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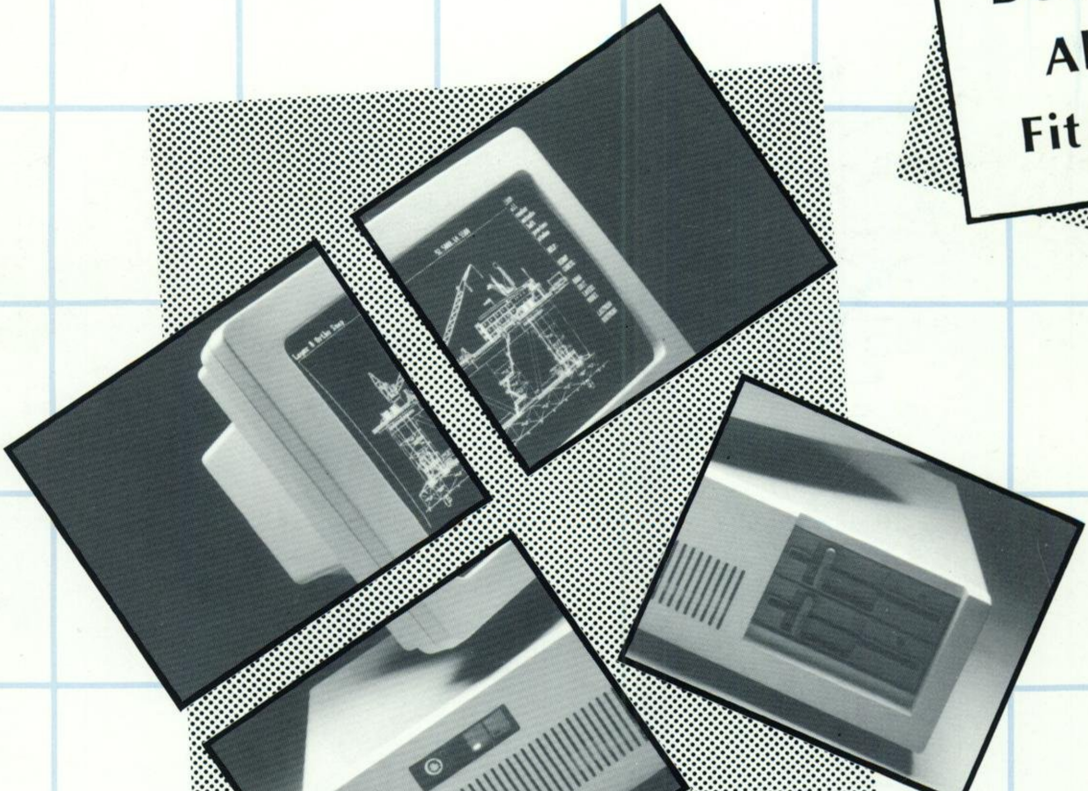
wisconsin engineer

TECHNOLOGY

How Does It All Fit In?



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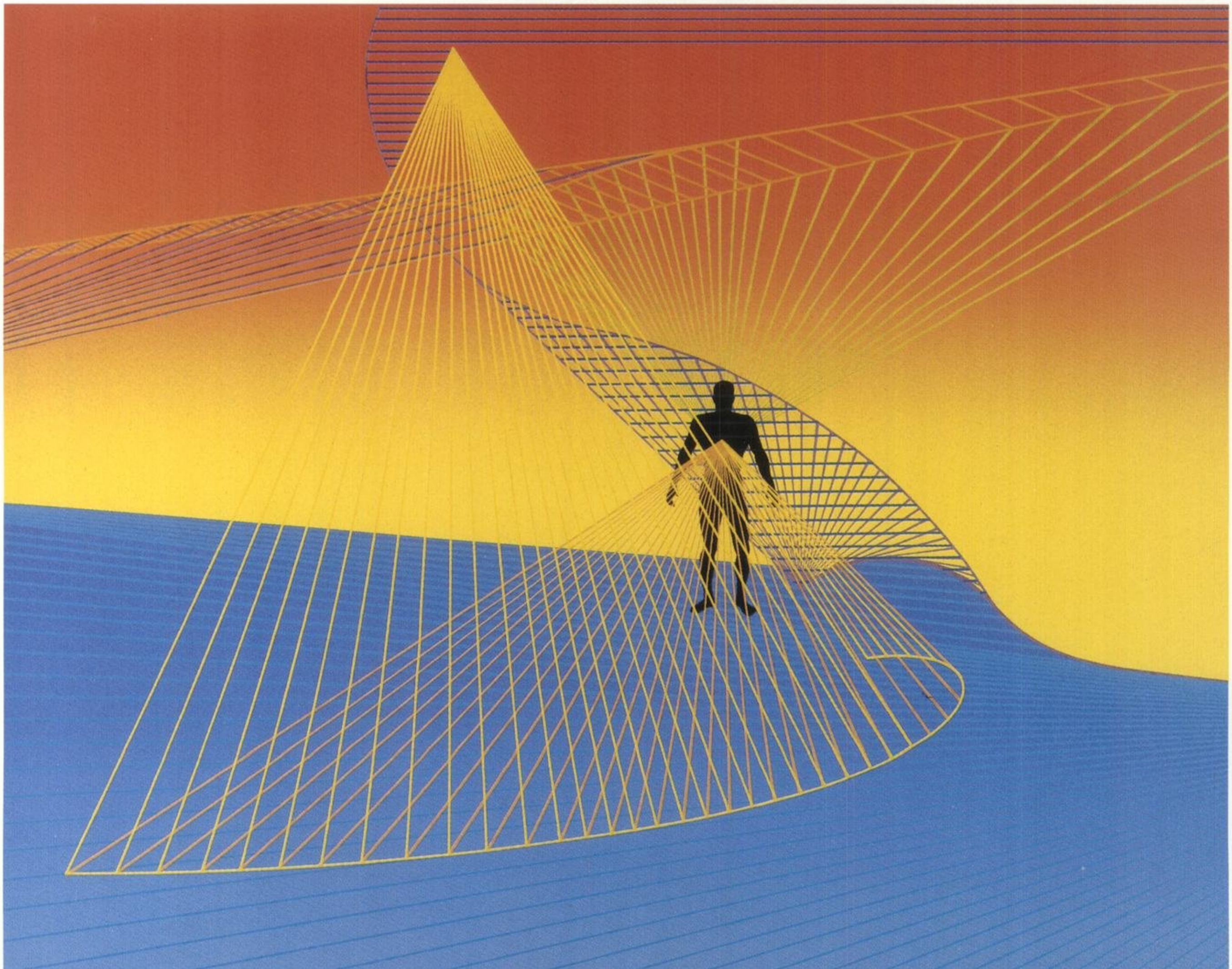

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COLUMNS

TECHNOLOGY FEATURES

ADDITIONAL FEATURES

Board of Directors: Michael Corradini, Gerald Duchon, Ed Kuipers, Evelyn Malkus, Richard Moll, Tom Murray. **Faculty Advisor:** Don Woolston.

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Lake Water

Practical computing experience

by Clement Audu

The application of computers in engineering design and analysis grows rapidly every year. With this growth comes a large volume of design and problem-solving information which the engineer must learn to use effectively. Effective use of this information requires that the engineer has necessary and adequate skills to use it.

Exposure to computer science courses as well as the practical use of computers in engineering courses has not kept up with the growth of computers in industry. I do not necessarily imply that the engineering school needs to maintain the same level of computer use as in industry. That is impossible considering the financial and research constraints on the University. But I think that engineering students should be adequately prepared to design and analyze software applicable to their respective fields. Presently many engineering classes require the use of computers for class homeworks and/or projects, but most of those classes require only that the student can input data and run the programs. Most of these students have no concept of what different components of the programs do, or how they might modify the programs to achieve additional results.

Much of the problem could be attributed to the fact that some of the engineering departments only require two credits of computer science. Although two credits of a computer language is sufficient for some proficiency in that language, most of the introductory computer science classes provide little of the practical experience needed for effective functioning in industry. By their senior years, many engineering students will have retained only a small portion what they acquired in their introductory computer science courses as a result of minimal use. But the small percentage of students who own personal computers are able use the languages they learned by modifying programs for their PCs.

One possible way to provide engineering students with proficiency in practical computer use is for the engineering administration to integrate a computer course into the curriculum of each of the departments. The proposed courses should provide practical application of computers to engineering problems within that particular field. But more importantly, the courses should provide the opportunity for instructors and students to jointly design and develop software for their use. Such courses would provide the students with some first-hand experience of the process involved in the design and production of engineering software.

Exposure to computer science courses as well as the practical use of computers in engineering courses has not kept up with the growth of computers in industry.

This proposal would likely require a few years to implement, but in the meant time, respective engineering departments could require an additional computer science course that closely complements studies in the respective fields.

One way students can acquire practical experience with computers is to be involved with Project Trochos, a campus wide project with the goal of finding how personal computers can be used in course work as well as in industry. I recently got involved in the project and have a chance to learn a new language as well as to gain practical experience in how to use computers in Civil Engineering design and analysis. Professor Bosscher of the Civil Engineering department, a member of the Project Trochos team, states that the experience students will acquire from working on the project is invaluable because the systems and software used for the project are presently used in industry.

Project Trochos is not limited to the Civil Engineering department Students interested in the project can talk to their respective department heads. The number of available vacancies is limited. Considering how important practical experience in the use of computers is, students should seek any avenue that might lead to such experience.

Dean's Corner: Technology in the Workplace

by John G. Bollinger

I view the introduction of new technology into the workplace as the intellectual challenge of this decade. First of all, all engineers should realize that we are in a world marketplace. Our products must compete in function, quality and price. Second, change is made for the purpose of improvement, not for the sake of change. Third, the most important element in a successful business is people, because people determine all of the above.

In my opinion, engineers use of the computer, the robot, and the application of the science of materials will literally transform our industry during the next ten years. In a typical manufacturing business today we can divide all activity into ten neat packages of costs that cut across an entire company. They include:

1. The generation of new ideas
2. The creation and collection of information
3. The manipulation and modification of information
4. The storage and retrieval of information
5. The handling of materials
6. The processing of materials
7. The assembly of parts
8. The checking of quality
9. The handling of products
10. The management of all of the above.

If we accept this list as generic functions in a business which creates wealth including salaries for employees, taxes for governments and profits for owners, then the important technological changes leading to improvement should follow.

People play the central role in the first two items through their creativity in advancing new ideas and their ingenuity in collecting information that forms the knowledge base of any organization. People can be aided by the computer in collecting knowledge as well as stimulating creativity.

The computer plays a central role in item three in that it can be programmed to manipulate and modify information with great increases in productivity and reduction of costs. The computer again fulfills our needs in item four in that it has already revolutionized the storage and retrieval of information.

Item five, the handling of materials, has until now bee accomplished extensively by people. We have seen a growing trend to transfer this function to computers and machines in the form of computer-directed robotic devices. A robot is defined by the Robot Institute of America as "a preprogrammable, multi-functional manipulator designed to move materials, parts, tools, or specialized devices through variable, programmed motions for the performance of a variety of tasks." This definition literally demands that the manipulator be controlled by a computer of current vintage. Without modem computer technology, costs would prohibit their extensive use in a truly programmable form. Even the design of a robot requires the manipulation of a significant knowledge base which is greatly facilitated by the use of the computer, namely, kinematics, machine design, electrical and hydraulic drive systems, computers, sensors and artificial intelligence.

The processing of materials is an area

I view the introduction of new technology into the workplace as the intellectual challenge of this decade.

which is still dominated by people and machines, but the trend is toward intelligent machines controlled by computers. There has perhaps been more progress in this direction in the chemical industry than in the mechanical industries. It logically started there because capital investments were higher, process variable sensors were more widely used, and centralized control by older generation large computers could be justified. But today, the cost effectiveness of distributed and hierarchical control has brought the computer integrated systems to the limelight. Newly engineered materials and the processes to create them are also driving change. New processes are emerging which require levels of control that only computers can provide.

In the past, people dominated the world of product assembly, item seven.

Dean John G. Bollinger

But rising labor costs, demand for repeatable quality and the down-scaling of component size (particularly in the electronics industry) will ultimately remove people from this role. We have seen hard automation replace people in the past where lot sizes justified large investment in special purpose production lines. Today, new technology and changing customer demands are changing mass production. Industry must now produce in mass with smaller lot sizes or more products. This can only be achieved by using computer-driven flexible automation. We are also learning something about design for production through group technology and computer-assisted design where computer data bases are essential.

The concept of quality, identified in item eight, is changing rapidly. Quality is no longer something we can check for when a product is ready to ship. As products develop from raw materials into finished goods there is value added continually along the way. It does not make sense to add even one faulty element to a product which, when complete, would have had great value. Statistical quality control has played an important role in preventing this from happening. Computer-interfaced sensors and software to provide thorough, automated inspection procedures can virtually eliminate faults. Standards need to be developed and rigidly adhered to in order to eliminate the

(continued on 15)

Super Diesel

Could laser pictures lead to a more efficient engine?

by David Chew

Assistant Professor Patrick Farrell and his graduate student Dean Verhoeven spend much of their time in the Engineering Research Building looking at pictures. The pictures are made by shining a laser on the interior of a running engine. The surface roughness produces images which can be captured on film. These images, called speckles, provide valuable information that could help the researchers achieve their goal: an adiabatic diesel engine that doesn't need a cooling system.

The term adiabatic means no heat is added or removed from a system. In this case, it means the engine has no radiator or any other method of removing the extreme heat produced in an automobile engine. The U.S. Army, which is partially funding the project, has been quite interested in the adiabatic diesel for some time now.

There are many advantages to such an engine. Without a radiator engine volume and weight are reduced and an area on a military vehicle which is vulnerable to stray bullets is eliminated. There are other advantages which greatly interest commercial groups such as General Motors and Ford.

Professor Gary Borman, who heads the engine project, says this combination could increase the efficiency of a normal diesel by possibly 10 to 20 per cent.

Approximately 25% of the energy in automotive fuel is lost to the engine coolant through the cylinder walls. The adiabatic diesel (often termed "low cooled") will hopefully convert much of this lost energy into power via the exhaust. The exhaust, which is much hotter in the low cooled engine, would be routed to a turbine similar to a turbocharger. The turbine, however, will be hooked directly into the drivetrain, thus essentially making a two-engine automobile. Professor Gary Borman, who heads the engine project, says this combination could increase the efficiency of a normal diesel by possibly 10 to 20 per cent.

Another advantage is associated with the engine's high operating temperature. At higher temperatures a compression-ignited engine such as the diesel can burn lower grade fuels, providing substantial cost savings.

At higher temperatures a compression- ignited engine such as the diesel can burn lower grade fuels, providing substantial cost savings.

These high unknown operating temperatures cause the need for Professor Farrell's research on the speckle technique. Interior engine temperatures (typically greater than 1000 degrees F) are extremely difficult to measure; thermocouples are useless because they melt. The speckle technique is a good alternative.

In the Engineering Research Building Dr. Farrell has set up a laser which monitors a small snowmobile engine. The engine head was modified by inserting a piece of ground glass which acts as a window through which the laser can see. The speckles, which originate from the interior of the ground glass, are photographed with a 35mm camera. The speckles' phases are a strong function of temperature. When compared with the speckles of a reference beam, the temperature inside the cylinder can be determined.

Unfortunately, as one might guess, the speckles are affected by vibrations, and engines are full of vibrations. The engine in the present setup is run by an electric motor to reduce vibrations; it is not fired up. A new engine is being built which will actually be fired up. Dr. Farrell is anxious to test the speckle technique on the new engine. He is also optimistic. "Even if the vibrations give us problems," he says,"we

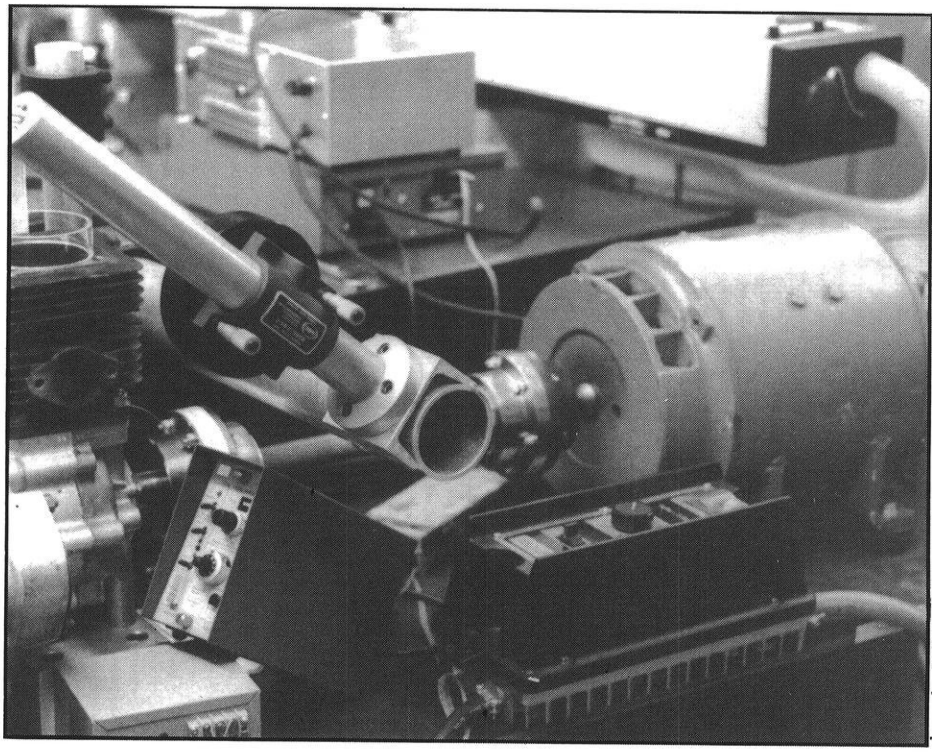


photo by Jeff Molter

This heat engine's temperature is measured by laser spectroscopy.

have some other tricks up our sleeve. We'll eventually get the information we need."

The interior temperature is the key to the adiabatic engine, because it will determine what materials can be used inside the engine block. Professor Borman expects the temperatures to be much higher than 1000 degrees. "The heat flux we're talking about (in an engine of this type) is approximately 3 MW/sq meter, which is an awful lot of energy. That's similar to the energy absorbed by the space shuttle during re-entry." Consequently different types of ceramic are being considered, much like the type used in the shuttle tiles.

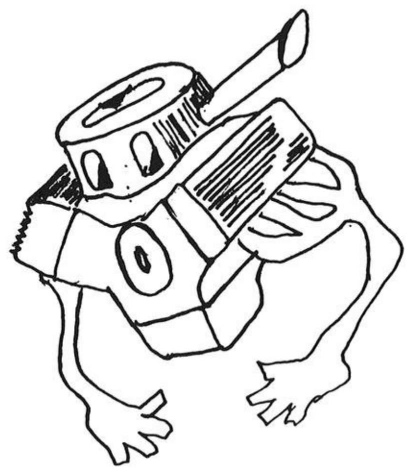
The construction material must overcome a related problem, which Dr. Borman calls high frequency temperature fluctuations. If a material with a low thermal conductivity, such as ceramic was used, he expects that the temperature right at the surface of the wall could fluctuate from 50 to almost 200 degrees. The thermal stresses will be enormous and many materials would crack to pieces. Other ideas are a metal surface with an air gap behind, or possibly a thin spray of ceramic.

The heat flux we're talking about (in an engine of this type) is similiar to the energy absorbed by the space shuttle during re-entry.

The ultimate goal is a compound diesel/turbine engine which needs no cooling system and can burn a wide variety of fuels. Gasoline is not considered because at such high temperatures the fuel would ignite prematurely, which is called knocking.

"Essentially what we're trying to do," Borman says, "is take the turbocharged diesel, the most efficient engine we have, and improve its efficiency by 10 to 20 per cent. That's a very difficult thing to do."

Indeed it is. But if Dr. Farrell can get his pictures developed and they are successful, it will be a big step toward his goal, and the repecussions in the automobile industry could be considerable.



graphic by Brad Baxter

About WE

The *WISCONSIN ENGINEER* is produced five times yearly by students of the University of Wisconsin - Madison College of Engineering. 3000 copies of each issue are printed and distributed to Wisconsin high schools, paid subscribers, and other universities across the country. In addition, issues are distributed free of charge around the College of Engineering and the campus in general. The *WISCONSIN ENGINEER* is a self sufficient, non-profit organization funded through the sales of local and national advertisements.

In addition to the one General Engineering credit received by each staff member, the WE offers experience in all aspects of magazine production: writing, editing, photography, graphic design, advertisement, sales, business management,layout, typesetting,... (not to mention a lot of fun!) Each staff member is encouraged to participate in his\her areas of interest to the best of their ability.

If you are interested in developing and using your communication skills, management skills and creativity, then join US at WE! Stop by the office in Room 101 of the T-21 bldg. (next to General Engineering bldg. on the corner of Breeze and University) for more information. You'll be glad you did!

Editorial

Engineers and responsibility

by Lisa Peschel

In this issue you will find a type of article that you've never seen before in the Wisconsin Engineer. It's a testimonial -- a tribute from one engineer to another who was his respected colleague and friend. But it's much more than a simple obituary. It tells the story of an idea that shaped a man's life, an idea that we should all keep in mind.

We live in an era of incredible scientific advances. We have the ability to increase our production of food and other goods. We can cure many diseases that have plagued mankind for centuries. We can store and communicate information in ways that our ancestors probably never dreamed of. However, use of our new technology hasn't yielded only good. We have to deal with an exploding population. We also have to face the fact that we can blow our entire world to bits in a matter of hours. In a way, we are like children holding a gun -- we have an extremely powerful weapon that can do us a great deal of good or a great deal of harm, but we're not sure how to use it.

This is where an engineer's responsibility comes into the picture. Technology must be used with care; researchers must consider the influence their work will have on ourselves and our world and generations to come. When we're experimenting with things like nuclear weapons and genetic engineering and chemical warfare, we need social and moral guidelines to follow; otherwise, the gun could go off right in our faces.

Whatever level of engineering you're at, whether you've been practicing for years or are just beginning a job or are still in school, this is a message that you should take to heart. Engineers, and people of all professions, must remember that we're all in this together. As long as we're here, we should do as much as we can to take care of each other and the world that supports and nutures us.

Lisa A. Peschel

Lisa Peschel, Editor
Written response is welcome.

IN MEMORIAM

C. KENNETH WEIDNER P.E., of Colorado Springs, Colorado, entered the civil engineering profession in 1925 on public works projects and railroad construction. From 1941 to 1946 he served in the United States Navy Civil Engineer Corps in the American and Asiatic Pacific theaters, and rose from the rank of Lieutenant to Captain. From 1947 to 1951 he was Chief Engineer on the design and construction of the Argonne National Laboratory at the University of Chicago. In 1951 he entered a pioneering venture in engineering education and moved to Beirut, Lebanon, as Professor of Engineering and Founding Dean of the School of Engineering and Architecture of the American University of Beirut. Fourteen years later he returned to the post of Vice President of Prescott College in Arizona. In 1971 he established his office as a Consulting Engineer. He was an active member of various engineering societies, principally the American Society of Civil Engineers and the Society of American Military Engineers. He died on June 7, 1985. In part the Crisis results from the impact of science and technology upon mankind which, neither socially nor morally, has caught up with the problems posed by that impact. In part it is caused by men's efforts to solve those problems . . . . It is not a revolution of violence. It is a revolution of bookkeeping and law-making.

C. Kenneth Weidner Remains a Witness

A Witness to a profound Truth is a person of exceptional experience and wisdom, and endowed with the integrity and courage to speak out and dissent when his conscience so dictates. A Witness has a deep sense of loyalty, and an abiding faith that the Truth will prevail. Such a man occupies a position of leadership, and his words live after him.

The men who possess these qualities are rare, and their lives are founded on high standards of independence and freedom of choice. They remain inspired by that small group who signed the Declaration of Independence two centuries ago and thereby founded our great nation.

Kenneth Weidner entered upon his career as a Civil Engineer with the professional duty of applying science for the benefit of man. But he found himself in a new historical era: the era of the scientific revolution, "the most violent ordeal in the history of the world" and "a crisis for all mankind."

The first Witness to identify the magnitude of this crisis in simple terms was Whittaker Chambers in his "Letter To My Children" (1952):

> "In part the Crisis results from the impact of science and technology upon mankind which, neither socially nor morally, has caught up with the problems posed by that impact. In part it is caused by men's efforts to solve those problems . . . . It is not a revolution of violence. It is a revolution of bookkeeping and law-making."

The second Witness, who identified this crisis for the engineering profession, was the esteemed Admiral Ben Moreell who declared (1958):

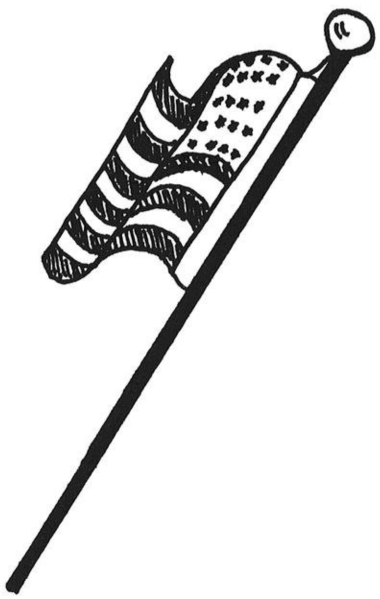
> "It is not enough to be an engineer! Our nation is in a crisis of morals and moral courage. . . . The final battle will be fought in the arena of moral values. In the application of modern science the antagonists will be the forces of self-disciplined, responsible individualism on the one side, arrayed against those of atheistic, coercive collectivism on the other."

A third Witness in this crisis, and at this high level of engineering responsibility, was Kenneth Weidner. His entire career stands as a model for the future of engineering and, especially, in engineering education. His writings and speeches have been carried far and wide under such titles as: "Major Strategic Problems Expected to Confront the United States in the Next Decade," as seen by the Dean of the Engineering Faculty of the American University of Beirut, Lebanon (1958), and "The Rise and Fall of Professional Engineering" (1963). In his Discussion of ENGINEERING ISSUES, ASCE paper 15374 (1981), he declared:

> "From the time of its founding until its progressive abdication, the engineering profession constituted one of the strongest ad most influential blocs of people in our society. Unfortunately, this is no longer true. The impact we now have as a profession on national policy and evolving economy is practically nil. To all intents and purposes we have ceased to be the professional guardians of our society, but have become, instead, a collection of specialized technical employees and expert advisers seeking individual security without professional responsibility. . . ."

> "The professional discipline of the engineer, applied with moral courage, intellectual honesty, and social responsibility with complete professional freedom, is the only protection which a free society has to insure that the products of science and technology are used in its interest and welfare -- and not for its enslavement. It is the prime function of the professional engineering societies to rigorously protect and enforce this concept."

In confronting today's realities in the engineering profession, Kenneth Weidner has identified for all its members their new duties to defend the future well-being of our country and its people. He saw this as his duty to fight a new kind of battle, a battle based on Faith, a Faith held with deep intensity. In this battle Kenneth Weidner continues to serve as a witness.



Automated Control in the Laboratory

by Bill Petrie

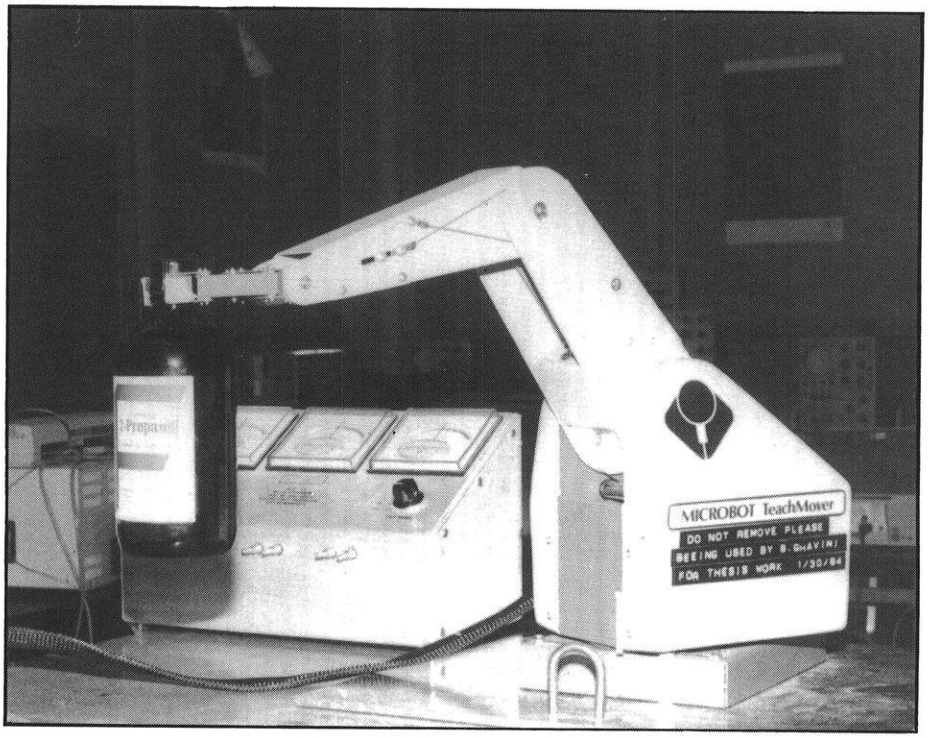
Imagine walking into the laboratory, flipping a few switches, typing a couple of commands, and then sitting back and waiting for the computer to spit out results. A chemistry student's dream, right? However, in the past few years, this dream has become reality as laboratories begin using microprocessors and robotics to handle the growing number of samples and data which they have must analyze.

> **Because the computer system is not subject to human factors such as fatigue, hesitation, or indecision, it is able to work at a higher level of efficiency for many hours at a time.**

Advances throughout the past decade have developed systems which are not only more accurate and efficient than traditional apparatus, but are often much easier to use. The improvements in microcomputer technology and their implementation in the laboratory have dramatically increased efficiency and productivity. While it is probably safe to say that freshman chemists won't have the luxury of having a computer-controlled system to do their experiments for quite some time, such systems are becoming part of the laboratory.

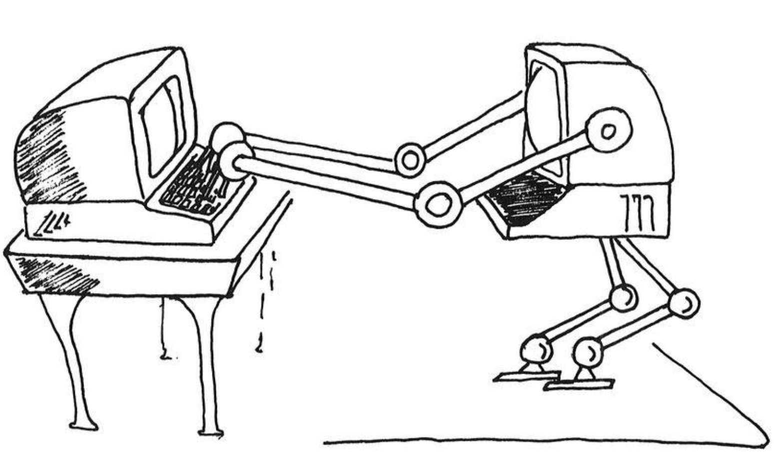
The microprocessor, most often a desktop computer, is the heart of the laboratory system. Its purpose is not only to control the accessories and collect and process data, but to continuously monitor the process to ensure proper execution. Using a language such as BASIC or FORTRAN, the computer can be programmed to coordinate the various accessories necessary for carrying out the procedure as well as processing the data. It should be emphasized that the computer-controlled system is performing the process as instructed by the programmer. A thorough understanding of the process is necessary before the computer can be used to successfully carry out the procedure. There are often many subtleties in laboratory methods which the computer cannot accommodate unless instructed. Once the method is completely understood the computer becomes a very powerful problem solver. While the computer is the brain of the system, the other components, such as mechanical arms, electronic balances, or spectrometry apparatus are what make the system functional. It is important that an automation system be modular in design; that is, it should be composed of instruments which can be easily interchanged. Each component should act independently, but should also coordinate well with the others as instructed by the microprocessor. Modular design is very important for increasing the flexibility as well as extending the number of applications of the system. If the analyst modifies the process he need only change the individual modules rather than redesign the entire system. The modules used in the computer-controlled system are the same as those which would be used if the work were being done manually, the only difference being that an interface for communicating with the computer is required. Ease of modification is a major criterion in the laboratory since many different procedures are performed and new methods are constantly being developed. Modular design enables the analyst to effectively control and modify the system.

Robotics have been used as part of laboratory systems in recent years because they improve efficiency and reduce costs. Small mechanical arms which are able to handle many types of lab equipment are useful in many situations. While automizing processes using robots, there may be the tendency to "over-automize" by using devices beyond their limits, thereby reducing the efficiency of the system. Dr. Joseph H. Abler, president of Abler Data Systems, Inc., emphasizes that a robot is not always an effective substitute for a human technician. Attempting to substitute a complicated robot for a procedure which is more efficiently done by hand not only increases the complexity of the system and the likelihood of failure, but also adds significantly to the cost. Dr. Abler also sees a trend toward more universal robots which perform simple and



Mechanical arms like this could revolutionize our research labs.

photo by Bill Petrie



graphic by Brad Baxter

repetitive motions and away from those which try to mimic human novements. By keeping this important concept in mind when designing system, robotics can offer significant advances in laboratory automation.

The advantages of a computer-controlled automation system are many. First among these is the great improvement in efficiency which is obtained using a suitably designed system. By performing tasks that are repetitive, such as weighing samples and transferring them to vessels for analysis, or diluting a large number of solutions, the system allows the analyst to use his time more effectively, analyzing data or planning further experiments. Because the computer system is not subject to human factors such as fatigue, hesitation, or indecision, it is able to work at a higher level of efficiency for many hours at a time. The ability to operate continuously for long periods compensates for the fact that robot movements are certainly slower than those of a skilled analyst. Since the interfaces between the computer and the modules allow a continuous flow of data, the computer is able to make many different measurements more accurately and at a much greater rate than could be done manually. Documentation of these measurements as well as of the samples is an important task which is well-suited to the microprocessor system. Records that are well-organized and clear can save the experimenter hours of work when data must be interpreted and reported. Analysis of the data obtained is also much more efficient because the computer can be programmed with all the necessary conversions and algorithms and can proceed with the computations directly after receiving information from the various instruments.

Another great advantage of laboratory systems, especially of robotics systems, is safety. Any potentially explosive or hazardous substances, such as radioactive materials or carcinogens, are better handled by automated machinery, thus minimizing risks for laboratory workers.

Reproducibility is an important requirement for any experiment carried out in the lab. A microprocessor system is particularly favorable in this regard since a software program can be saved and identically executed many times. Not only is the procedure reproducible in the lab where it was originally set up, but, because it is on software, it can be run on compatible machinery elsewhere.

A technology has recently been developed that has many applications as well as tremendous potential in the future: the "intelligent interface." This would allow the computer to make changes in the system in response to data it acquires from the other instruments. For example, certain instruments are calibrated only for a particular concentration range. If the computer senses one or more samples outside the calibration range it can dilute all of the samples and perform the experiment again. There are also many steps in an analytical process which can be optimized by varying the parameters of the reaction such as temperature, time, and concentration. Through automatic control of the variables, many trials can be performed quickly to produce the best results.

While there are many potential situations where a microprocessor-controlled system can be a considerable advantage, several applications of computer technology have already proved to be extremely beneficial. One of these is the area of sample preparation. Perkin-Elmer has developed a sample preparation system which includes an IBM-PC as the microprocessor controller. The system uses modules such as an electronic balance which sends its data directly to the computer, a small mechanical arm able to manipulate laboratory equipment, and a syringe and mixing system for adding reagents and dissolving the samples. Automated sample preparation is especially promising because often more time is required to prepare the samples than is actually spent carrying out the analysis.

Computers, especially data acquisition systems, have been very useful in the clinical laboratories at the University of Wisconsin-Madison. Many small computers linked to a central system allow for the collection and transfer of large amounts of data between doctors and pathologists. Precise and efficient communication between administration and laboratories is essential and computers have proven to be the most accurate device for this purpose. The routine analyses which are performed in clinical laboratories are especially suited to automation because of the great number done. Computer diagnosis based on the results of tests eliminates the need for data interpretation by a pathologist or doctor, thereby greatly increasing efficiency.

Methods of analysis such as nuclear magnetic resonance, mass spectrometry, and gas chromatography have depended on computer data acquisition for many years and such systems have successfully demonstrated their usefulness. These processes provide continuous data flow and thousands of measurements which are best handled by a computer. Also, there are many algorithms which use data obtained from the instruments to perform the desired calculations. However, care must be exercised when using such algorithms to ensure that they are applicable within the limits of the experiment. They are extremely advantageous in determining the composition of unknowns.

While it is probably safe to say that freshman chemists won't have the luxury of having a computer-controlled system to do their experiments for quite some time, such systems are becoming part of the laboratory.

Computer control and robotics have been applied to many areas of laboratory research with great success. It is also certain that new applications will be realized as new computer technology is developed. Tomas B. Hirschfeld states, "As the computer's capabilities double every two years at the same time as its price halves, it is becoming easier and easier to afford paying for artificial intelligence while, at the same time, we are pricing the natural one out of the market." It is clear that the utilization of the computer in the laboratory will bring about revolutionary changes in the manner in which future research is conducted.

From the Midwest to Chesapeake Bay

The story of alumnus Brett Schneider

by Lisa Peschel

People do graduate. Maybe it seems like it will never happen to you, but unless you drop out or win a big sweepstakes and retire at the age of 20, that fateful day will finally arrive. What then? Maybe you will already have a job lined up through campus interviews or co-op work. Or -- maybe you won't. Even if you don't, there's no reason to panic; many graduates don't find a job until after they graduate. Brett Schneider, a May '85 graduate with a Bachelor of Science in Mechanical Engineering, was one such student. In a recent telephone interview, he spoke to us about his experiences in the "real world."

Q. Brett, where are you working now, and what do you do?

A. I'm working in Newport News, Virginia, at the Newport News Shipbuilding and Drydock Company. It's a part of Tenneco, which is a huge corporation -- they also own Case Tractor and other companies. But all the work at the shipbuilding company is for the military. My job is to help in the construction of nuclear submarines for the U.S. Navy.

There's no reason to panic; many graduates don't find a job until after they graduate.

It takes three years to put together a nuclear submarine from the time the keel is laid until the Navy takes it over. During that time, my group does the construction engineering for all of the systems that support the reactor: the safety system, the steam and cooling systems, the radioactive level sampling systems, everything but the reactor itself. When the submarine is finished, the Navy runs it from eight to twelve months, then brings it in for any needed repairs. We also do backfitting on submarines that the Navy has been using for eight or ten years; we replace the old, outdated systems and equipment with new equipment.

Q. How did you get your job?

A. Well, during my last semester I did some interviewing through the Placement Office. But I only did about 10 interviews because I was very selective about where I wanted to work. I wanted to live in, or at least near, a major metropolitan area, because my fiancee would like to get her Ph.D. and we wanted to live near a school where she could do that. Unfortunately, none of those interviews led to a job offer, so over the summer I had to open my views and I became a lot less selective about location and the type of work I wanted to do. I started flooding the market with resumes, sending them all over the country.

I read the job description for Newport News in the CPC Annual (a magazine at the Placement Office). I sent them a resume, an interview form and a cover letter, and two weeks later I got a letter and application form from them. I filled it out and sent it back, and after that, things moved really fast. They called me a week later on Friday, and that Wednesday they flew me out to Virginia for my interview on Thursday. I flew back that same night, and Monday morning they called me with a job offer.

Q. What was the interview like?

A. They didn't interview people separately and one-on-one like they do for campus interviews. I was interviewed in a group of eight people. We were split up into groups of two, and we went around to the four sections that were hiring engineers. At each one we talked with the supervisors and there were presentations from each hiring group about their duties and the projects they were working on. After lunch, we all went on a tour of the shipyard and watched the construction. Six of the eight people in my group ended up getting jobs there.

Q. How did things go when you first began work?

A. I spent the first two weeks at an engineering orientation program with a nuclear construction group, so I could see what kinds of problems can arise during construction. There's not a lot of extra space on a submarine and everything has to meet very exacting calculations. I spent seven days on the submarine, then spent three days on a nuclear aircraft carrier. They are also built at the Newport News Shipyard.

After the orientation was over, I started work in my department. About 32,000 people work for the company, and my department, E-71, employs 600 engineers. But I work in a group of seven people. We all work in one big open area; we're in contact all the time and it was easy to make friends. At first work was kind of strange because I had to be supervised all the time. It takes three months to get clearance from the Department of Defense and, since most of our work is classified information, I couldn't work on anything on my own. But now I'm taking on a lot more responsibility. Right now I'm trying to qualify a new pump for a freshwater submarine system. The government is trying to get into competitive bidding more than it has in the past so it can save money, but when they want to buy parts from a new vendor, the parts have to be checked out very carefully for design, performance and safety. I'm acting as a liaison between the vendor and the government, working to see that the pump will meet all the military specifications. When it does, I'll get to travel to New Jersey where they'll do the final testing. If it works, great; if not, we'll bring it back and keep working on it.

My group does the construction engineering for all of the systems that support the nuclear reactor.

Q. Do you have the opportunities to advance?

A. Right now I'm an Engineer 1, which is where all the beginning engineers start out. The classification goes up to Engineer 4, which is a supervisory position. It usually takes two to four years to move up a step, then you get a wage increase and a big increase in benefits.

Q. What do you think was the most valuable thing you learned at Madison?

A. When you get your degree, you're really only proving that you have the ability to learn. I guess the most important things I got out of college were the basic tools to solve a problem that's presented to me. Actually, I use my textbooks quite a bit; more important than just memorizing information is knowing where to look for it.

Most important, keep an open mind. Just because you haven't been exposed to something, that's no reason to stay away from it.

Q. What do you miss most about school?

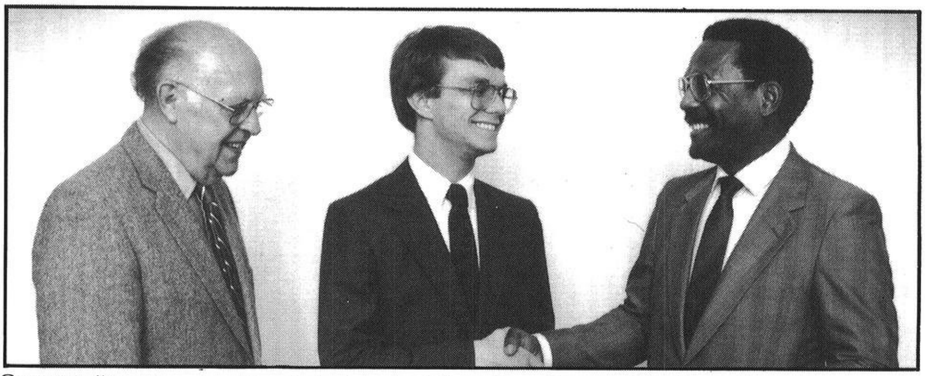
A. The relaxed atmosphere. I took five years to graduate so my course load wasn't too terrible and I had some free time. Also it was nice to have a varied schedule every semester. But now I'm putting in nine-hour days, five days a week, and for security reasons, I have to check in and check out every day and wear an ID at all times. Since it's government work, everything is very regulated and very controlled. It's a very different atmosphere from Madison!

Q. Do you have any advice for the May '86 graduates?

A. When you're out there looking for a job, don't get discouraged. The jobs are out there; you just have to keep looking. A lot of it is being in the right place at the right time. Also, a lot of the older industries, like the steel industry, are in trouble now. If you keep interested in new and growing industries, you'll have a better chance. Most important, keep an open mind. I grew up in the Midwest; I was never exposed to shipbuilding. But just because you haven't been exposed to something, that's no reason to stay away from it.

A Real Challenge: International Engineering in Japan

by Ryan Radtke



Gregory Lillegard receives his scholarship check from Newt Watson of the Xerox Corp. while Professor Barry looks on.

The spring semester of the 1985-86 school year marked the addition of another student to the International Engineering Program's Japanese Scholarship Program. Gregory Lillegard from Rice Lake, Wis., was accepted into the five-year program and will be sponsored by the Xerox Corporation.

The program, which began in the fall of 1984, is designed to give the students involved a degree in engineering as well as a certification in Japanese studies. The latter includes course work in Japanese, technical Japanese, and the history of modern Japan. The highlight of each student's collegiate career will be a year of study at one of the cooperating technical universities in Japan. The students may apply for the scholarship while still in high school. Those with above average academic records and an interest in engineering are encouraged to send in their applications along with a short essay on why they would like to be selected for the program. Finalists are selected and invited to be interviewed by representatives from the International Engineering Program, the College of Engineering dean, and the sponsoring corporation. The scholarship winners are selected by this committee.

These students will be valuable engineers in the private sector not only because of their fine education but because of their unique cultural experience.

The scholarships are funded by private companies. Companies commit $35,000 to put students through the entire five-year course of study. Currently there are three companies participating: the Nicolet Instrument Company, the Kodak Company, and the Xerox Company. Each Company supports three students. The sponsors donate to the University of Wisconsin Foundation. The scholarships and forgivable loans are processed through the Student Financial Aids Department. If the student doesn't make it through the whole program, they become responsible for the loans.

There are currently six other students participating in the Japanese scholarship program with Gregory Lillegard. They are:

1984 Sponsor -- Nicolet
Andrew Strauch, Baltimore, MD
Mary Paulson, Madison, WI
Kirk Freeman, Duluth, MN

1985 Sponsor -- Kodak
Lisa Gentz, Verona, WI
Bjorn Christenson, Rochester, NY
Gregory Sharp, Racine, WI

1986 Sponsor -- Xerox
Gregory Lillegard, Rice Lake, WI
(Two students to be named in the fall of 1986)

The structure of the scholarship program is set up so that a majority of the students' course work is completed before they leave for Japan. While in Japan, the students will be studying at a cooperating technical university such as Kobe, Kyoto, or Toyohashi (all named for the cities where they are located). The students will be doing what would be comparable to a senior or graduate thesis here at Madison. Professor Barry says that each of the sponsoring companies has affiliates in Japan, and he hopes that the students could also spend some time with these companies to gain some practical experience while studying overseas. When the students return they will complete their degrees. Upon graduation the students may, but will not be obliged to, work for the company that sponsored them; they will be free to pursue any job opportunity they choose. Professor Barry feels that these students will be valuable engineers in the private sector not only because of their fine education but because of their unique cultural experience.

In today's world, the struggle to gain an edge in technology is fierce and competitive. It is reassuring and refreshing to see programs that mutually benefit each country technologically while helping each to understand and appreciate the other's culture.

The Deming Quality

by Owen Gwynne

As an engineer you might someday be a manager, and whether you manage an aerospace division of a major firm or a factory line you will need to know how to get the most out of the operation you manage. Wouldn't it be nice to know how some of the most successful managers in the world today, the Japanese, achieved their success? The reasons lie not only in their social culture or tax benefits, but also with the managerial climate in their companies. But the Japanese didn't invent the management techniques that have worked so well for them-- an American did. His name is Dr. William Edwards Deming.

For the past thirty years Dr. Deming has taught the Japanese how to reduced costs and improve efficiency while still producing a high quality product. After World War II he was invited to Japan by JUSE (Japanese Union of Science and Engineering) whose sole purpose at that time was to bring Japan out of the post-war depression. Dr. Deming was to address a gathering of Japanese mid-managers, but he decided that he should talk to top management instead. So a meeting was arranged between Dr. Deming and the heads of forty-five top Japanese companies. After this presentation many managers felt an obligation to try Deming's methods, and within months of doing so their companies showed marked increases in production and profit. After the first seminar came many others. Finally, to show its appreciation for his help in rebuilding Japan, JUSE established the Deming Prize for quality control, for it is quality which lies at the heart of the Deming methods for management.

Quality. Think about it for a minute. Quality watches are expensive, right? Quality cars are expensive. The myth that high quality means high price is one that Americans believe. Perhaps it's true that a gold plated DeLorean will cost more than a Gremlin, but of any two products roughly equal in raw material and technology costs, the product built with higher quality using Deming methods will cost less. Using the Deming methods of quality control, the Japanese consistently produce a higher quality car that they ship across 13 time zones and sell cheaper than the same mid-compact that was built an hour's drive away. How is this possible?

Considering the quality control methods used in America verses those used in Japan, it is easy to see how Japan's methods help them. To build a quality product you have to be sure that the product works. The American system is to build a predetermined quota of items, then test them to see how many work. There's only one problem with this method: what do you do with the defects? Here, for example, sits a $20,000 car that just will not work. You could set up another area to repair these cars, or you could scrap them, but, short of knowingly selling a defective product, you will incur some additional costs.

The Japanese didn't invent the management techniques that have worked so well for them -- an American did.

Now let's consider the Japanese company. Using Deming methods of quality control it, in theory, produces 100 widgets and none are defective. It sells them all and makes $100. The American company makes the same 100 widgets but only 80 of them work, so to make the same $100 it must increase the price.

Perhaps it's true that a gold plated DeLorean will cost more than a Gremlin, but of any two products roughly equal in raw material and technology costs, the product built with higher quality using Deming methods will cost less.

So what exactly is the Deming method? It is an idea which correlates quality with production, not testing. Three overall ideas define the method: first, an obsession with quality; second, achieving a feeling among all employees that they are one big family; finally, decisions about what changes to make are based on data and not opinion, emotion or one person's idea. These overall ideas coupled with the four major areas of implementation are the heart of Deming's teachings. These areas of implementation are organization, operation, education and training, and a change in corporate culture.

To illustrate the use of the Deming methods, it is best to look at them in practice. Each year Japan gives out the Deming Prize with ballyhoo comparable to the Academy Awards. The winners of the Deming Prize are not all alike even though they are the best at quality control. However, they often give similar answers as to how the use Deming methods to improve their company. They begin with the four areas of implementation.

The first area is organization. This means establishing a committee for company-wide quality control that oversees progress. The next step is establishing quality circles at all levels of the company. These are groups that meet regularly to discuss possible improvement and promote progress.

The second area of implementation is operations. This is the hands-on part of quality improvement. A method called the "Plan-Do-Check-Analyze and Act", or "P-D-C-A" for short, is used to insure quality at each level. "Plan"means that any action has an extensive predetermined plan behind it, created with quality control in mind. "Do" means simply that: do the work. "Check" means that, upon finishing individual steps, checks for quality are made. "Analyze and Act" means determining the effectiveness of the present plan based on statistical calculations. Using this data the plan is changed to improve quality. The cycle then repeats continuously.

Consider, for example, a worker making circuit boards. He first makes sure that

(continued on 19)

Machines in Space

Could computers replace astronauts?

by Susan Kullerstand

We often hear about people being replaced by machines. One area facing this that is not often talked about is space exploration and development. NASA has less than a year left in the preliminary design phase of its first space station, and it is trying to increase the number of automated systems and decrease the number of manned systems it uses, thereby increasing efficiency and reducing operating costs. A Congressional mandate prompted this push in artificial intelligence and automation. NASA complied. There are two reasons for doing this. First, much of what humans are doing can be done by automated systems. Second, the cost of putting humans in space -- the cost of life-support systems and accommodations for physiological problems encountered in microgravity is, well ... astronomical.

In a weightless environment, the body experiences a number of medical afflictions that require time, money and attention of researchers that could otherwise be spent on research of other types. For instance, the flow of bodily fluids, the organs involved with vision, balance and coordination, and the circulatory and skeletal systems all undergo profound changes under zero gravity. Shortly after man leaves the gravity of earth problems begin, and they take several weeks to resolve.

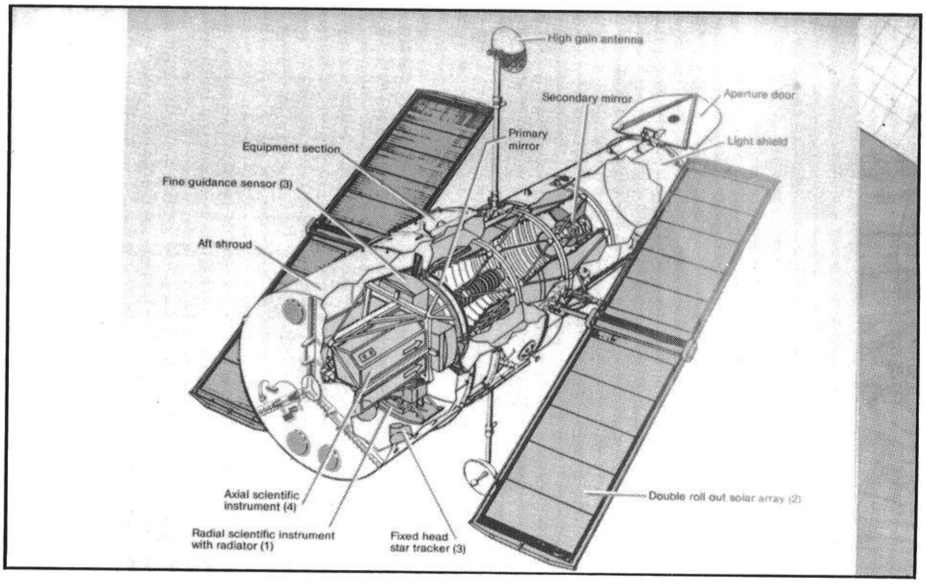
The cost of putting humans in space -- the cost of life-support systems and accommodations for physiological problems encountered in micrograviity is, well ... astronomical.

Most astronauts experience motion sickness to some degree. It can usually be suppressed with medication, but this could hinder the astronaut's ability to accomplish a mission. The body also undergoes heart rate and blood flow alterations in space .

While on Earth, the body's interstitial fluids are relatively evenly distributed, but in space they "float"from the lower extremities upward, causing bloating in the upper body. In addition, the muscles are hardly used at all (except for some isometric exercises). This could result in muscle atrophy. Bones become weakened due to a depletion of calcium and minerals, which are excreted. It may take months for this to happen, but it is a serious side-effect of space travel. Most of these problems can be resolved as the astronaut's body slowly adjusts to microgravity, but when he returns to Earth he must readapt to equilibrium under the force of gravity, which may take even longer. Undoubtedly, the development of space technology that doesn't have to accommodate the physical needs of people would substantially reduce building and operating costs.

A completely automated space station will probably never be built, because machines and computers can break down and artificial intelligence cannot replace human intuition and complex, spontaneous problem solving. However, NASA wants to streamline the human operators' responsibilities to communicate, supervise the systems, and solve complex problems. The expert systems would provide the operators with information and data, malfunction alarms, and routine decision-making.

So many of the problems and tasks of the technologists at NASA have parallel solutions that artificial intelligence seemed an efficient method for time and money savings. Presently, NASA has plans to develop expert systems for robotics systems, payload scheduling, spacecraft tracking, and power management. Since the space station will require more power than any mission to date, researchers consider a nearly autonomous system to be vital. Otherwise, it would require more manpower than NASA could spare. Enormous amounts of data generated would demand a state of the art expert system to prioritize information and alert operators to critical statistics.



More automation on unmanned spacecraft could mean fewer astronauts in space.

They want systems to assist engineers, planners, and managers too. Several contractors working with NASA have been investigating the possibility of developing automated space station systems for assembly, manufacturing, and satellite service and repair.

Because of the difficulties astronauts experience in the weightless environment of space, unmanned spacecraft will probably become more and more prevalent, and the spacecraft that are manned will be full of automation and robotics. This trend toward efficiency will free human operators to concentrate full-time on their scientific studies.

(continued from 3)

costs of repair. Computers and machines will ultimately replace people in this role.

The handling of products (item nine) has utilized manpower extensively, particularly at the consumer interface. Hard automation in packaging was the beginning, but new levels of flexibility are needed to minimize inventories and accommodate change. We are all aware of the changes that have taken place in the character of the grocery store and the supermarket. Look around in one of the more recent discount supermarkets and you can verify that we are moving in the direction of automated shopping. If the stocking of shelves were automated, then we would be only one step away from computer ordering and automated bagging and billing from a color graphics terminal in your local "compumarket."

Finally, a business is held together by management. Management organizes the human, financial and physical resources, of a company. It is widely accepted today that in U.S. industry management costs as a percentage of sales in a corporation are too high. It has grown rapidly in the past few decades. Thus, the costs of item ten need also be reduced if we are to be competitive. Management can utilize computers for more effective communication and more thorough analysis in order to implement more effective decisions.

Look around in one of the more recent discount supermarkets and you can verify that we are moving in the direction of automated shopping.

Management must also take responsibility for providing compatibility between people and computers and machines. We must learn to develop integrated systems of people and technological developments which:

- provide people with the satisfaction of contributing as a team member;
- encourage people to use their heads and not only their hands;
- reward performance and share in success;
- provide a mechanism for continued intellectual growth and retraining for new challenges;
- strive for change and a competitive posture.

For our graduating engineers, this is the intellectual challenge you have inherited as the children of "technology in the workplace."

John G. Bollinger
Dean

Editor's note:

Want to know what budget cuts are going to do to the College of Engineering? what the Dean thinks of nuclear weapons testing? what his favorite color is? If you have an issue or question than you would like Dean Bollinger to address, just write us a note and leave it in the mailbox of the Wisconsin Engineer, located in the far right column of mailboxes in the Mechanical Engineering Building.

Got a Problem? Talk to BARNY

by Beth Bertling

Would you ever have thought that a computer could help you examine and solve personal or family problems? Could you have guessed that the same computer could provide teenagers with important information on topics such as stress, drugs, alcohol, smoking, sex and body care? Meet BARNY, the whiz of a computer powered by software developed at the University of Wisconsin.

The BARN (Body Awareness Resource Network) Project was researched and implemented by a group of people with a wide range of expertise. David Gustafson led the conceptual development of the BARN Project. Dr. Gustafson is the Chairman of the Department of Industrial Engineering, Co-Director of the University of Wisconsin Center for Health Systems Research and Analysis (CHSRA) and Professor of Preventative Medicine at the University of Wisconsin Medical School. Kris Bosworth is the Project Director and Research Associate at CHSRA. Dr. Betty Chewning is Co-Director with Dr. Gustafson of CHSRA and Associate Clinical Professor of Preventative Medicine. Dr. Robert Hawkins is Professor of Journalism and Mass Communications. Trisha Day is the statewide 4-H Health Education Specialist for the University of Wisconsin-Extension Cooperative Extension Services.

Help for Teens

Individual BARN is a group of 35 computer disks containing over 20 hours of interactive programming aimed at teens' problems and issues. The computer calls itself "BARNY" and speaks in clear, comfortable language.

BARNY will talk about issues found within any of these topics: alcohol and drug use, body management, human sexuality, smoking, and stress management. Once the user has chosen a main topic, he can then choose to explore one or more of the numerous subtopics. There is also a section on whom to call for help in the community regarding any of the topics.

The "Alcohol and Other Drugs" program has seven subtopics: medical risks; use/abuse/dependency; a checklist of usage patterns and whether those patterns may be leading to problems; "The Bridge Quiz" -- a multiple choice quiz asking questions on knowledge of facts and myths about alcohol and drug use -- with the goal of building sections of a bridge with each correct answer (it's not an easy quiz!); "You Bet Your Life" -- a game of

BARNY will talk about issues found within any of these topics: alcohol and drug use, body management, human sexuality, smoking, and stress management.

chance showing how alcohol-related decisions affect the user's life; "Should I?" -- a simulation that helps users assess how drug use affects goal achievement; and a referral section that lists community resources dealing with crisis situation, prevention and intervention along with a section on confidentiality of reporting

The "Body Management" program is designed like a space adventure video game The user must perform a rescue in space, and in order to complete the mission, he must choose foods with proper nutrition and calorie requirements.

"The Human Sexuality" program deals with sexual topics in a straightforward, comfortable manner The subtopics within the program include: information on sexually transmitted diseases (STD) accessed by playing a game that challenges their knowledge about STD against the computer's' pregnancy and VE community resources available for helping with these problems along with symptoms and clinical testing procedure; reproductive anatomy information accessed through a game that allows the user to test his knowledge of male or female anatomy; answers to teens' questions about sexual topics in a "Dear BARNY"format; chances to see consequences of various sex-related decision; a presentation of true-to-life situations showing common decisions teens make about sexuality and how they might communicate these to a partner and also promote thinking about possible ways to handle similar situations; and "Skunk BARNY" -- a game that challenges teens with questions about sexuality with the goal of not allowing BARNY any points by answering all the questions correctly.

The "Smoking" program talks about prevention (resisting use of tobacco),

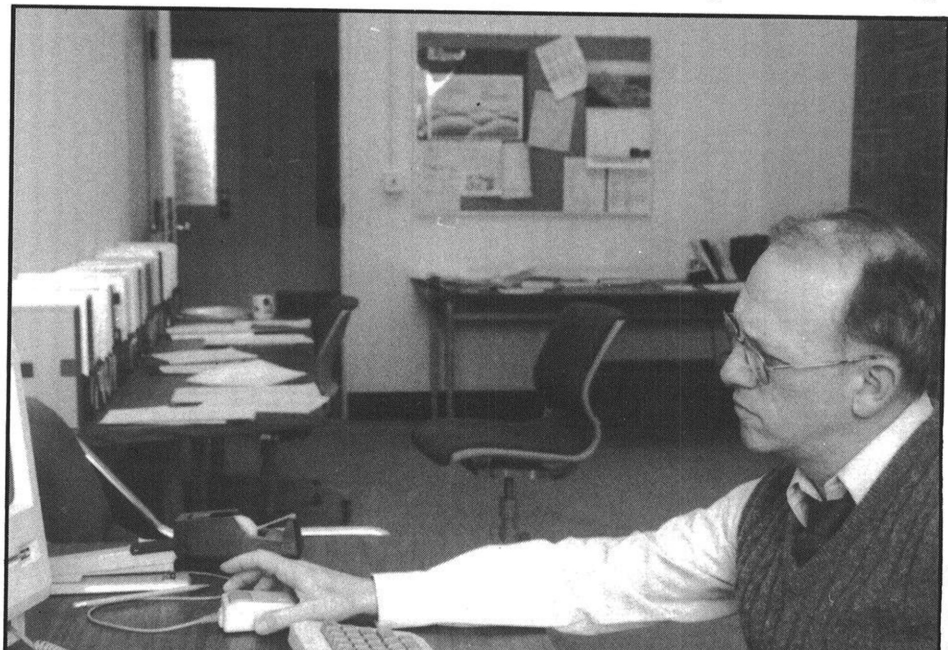


photo by Pat Davidson

Professor David Gustafson, one of the originators of the BARN project.

information of medical facts/bodily effects of smoking, tips on quitting and staying off cigarettes, guidance in helping others to quit, a self-assessment quiz which gives comparisons of the user's answers to other teens' answers to the same questions, and the "Tobacco Game" -- a board game that tests knowledge gained in other part of the program.

The "Stress Management" program aims to help teens identify and manage stressful situations and overall stress The program gives infora tion about stress symptoms, evaluation fo stress levels, and how to choose ways to manage stress. BARN clearly has advantages A use can move around the main menu and choose to view a few or all of the topics at his own pace and on his own time BARN can be used in private, making it a confidential information source for teens who may initially be uncomfortable talking to a parent or counselor. BARN can also be used in a group situation, with or without a counselor present.

According to evaluation, two-thirds of students that used BARN gained access to it in test schools. Middle school students used BARN more than high Schoolers, and , in general, males used it more than females The most popular programs are (in Order): "Body Management"; "Human Sexuality"; and "Alcohol and Other Drugs." According to Dr Gustafson, BARN is able to help about three-fourths of users with their problems.

Help for Families

In addition to the "Individual BARN" developed for teens, a newer system, "Family BARN," has been created and is now in the testing process. Family BARN emphasizes communication between family members and requires more than one user to access the sections inside the program. The topics within Family BARN include: "Decision Aid,""What If . . .," "Body Adventure," and "Communication." "Decision Aid" is an extensive program designed to help families solve their specific problems. First, family members must identify themselves and give their ages to the computer. Then each must give a brief description of what they think is the problem. After comparing these responses, they each must provide up to a given number of possible solutions to the member must rate the solutions as compared to each other solution. After each family member gives their opinion, the computer asks of anyone should be given more voting weight than other family members After all information is entered, the computer tallies and graphically displays the family's responses. The graph shows how everyone voted as a

Would you ever have thought that a computer could help you examine and solve personal or family problems?

whole and where the differences in preference are located The computer also frequently encourages discussion throughout the session This program can be used by a few or all family members, with or without a counselor's presence, and to help sove almost any type of problem.

"Family BARN" contains a "Body Management" program very similar to the Individual BARN program. It also contains the "What If . . ." program, posing parents and teens with a typical "touchy"situation, such as finding an appointment slip for a birth control clinic in a daughter's jeans. Then both the parents and teens are asked to rate responses that each might make to the situation. The computer than tabulates the most favorable responses. Parents and teens are then encouraged to communicate in a way favorable to each party in a given situation

The "Communication" program is a drawing game with an emphasis on family communication. One family member faces away from the computer screen, while another watches the screen draw a picture He must then describe the picture to the person not able to see it. This person must then draw the picture as it is described to him. As you can see, the more clearly the people playing the game can communicate, the better the drawn picture fits the screen's picture.

BARN can currently be found in use in the communities of Baraboo and Beaver Dam, Wisconsin as well as in the Madison public schools. In the two communities, BARN has been placed in doctors' offices, churches, alcohol treatment centers, corporations and even in a bowling alley.

At his time, the Illinois State Legislature has appropriated funds to implement BARN in the Chicago School District, with future plans to place BARN throughtout Illinois school districts.

In summary, the BARN programs have developed a new way to deliver health promotion and decision -making information to teenagers, and health information and communication and decision-making methods to families. There are many opportunities to use a system like BARN to reach parents, families and workers with information on almost any topic.

REFERENCES: Cannon, Marsha, BARN, The Body Awareness Resource Network, UW-Madison Office of University Publications and College of Engineering Publications Office, 1985.

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A service of the General Engineering Department and the Wisconsin Engineer.

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he has all the parts and tools needed to finish the board. Then he makes a mental plan for completing the board in the fastest and most thorough manner. (Should he put all the blue parts on the board first, or should he start at the left and assemble the board piece by piece moving to the right?) Second, he assembles the board. Third, he checks the board for completeness and then tests it. Finally, he records how long it took him to complete the board and if it worked. At the end of the day he averages his times and counts his defectives. Based on the data, he decides if his procedure yields the best results. This is a basic example, but it does illustrate that even at basic levels the Deming method is applicable.

The third area of implementation is education and training. This area keys on knowledge of statistics and training to execute Deming methods in specific cases. Everyone in the company needs to be taught basic statistics, for without understanding how to take accurate data and design appropriate sample groups you can't make correct statistical analysis. As you move higher up the corporate ladder you will need more training in interpretation of data.

The final part of implementation is corporate culture. To maximize the effectiveness of the Deming method, it is necessary to alter the present mind set of corporate America. Managers should no longer make project pert charts that end with a final testing procedure as the method of quality control. If top management recognizes a corporate survival problem, consulting a statistician who will help guide management is a wise step. The statistical guidance is useful because the implementation of the Deming method may be simple but the statistical theories that make the method work are not. When this is done they should identify sympathetic managers and help them make the changes that need to be made. Finally, to promote the corporate family, the results of the changes should be publicized throughout the company. The corporation should also drive home the idea that the Deming method is not a new program with some finite life span, but the start of a way of life.

The previously outlined method was used by Japanese companies who felt that, without some changes, they would shortly be out of business. The method for implementation is not always the same but the results are. For example, six months after trying Deming methods a Japanese company had increased production threefold with no changes in machinery. Here in America, Polaroid's camera division converted to Deming methods and had a 37 percent drop in product defects. We have looked at how to implement the

Using the Deming methods of quality control, the Japanese consistently produce a higher quality car that they ship across 13 time zones and sell cheaper than the same mid-compact that was built an hour's drive away. How is this possible?

Deming method and examples of the results, but why does it work?

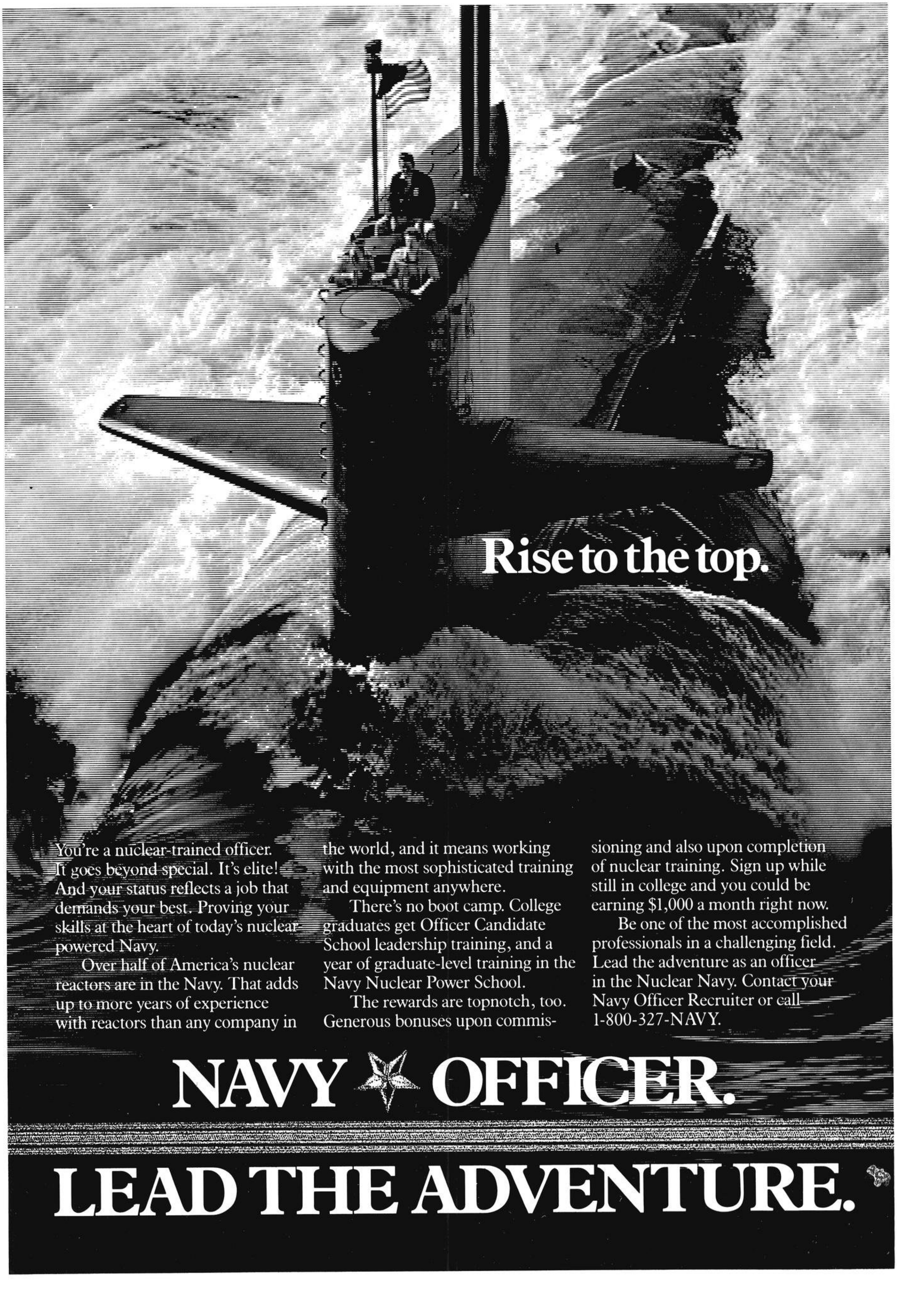
The theory behind the Deming method is that no system is perfect and that continual refinement is needed to make a system work in a changing world. In a company this means first, that to build in quality everyone must be involved in the quality control process from top management to the factory line workers. Second, no amount of planning makes a process perfect; there will be faults and these need to be corrected. Finally, Deming believes that in any factory process 85 percent of the problems are due to the system itself and only 15 percent are due to the people. If top management incorporates these facts with a commitment to changing, real progress will be made. However, Deming techniques can improve the process at any level of management.

The Japanese have been able to alter the world market without abundant natural resources and in spite of the additional cost of exporting over vast distances to reach their markets. Yet even with these great limitations, they have been able to excel. America can also use the methods taught by Dr. Deming to turn the tables on the Japanese, or at least to move into a more advantageous position for competition. But without altering the fabric of corporate America it is likely the Japanese and others will increasingly dominate production markets.

Just One More

After months of analyzing data and days of careful deliberation, this unidentified group of experts has come to a conclusion in the case of Mr. I. M. Icke. Let it be known from this day forward, January 1, 1986, that swimming in the nuclear reactor pool in the Mechcanical Engineering building is strictly prohibited.

by Gary Webster


Rise to the top.
You're a nuclear-trained officer. It goes beyond special. It's elite! And your status reflects a job that demands your best. Proving your skills at the heart of today's nuclear-powered Navy.
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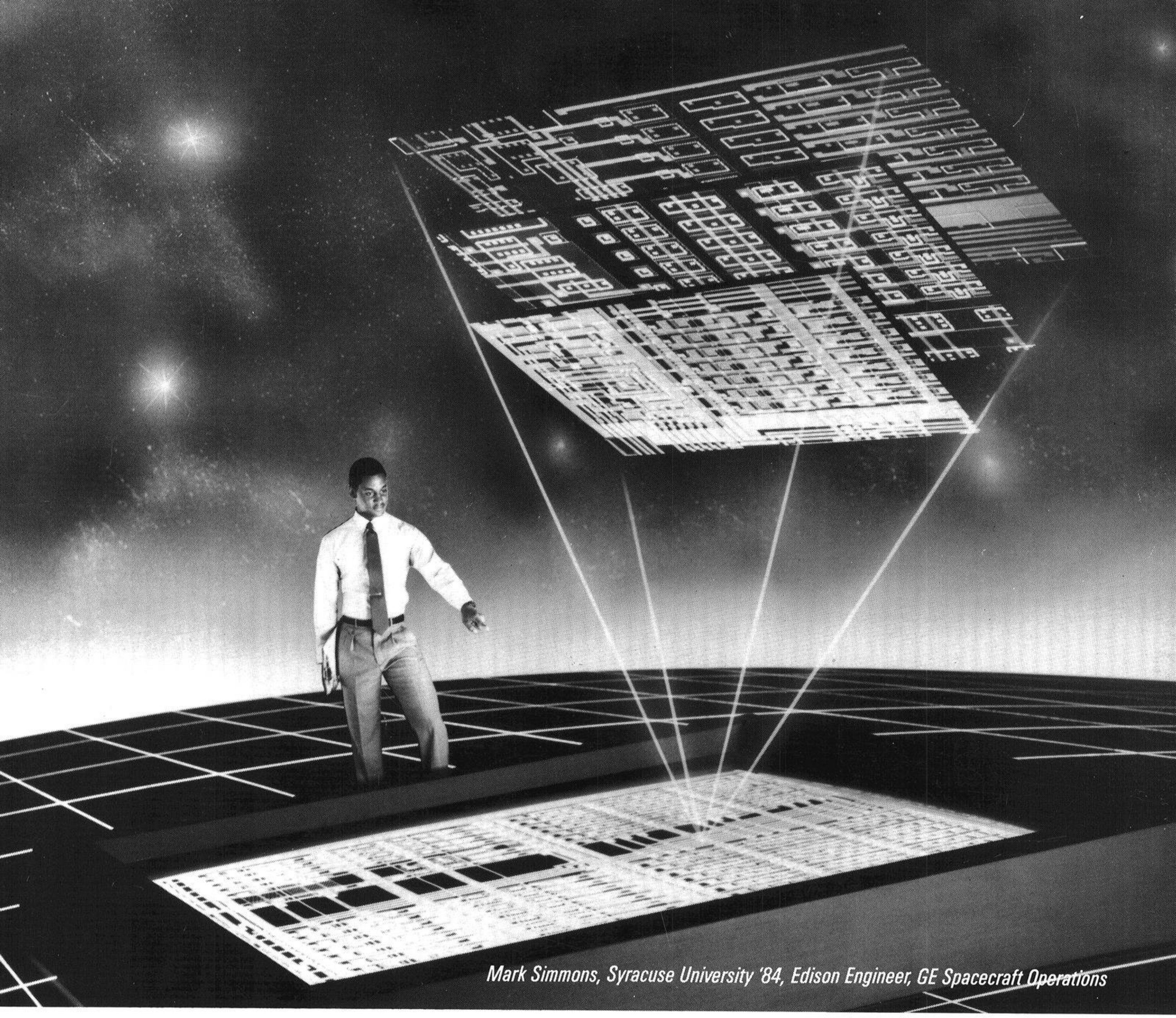

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