beneficiaries in 1989.

Meet ten Fascinating Engineers
in the Summer 1990 **wisconsin engineer**

ChE Bids Farewell to a Dear Friend

With over 35 years of service to the Chemical Engineering Department, Jeanne Lippert clocked out for the last time on Friday, April 27. The department held a dinner in her honor on Monday, April 30, to show its appreciation at this time of her retirement. Many friends were present to extend congratulations and bid a fond farewell.

Students and Credit Cards

What is the Limit?

They're trying to reach you any way they can.

They contact you through direct mail and send representatives to the Unions during Welcome Week. They even compete for space on bulletin boards and kiosks, hoping to attract your attention and eventually your business.

The sales pitch of the major credit corporations is irresistible. "Right now with our Special Student 'Short Form' application, you don't need credit or even a job to apply — just your college I.D.!" reads a brochure advertising student VISA and MasterCard accounts.

Requirements have never been easier. If you're at least 18 years old, attending the University full-time and do not have a bad credit history, you're probably eligible for a credit card from a number of companies.

Although qualification rules vary, many credit card companies consider grants, scholarships and allowances as income.

According to *Fortune* magazine, two leaders in the student credit market are Citicorp with 1.5 million student cardholders and American Express with 500,000 student members. These companies, like many others, continue aggressive marketing campaigns directed at students across the country. For example, American Express offered special perks with new student accounts last year. The company enticed students with two $99 vouchers for Northwest Airlines.

Seven million undergraduates across the U.S. spend $10.5 billion dollars during the school year alone

Why are financial institutions so eager to sign up students?

"It's good business sense to get them early. This is a group with a great potential for success. We help them early and they're faithful to us," says Celine Gallo, manager of public affairs for American Express in New York.

According to *Fortune* magazine, the spending power of America's youth market is also hard for any business to overlook. Seven million undergraduates across the U.S. spend $10.5 billion dollars during the school year alone.

Student cardholders also have an additional financial resource that other cardholders don't — their parents. Banks issuing credit cards to students may rely on the presumption that many parents will bail out their children if they overextend their credit.

"It's difficult to estimate how often parents actually pay credit bills for their children, but it's obvious to the financial community that someone backs up the students," says Frank Barber, a financial advisor at the Office of Student Financial Aid.

Parents, however, have no legal obligation to pay their children's credit card bills if they did not co-sign the application. But with parents help or not, students are becoming more financially sophisticated, according to Barber.

"When I became an advisor seven years ago, students with credit acounts were a minority and the cards were in a parents name," says Barber. "Today, nearly every student I see uses credit cards. But I have to agree with the banks. Many students have a very good idea of what they can and can't charge."

A bad credit history stays with you for seven years and may ruin your chances of buying a car or renting an apartment after graduation

"Students are very responsible. They're delinquent no more often than the rest of the population," says Gallo. "We wouldn't sign them up if they weren't a good risk."

Nevertheless, complaints of credit accounts charged to their limit are not rare at Financial Aid Advising, according to Barber.

"Many students report they're in financial trouble due to credit card debt but it's usually too late for us to help," says Barber. "When a student comes in with a credit card debt of hundreds or even thousands of dollars, there's really very little we can do except refer them."

Financial Aid advisors can help students get Stafford Loans to pay back credit card debts that are incurred for school related costs. However, the increase in credit card use by students has affected legislation that regulates this service by limiting eligibility requirements, according to Barber. According to Barber, in order to qualify for a loan to pay for a computer charged on a credit card, for example, a student must:

• Prove the indebtedness occurred during a period of enrollment (summer not included).

• Present written proof from an instructor that a computer is necessary for a class.

• Present written proof from an advisor that the student does not have reliable access to university computer labs.

"Fewer students get the loans because Congress has limited the criteria to qualify for loans under these circumstances," says Barber. "I suspect that the legislation will tighten up more in the future as more students use credit cards."

Because UW-Madison has no formal financial counseling services, Barber often refers students to Consumer Credit Counseling Services (CCCS) in Madison. The non-profit organization estimates that students make up 10% of their clientele.

...with parent's help or not, students are becoming more financially sophisticated

"The students most likely to get into credit trouble are those who charge survival needs such as rent, food or utility bills," says Grace Mickleson, a financial counselor at CCCS. "Many students justify this spending by depending on their future income. But a first-year college student who charges necessities will have to wait four or five years before their accounts will be fully paid."

The possibility of graduating with a large credit card bill is not the only drawback to easy credit.

"Students run the risk of establishing a bad credit rating and ruining their leverage with future lenders and creditors," says Mickleson.

American Express, VISA, MasterCard and even some department stores report the payment history of their cardholders to credit bureaus. If you miss a few payments or even send in late payments, you can damage your credit rating. A bad credit history stays with you for seven years and may ruin your chances of buying a car or renting an apartment after graduation.

"...Credit is a wonderful thing as long as you control it and it doesn't control you.."

Mickleson believes that the increase in student cardholders is a reflection of a national trend.

"The way students are using credit cards is representative of the way the entire country handles its money," says Mickleson. "From the national debt to individual consumer debt, we rely heavily on credit and it's beginning to affect the way we manage our finances. Credit is a wonderful thing as long as you control it and it doesn't control you."

SMART CREDIT

Students who apply for credit cards actually have an advantage in the credit game.

If you do apply for a credit card, remember, they want you. Students are in a position where they can be choosy. Shop around for the best deal. Don't think you have to sign the first application that is mailed to you. Chances are good that many more will follow.

Here are some additional tips from the experts:

• Check into the packages offered by local banks in addition to the large national corporations that vigorously advertise to students.

• Both VISA and MasterCard leave the regulating of fees and interest rates to the individual banking firms that market their cards. Interest rates may vary from 16%-20% and annual fees range from $15-$50 dollars, according to Barber.

American Express cards, which are not revolving credit but charge cards, have a $55 annual fee.

• Don't charge any bills that can't be paid off in three months, according to CCCS.

• CCCS also advises all credit card users that individual consumer debt should not exceed 20% of their total income.

"This requirement is especially hard for students to meet because the 20% should include car and student loans in addition to monthly credit card bills," says Mickleson.

• Under Wisconsin's Fair Credit Reporting Act, everyone has the right to see his or her credit file. If you are concerned about your credit rating, contact the Credit Bureau of Madison. For a $10 fee, the office will provide a computer print out of your credit history.

AUTHOR

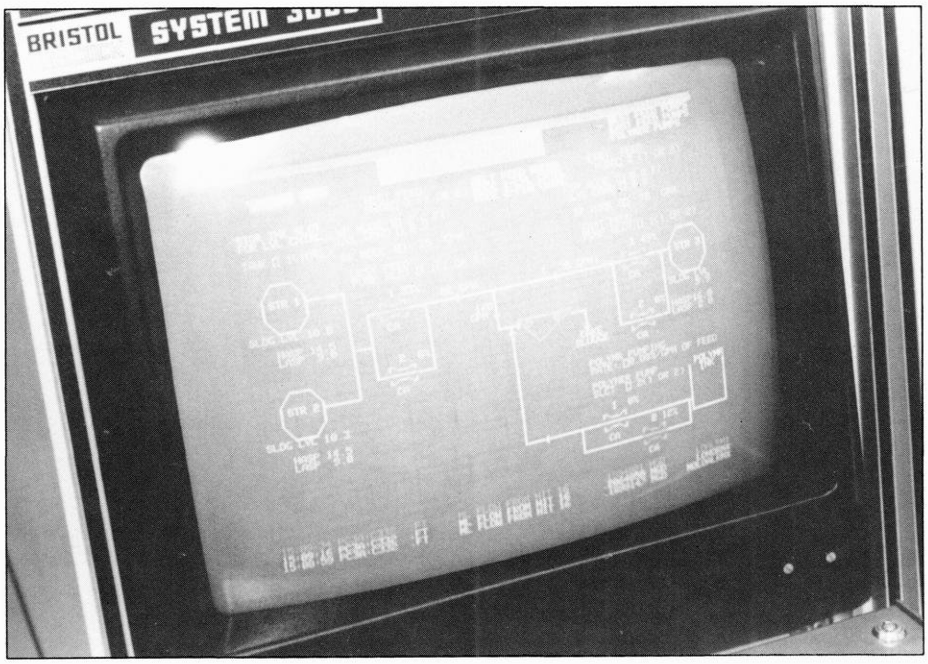
Ann Tomasko graduated in December 1989 with a BS in Family and Consumer Communications. Ann still lives and works in the Madison area.

Computer System Implementation Results in Valuable Changes for MMSD

Computers are an integral part of the everyday life that is taken for granted. For instance, when turning on a faucet in the home, who thinks about where the waste goes or how the waste may affect others? The thought is never consciously brought up, unless there is a problem. With the introduction of computers into industry, there have been fewer problems and thus, the thought of where liquid wastes go has become even more insignificant to people.

Seven years ago, the Madison Metropolitan Sewerage District (MMSD) began construction of the seventh addition of the Nine Springs Wastewater Treatment plant located south of the South Beltline. The seventh addition included the use of computers to obtain uniformity of control over the operations at the plant to meet more stringent regulatory requirements. Also, computers were to reduce the labor requirements of the plant over time, not necessarily to reduce the current number of employees, but to cut the need for hiring more.

Not only has the uniformity of control increased, but costs of operation remain relatively constant as a result of the seventh addition and the continuing computer and electronic additions at the facility. Operating shifts of three people were reduced to two as a result of installation of automatic samplers and the computer system. Personnel are now able to get an overall perspective compared to the very narrow perspective before the seventh addition. By seeing the overall perspective, individuals can look into areas not looked at before to do detailed analyses.



A close up view of a monitor screen reveals the sludge handling processes of the unit operation. Screens allow the operators to keep track of the sludge moving from process to process.

Other computer systems have been added to the facility since the initial computers and monitoring equipment for plant management were added in 1985. Also, enhancements to software are still occurring.

According to Curt Witte, Systems Analyst at the Nine Springs Facility, there currently exist four areas of computer operation at the facility:

- plant operations and monitoring area
- administrative area
- laboratory results area
- project management area

The plant operations computer system is very involved. It has thirteen process controllers located throughout the plant that control processes such as aeration systems and ultraviolet light disinfection. Each process controller has its own software that operates from the results they monitor. There are also two microprocessors that monitor results from the plant processes. Operators can change setpoints, but they cannot change the process of the microprocessors significantly. Should any of these microprocessors fail, the individual processes can be manually run.

Interfacing data from the plant operations microprocessors to the minicomputers that record and monitor data is done by an additional microprocessor. A Digital PDP 11/44 minicomputer makes records of the historical data, performs numerical analyses, schedules printouts of reports, performs data backup and retrieval, and is the backup of the telemetry system.

An additional PDP11/44 handles the telemetry system at the plant. The MMSD handles wastewater from neighboring communities such as DeForest, Waunakee, Middleton and Cottage Grove. Communities gather their wastewater into their sanitary sewers. These sewers generally carry the wastes to a sewer interceptor which is owned and operated by the MMSD. Pumping facilities are used to move the wastes to the Nine Springs Facility. These pumping facilities are monitored by the telemetry system at the plant.

The telemetry system uses three different pairs of 900 Megahertz frequencies to send out and retrieve data from forty-three individual pumping stations. The data received from the telemetry system is monitored in the operator's room. Typical data will include whether or not a pump is on, the level in the pump wet well, and the possibility of a power or pump failure. Monitoring pump stations is the most important part of the MMSD computer system. Should the Telemetry PDP11/44 fail, the other PDP11/44 in the plant is taken out of service immediately and used for telemetry purposes. It is essential to monitor the pumping stations. Should a pump station fail and go undetected, flooding could occur causing significant damage to area homeowners.

Through the use of computer systems, new hardware, and new electronics, people can live better for less

Data from the plant and telemetry database is down-loaded to two Compaq personal computers. Spreadsheet programs incorporate data such as rainfall versus flow rates at pumping stations. These relationships can, in turn, show the amount of infiltration and inflow that occurs at the various stations.

The administrative area uses IBM network computers for many applications. One is the monitoring of the applications of Metrogro. Metrogro is a processed organic fertilizer and soil conditioner that is a by-product of the wastewater treatment process. It contains a high amount of nitrogen which is placed on over 250 farms and

Telemetry and the Madison Sewage District

The sun was shining outside, but the puddle in front of the home was continuing to grow. The basements of homes in the area began to fill with water.

The water was not fallen rain or water from a fire hydrant, it was wastewater backing up from the pumping station outside. The station, located in a lower area of the city, collects wastewater from the community through the use of gravity. The wastewater is then pumped from that station to another station which directs it to the treatment plant. Unfortunately, no one knew that the power to the pumps had shut off. Personal property damage was growing by the minute.

Who is responsible for the damage of the above hypothetical scenario, and how can something like this be prevented?

Blame is usually placed on the owner of the pump station. Monitoring of the pump station can normally prevent this situation.

Madison Metropolitan Sewerage District is responsible for monitoring over 40 different pumping stations. Most are monitored through telemetry, a process in which a computer sequentially sends signals to individual pumping stations through the Madison area. These signals are a line-of-sight type of transmission over the 900 MHz range. Pairs of frequencies are used, one for transmitting, the other for receiving. Most of the telemetry is done using repeaters, where the signals are transmitted to a tower at another location in the Madison area and relayed to the pumping stations.

Some of the telemetry can be done directly without the use of repeaters. The signal is then sent directly to the pumping station. The district has one small pumping station that uses a wire hook-up and it is located relatively close to the treatment plant. The 900 MHz transmissions system has just recently been employed. Previously, phone lines were used but have since become cost prohibitive. The new telemetry system will pay for itself in less than four years.

Should a pump station fail, the new telemetry system can help the operator determine the reason for failure. With the old system, the pump stations sent a single alarm to the plant regarding the status of the station. If the station

(continued on page 20)

over 1,500 different fields as a substitute to commercial fertilizers from cooperatives.

Nutrients and heavy metals are monitored on representative samples that are applied to the fields. Records are kept to let farmers know the fertilizer value of sludge applied to the fields through Metrogro. Additional nutrients may be needed to completely fertilize the soil for optimal crop performance. The DNR requires monitoring of the trace metals that are applied to each field. Only a finite amount of total heavy metals may be applied to a particular field to minimize uptake by plants and humans. Area wells are monitored near application sites to ensure that Metrogro is not harming the environment through groundwater contamination.

The administrative computer system also handles the maintenance system. It stores work orders for the District, keeps inventory for the many parts in storage,

Multiple gauges and screens show results of continuous monitoring of the many processes of the sewage treatment plant. Keyboards allow plant operators to adjust parameters, if needed.

and monitors and computes vehicle fuel usage and costs. It is also used for accounts payable and labor distribution as MMSD services the pumping stations in the outlying communities. The only things the administrative computer system does not do are the general ledger and payroll. This exception occurs because it is more cost effective to have a service bureau perform these tasks.

failed, there was no way of telling what was wrong at the station. With the new system, additional information can be received from the pumping station. For example, not only can the plant determine that the station is functioning, but also if a pump is out of service, which pump is functioning, and how fast the wastewater is filling the station. This additional information aids the mechanic when responding to the troubled station.

It is essential to obtain current information from the pump stations. In times of high flow, a failed pumping station can be the cause of substantial monetary loss. Most pump stations are located in low areas where, by gravity, they collect water from runoff and infiltration. If the pumps are not activating properly, the pump stations can quickly fill with water. This can cause excess water to quickly backup in neighboring areas, including basements and streets.

According to Curt Witte, Systems Analyst at the Nine Springs Facility, "Other than meeting its Department of Natural Resources discharge permit limits, the district's liability is in the maintaining of the interceptors and the pumping stations. Continual monitoring of these stations is the treatment operators' highest priority."

Monitoring of the pump stations is so important that should the pump station monitoring computer ever go down, it will be immediately replaced by the historical recording, and data back-up and retrieval computer for the treatment plant. The historical recording, and data backup and retrieval are inoperable until the initial telemetry computer can be brought back on line.

In the laboratory results area, software and hardware for Compaq computers are integrated to obtain spreadsheet files for tests done in the lab. No measurements are ever written down or entered at the keyboard, rather they are fed to the computer through the balance. This results in a big saver of manpower in the lab. For instance, when measuring the weight of a sample, the initial tare weight of the filter or dish is recorded automatically into the spreadsheet. Then the filter and sample are placed onto the balance and recorded into the spreadsheet, and the computer then calculates the actual weight and concentration of the sample. The results are printed in report form and the spreadsheet is combined with other data for daily reporting.

The spreadsheet allows transformation of data as needed for the many tests performed on the different samples. Typical tests include atomic adsorption for trace metal analysis, gas chromatography for PCB analysis, and ion chromatography for the analysis of sulfates, chlorides and phosphates.

In the project management area, an Apple Computer is used to monitor projects that are taking place at the facility. Construction projects that are currently taking place at the plant are monitored and logged at the computer as to when individual milestones are finished and can determine if the overall project is meeting its due date.

Servicing software is very important to any industry that relies on computers for operating processes within the plant. Most companies rely on representatives from the computer manufacturer or from the sales company for backup support of their computer system. Costs can escalate quickly if a process goes down and the company has to wait for a representative from another city to arrive. The cost of the representative can be staggering since the company picks up the tab for transportation, lodging and food, as well as technical labor.

MMSD trains their employees to be the backup support as well as software specialists for their computer systems. This concept started before the computers at MMSD were even employed. A hardware instrumentation specialist was hired to work with the contractor when the computer system was installed, to gain an understanding of the system and to learn how to correct problems in the system. The system specialist was adding and changing programs for the many different processes before the contractor was completely done with his work.

Presently, there are two or more people on staff to make software changes. Should the system ever fail, there is at least one back-up person that can restore the system. Eventually, the computers will fail and a service representative must be brought in immediately, at a very high cost. In-plant training has saved many dollars in two ways: 1) Updating the software can be done with personnel on site, 2) New systems can be added without having to bring in outside help to control new equipment. Continuous training of personnel is the key to keeping the computer systems operating smoothly and efficiently.

MMSD is an example of how computers are integrated into industry to improve uniformity of control and reduce operating costs. Through the use of computer systems, new hardware, and new electronics, people can live better for less. Not so obviously, computers are an integral part of everyday life that is often taken for granted.

Photos by Frederick Hegeman.

AUTHOR

Fred Hegeman, a civil engineering senior, recalls his worst computer nightmare as recursive programming.

To Buy or Not to Buy...

A Student's Reference to Buying a Computer

"Darn! It still won't run...what time is it? Two. No, it can't be. Two in the morning?!?! I'm not even close to finished! For the last 18 hours, two of which have been spent waiting for a computer, I've been sitting in this cold, sterile computer center, working in front of a square, lit-up box, programming in some foreign code, on a program that's due tomorrow... What did she say? The lab will close in five minutes? *@!?# I wish I were a psych major..."

If this description is even remotely close to anything that has happened to you, you have probably wished, and maybe have even seriously contemplated getting your own computer. Most people realize that when buying a computer, there are many things to consider. No one wants to spend that much money only to find that they have made a very expensive mistake.

How much will someone of my major require a computer? There is no clear-cut answer to this question since computer usage depends on each person's specialization within his or her major. Obviously, there are some classes, as well as majors, that use the computers more often than others. Electrical engineers, for obvious reasons, use computers often. However, depending on their area of specialization, they usually find that they do not work with one specific type of computer consistently. For example, electrical engineers will undoubtedly find themselves using a VAX or UNIX one semester, and an IBM or Macintosh the next.

This switch-off is usually true with most other majors that use computers often. For majors that do not work on a variety of computers, they will probably find that computers are suggested for problem sets but not required. Most professors have stated that they are trying to incorporate computers into their curriculum. However, if you are buying a computer solely for school, you may find that it does not get as much use as it should. Nevertheless, there are a variety of uses for computers outside of school, and you may need a computer for your job, papers, resumes, etc.

No one wants to spend that much money only to find that they have made a very expensive mistake

Will the computer be used for programming, publishing, or calculating? If it will primarily be used for programming, then either an IBM or Macintosh will serve the purpose, depending on which programming package you are familiar with. You may find that the programming packages for IBMs are better than those for Macintoshes. However, this quality difference is currently changing as Macintoshes are gradually being incorporated into many larger corporations.

If the computer is to be used solely for graphics, the Amiga is the best. Amigas, however, do not have much else to offer and are definitely a poor choice for any student. Of the other, more functional computers, you will find that the Macintosh is better than the IBM for graphics, word processing, and desktop publishing. This difference is primarily because the Macintosh has acquired a reputation in graphics and desktop publishing and has a variety of software packages to serve this purpose. In the past year or two, desktop publishing and word processing packages for the IBM have been trying to compete with those of the Macintosh, and are gradually improving.

If spreadsheets and problem solving programs are the major function of your computer, then both Macintoshes and IBMs are fine. Whichever computer and software package you are most familiar with will probably be the best choice for you.

How long will this computer last? In other words, how long will it be before the computer is obsolete? This is a major problem with computers, because state-of-the-art this year will be run-of-the-mill next year. Thus, the technological life span of a computer is no more than five years. You want to make sure you're not buying an obsolete model. What is an obsolete model? It is a model that the manufacturer has decided to discontinue making or updating because it is inferior to the other computers on the market. This discontinuation means that it will be difficult finding software, and in some cases, hardware to upgrade your computer. Unless the computer will be used for some highly specialized purpose, such as counting radioactive blood cells in a test tube, you should probably stick with a more updated (and in many cases, more expensive) model.

Will I be able to expand my computer? This question is important if you plan on keeping your computer for a while. Is it upgradable? And if so, by how much? You definitely want the

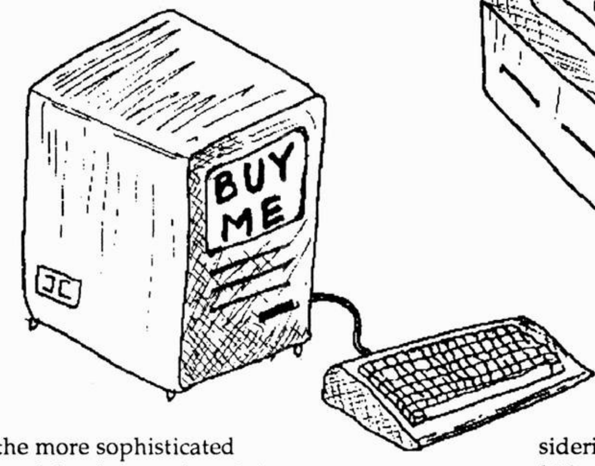
Whichever computer and software package you are most familiar with will probably be the best choice for you

option to upgrade. This option will allow you to expand your memory and attach an additional disk drive or other peripheral device (such as a keyboard).

Should I get a built-in hard drive? If you have the money for it, this option is definitely a good purchase decision. It saves time and is much more convenient. However, with a hard drive, you must become very careful not to get any viruses. One virus could blow your entire memory in a matter of seconds.

What type of computer will I need in industry? IBM, and IBM compatibles. Most businesses use, and plan on using IBMs. Fairly recently, more businesses have been gradually switching over to Macintoshes because they are easier to use and have more to offer in the area of presentations. However, if you're planning for a future in industry, you will most likely be using an IBM.

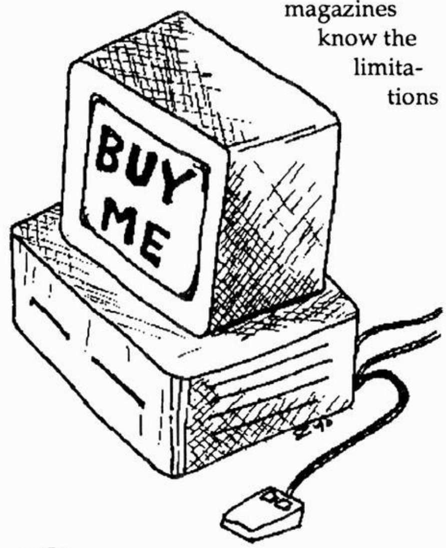
How much are you willing to spend on a computer? Depending on which model you get, Macintosh computers can range from $1,000 to over $5,000. These prices do not include the cost of the keyboard, printer, and in the case of the Mac IIs, a monitor. If you're looking for an IBM, you may want to look for an IBM compatible. IBM compatibles range anywhere from $700 to over $7,000 for



the more sophisticated models. As a student, it is tempting to go for the cheaper models, but remember, you get what you pay for.

What type of software is available for the computer? This is actually very important. How much are you willing to spend on software? Most of the software packages that students use for classes, like Microsoft Excel, are priced in the $100-$300 range. Assuming you don't pirate software, you will be spending, on average, another $600 to $700 on productivity software. This is software you use to do the "essentials" such as word processing, graphics, and spreadsheet calculations. To get an idea of what is available for your computer (since this is always changing), stop by a software specialty store and browse.

If you are planning on getting a computer, do your research first—especially if you are planning on buying a less well known brand. The best places to read up on the various models of computers are specialty magazines. These magazines know the limitations



graphics by Sharon Chen

of the computer you are considering, and can give you a general idea on the capabilities of the computer. Word of mouth is also great. These sources can give you a general idea of what works, and what doesn't.

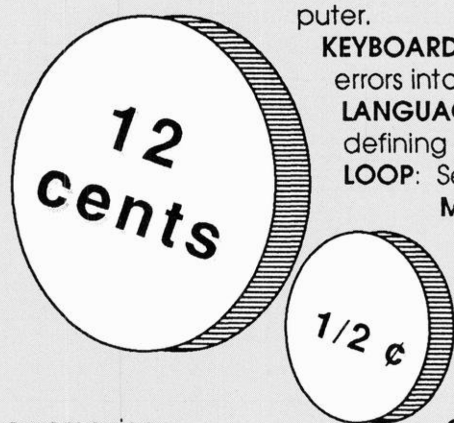
Computer technology advances so rapidly that buying a computer may seem like a bottomless pit. However, if you make a careful choice, you will find that your computer will give you many productive years. ▮▮

AUTHOR

Sharon Chen, a sophomore in chemical engineering, is always afraid of losing hours of computer work without saving first.

Improve Your Computer Vocabulary

ANALOG: Hors d'oeuvre, usually made from cheese and covered with crushed nuts.
BACKUP: Opposite of forward.
BATCH PROCESSING: Making a lot of cookies at once.
BINARY: Possessing the ability to have friends of both sexes.
BIT: 12 1/2 cents (see diagram at right).
BRANCH: If watered, will grow into a Computer Club.
BUFFER: Programmer who works in the nude.
BUG: 1) Programmer's term for a feature. 2) An elusive creature living in a program which makes it incorrect.
NOTE: The activity of "debugging" or removing bugs from a program ends when people get tired of doing it, not when all the bugs are removed.
CHARACTER DENSITY: The number of very weird people in the office.
COMPUTER: A device designed to speed and automate errors.
COMPUTER CLUB: Used to strike computer forcefully upon receiving error messages.
CODING: An addictive drug.
COMMAND: A suggestion made to a computer.
COMPILE: A heap of decomposing vegetable matter.
COMPILER: Noah Webster (1758-1843).
CONTROL CHARACTER: Agent 99.
CONSOLE: What one does to a down computer.
CRASH: Normal termination.
CURSOR: An expert in four-letter words.
DECOMPILER: The software needed to undo the wrongs of compilation, i.e., to repack object worms in a can of source.
DUMP: System Programmer's work area.
FEATURE: A hardware limitation as described by a Marketing Rep.
HARDWARE: 1) Typically boots, leather, and chains. Contrast with *Software*. 2) The parts of the computer which can be kicked.
HEXADECIMAL: Unlucky numbers used by computer.
INSTRUCTION: Another suggestion made to a computer.
KEYBOARD: An instrument used for entering errors into a system.
LANGUAGE: A system of organizing and defining error messages.
LOOP: See Loop.
MACHINE-INDEPENDENT PROGRAM: A program which will not run on any machine.
MICROCOMPUTER: One-millionth of a computer.
NULL STRING: The result of a four-hour database search.
ON-LINE: The idea that a human being should always be accessible to a computer.



PASSWORD: The nonsense word taped to your terminal.
PERFORMANCE: A statement of the speed at which a computer system works. Or rather, might work under certain circumstances. Or was rumored to be working about a month ago.
PRINTER: Johann Gutenberg (1400-1468).
QUALITY CONTROL: Assuring that the quality of a product does not get out of hand and add to the cost of its manufacture or design.
RAM: A male sheep.
ROM: A RAM after a delicate operation.
STRATEGY: A long-range plan whose merit cannot be evaluated until some time after those creating it have left the organization.
SOFTWARE: Typically silk nighties, nylons, and garter belts. Contrast with *Hardware*.
USER: Someone requiring drug rehabilitation.
8-BIT MACHINE: A computer selling for $1.00 (see Bit).
16-BIT MACHINE: A computer selling for $2.00 (see Bit).

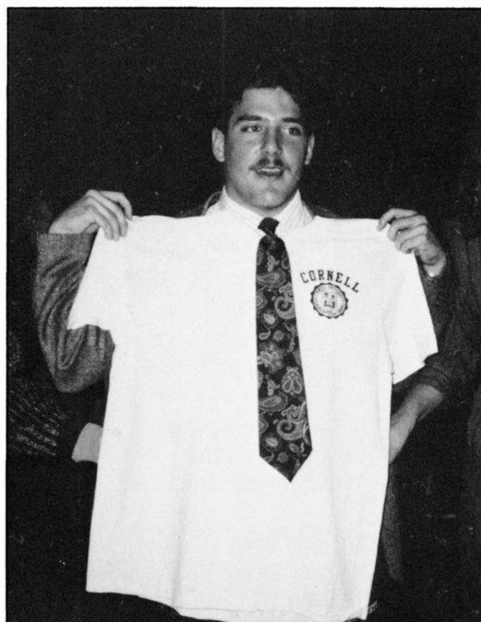
Wisconsin Engineer Takes Top Honors

The Wisconsin Engineer proudly accepted awards in five categories at the annual Engineering College Magazines Associated convention held April 6-9, 1990 by the *Cornell Engineer* in Ithaca, New York.

The awards are:

- 1st Place for Best All-Around Magazine
- 1st Place for Best Layout in All Issues
- 2nd Place for Best Single Issue (May 1989)
- 2nd Place for Best Layout in a Single Issue
- Honorable Mention for Best Non-technical Article (More Than Money: What Makes a Good Job Offer?, May 1989)

The *Wisconsin Engineer* staff displays the awards. Bottom row (l. to r.) Sharon Chen and Nancy Hromadka, Co-editors. Center row - Wendy Weinbrenner, Circulation Manger; John Stangler, Business Manager; Andy Whitman, Advertising Manager; Mike Bashel, General Manager; Shelly Hoffland, Production Editor; and Amy Damrow. Back Row- Ethan Johnson; Dawn Stanton; Professor Don Woolston, Faculty Advisor; and Mike Waters.



(Left) The trip to New York took eighteen hours. Just glad to be out of the van for an hour, *Wisconsin Engineer* staff members pose at Niagra Falls. (Above) General Manager Mike Bashel proudly displays his Cornell University door prize.

New ECE Curriculum Takes Effect

To the students in the Department of Electrical and Computer Engineering, it should come as no surprise that the course curriculum is changing, effective Fall Semester, 1990. The new curriculum places an added emphasis on laboratory experience as well as a strong mathematics background. The major changes in the curriculum are not drastic. Instead, they are intended to provide students with a smooth transition from general engineering, through the electrical engineering program, into industry.

One of the major changes in the curriculum is an increase in the number of required laboratory classes. Without getting into specific course numbers, which have also changed, the number of required ECE lab credits has increased from four to six credits. This increase includes the addition of a one credit introductory lab class designed for students who have had no previous ECE course work.

A beginning student following the new curriculum can now begin taking an ECE lab class (ECE 170) concurrently with Physics 202. This addition provides pre-engineering as well as non-engineering students the opportunity to take an electrical engineering lab class. Under the old curriculum an electrical engineering student could only begin taking required lab classes after taking a linear circuits course (ECE 230) and a concurrent course in electrodynamics (ECE 220)

The other addition to the required ECE lab classes is a one credit digital logic laboratory (ECE 351, formerly ECE 307). This change accompanies a one credit increase in the corresponding digital system fundamentals course (ECE 352, formerly ECE 360). In order to make room for these additional lab requirements, the number of lab electives in the new curriculum was decreased.

The second major change in the ECE curriculum is the addition of a probability/statistics elective as well as an

One of the major changes in the curriculum is an increase in the number of required laboratory classes

advanced mathematics or an intermediate/advanced computer science elective. These two required courses are in addition to the advanced mathematics elective which exists in both curriculums. The probability/statistics elective must be chosen from a list of five courses; whereas, the advanced math/computer science elective can be any course as long as it is not cross-listed with ECE. The only exception to this restriction is ECE/CS 354, which is required for students in the computer engineering option and can be used to fulfill this requirement. Space for these additional courses was made by decreasing the number of advanced course electives required in the old curriculum.

The main reason for the inclusion of these additional courses was to better prepare students for entering industry. As Professor Willis Tompkins, the Associate Chairman for Undergraduate Activities and Chairman of the Curriculum Committee, explains, "the reason for this change is (that) once in industry, engineers are concerned with quality control and statistical error, determining the probability that a system is going to break down."

The new curriculum includes several other subtle changes, such as the adherence to The College of Engineering Liberal Studies Guideline. This guideline provides structure to the required 16 credits of liberal studies electives, yet it still allows a certain amount of freedom for individual preferences. Included in these 16 credits is the requirement of EPD 101, a one credit course entitled 'Contemporary Issues in the Engineering Profession,' and one course selected from a list entitled 'Understanding Other Societies, Races and Ethnic Groups.'

Similarly, two of the liberal studies courses must be selected from the lists 'Understanding Individuals and Interpersonal Relationships,' 'Understanding

American Society,' and 'Enrichment.' Most of the more common liberal studies courses, those taken by former engineering students, are included in this requirement.

The changes mentioned up to this point apply to all students in the Department of Electrical and Computer Engineering. There is one additional change that applies to only those students in the computer engineering option. It is now required for these students that an introductory course in computer architecture (ECE 552) be included as one of the advanced course electives. This addition leaves the computer option electrical engineering student with 10 remaining advanced course electives. Students in the computer engineering option represent 40% of all students in the ECE department.

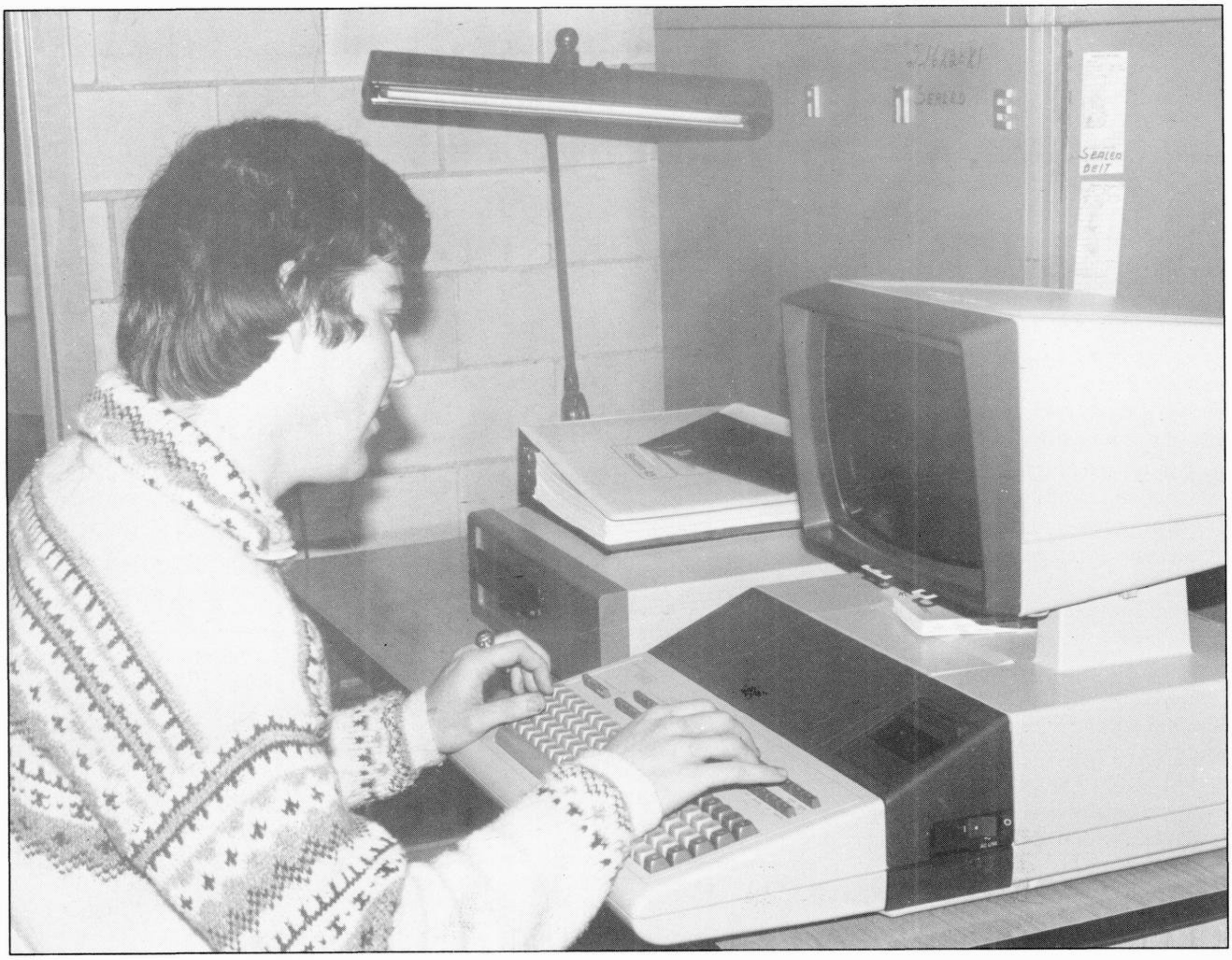
Students with an ECE classification who would like to follow the new curriculum must declare their intent at the department office (2414 Engineering Building) before graduation. For students accepted into the ECE department prior to the fall semester 1990, it will be assumed that they will be following the old curriculum. In most cases, a student transferring between curricula will generally be allowed to substitute classes already taken for some of the new requirements. Any further questions can be directed to an ECE advisor.

AUTHOR

Dan Grellinger, a junior in electrical and computer engineering, fears the ever-present *system error* (you know, that bomb that shows up for no apparent reason).

Just One More

College of Engineering Updates Computer Labs



A mechanical engineering senior checks out a "new" computer in an ME lab. Despite the expanded labs, students still wait for computer time, and the printers are still down.

Madison, WI - The UW-Madison College of Engineering recently celebrated the opening of three updated laboratories with equipment purchased from Ragstock.

The effort to update the labs was initiated by Dean John Bollinger, who unsuccessfully proposed a $400/semester tuition increase for engineering students to help cover the costs.

The students, however, fought the increase tooth and nail. They agreed with Bollinger that better lab equipment was necessary, but threatened to boycot a tuition increase. The students questioned why the funding could not come from corporated grants or from the state.

Bollinger compared UW-Madison lab facilities with those of similar universities, and UW-Madison came out behind.

The new labs were made possible by computer equipment originally owned by Michigan Tech and MIT. Bollinger explains that though the equipment is outdated, it is a step up from the previously used equipment. He added that, though the students will benefit only slightly from the new labs, they will not have to pay more for tuition.

-Just One More staff

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