



# LIBRARIES

UNIVERSITY OF WISCONSIN-MADISON

## **Wisconsin engineer. Volume 79, Number 4 February 1975**

Madison, Wisconsin: Wisconsin Engineering Journal Association,  
[s.d.]

<https://digital.library.wisc.edu/1711.dl/7P3DBZ6M5SIJV8I>

<http://rightsstatements.org/vocab/InC/1.0/>

The libraries provide public access to a wide range of material, including online exhibits, digitized collections, archival finding aids, our catalog, online articles, and a growing range of materials in many media.

When possible, we provide rights information in catalog records, finding aids, and other metadata that accompanies collections or items. However, it is always the user's obligation to evaluate copyright and rights issues in light of their own use.

# wisconsin engineer

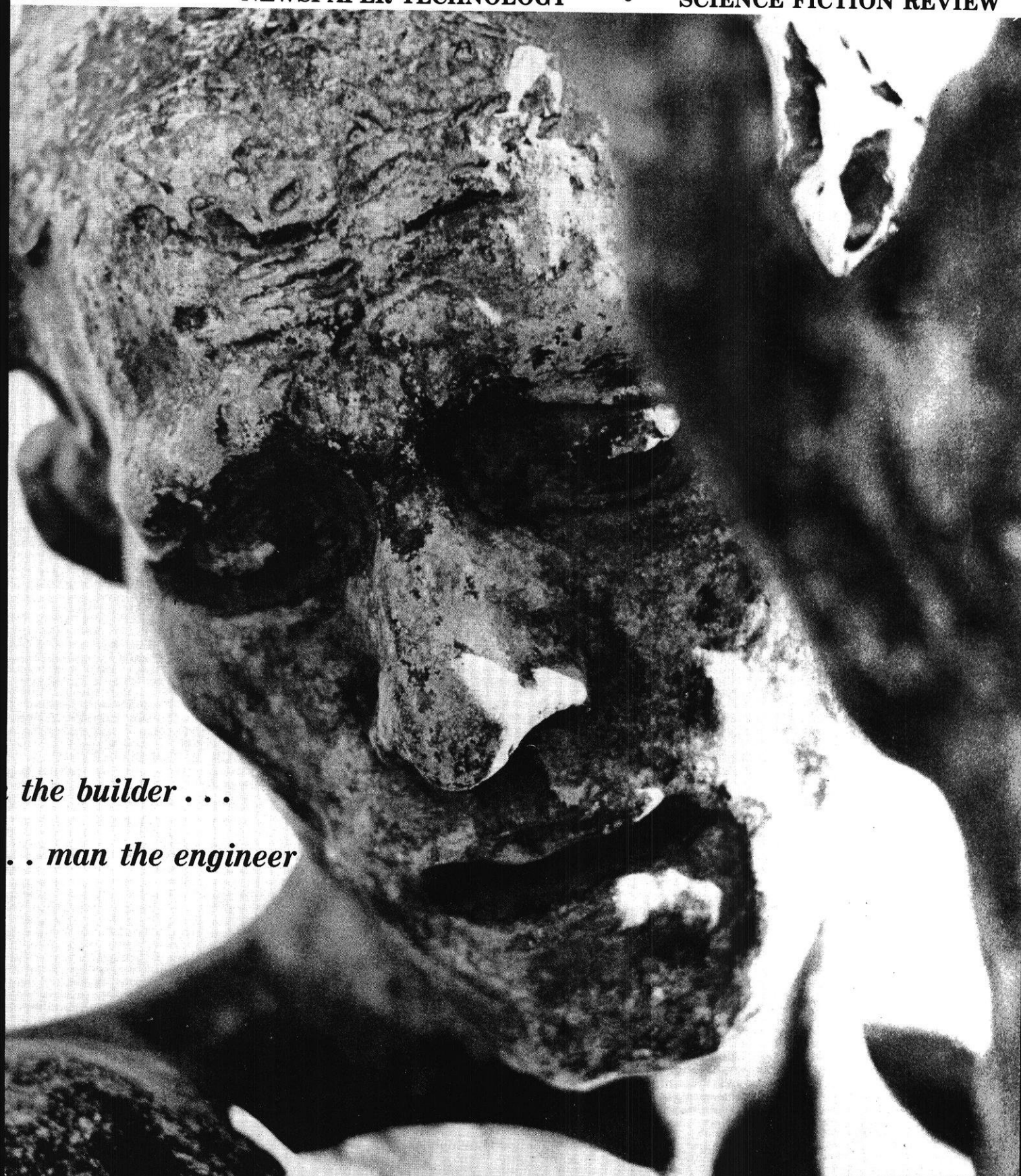
PYRAMIDS

•

NEWSPAPER TECHNOLOGY

•

SCIENCE FICTION REVIEW



*the builder . . .*

*. . . man the engineer*



***The dreams of engineers, ecologists, biologists and planners  
don't mean a thing until  
we make them a reality!***

There are people who talk about a better quality of life and people who *do* something about it. The Corps of Engineers gives you a chance to pitch in and *do* something important for the protection of our natural environment.

We need engineers, economists, planners, landscape architects, and others who are interested in the broad picture, who can bring a creative approach to meeting changing public needs. It's a chance to make your know-how count, working as a team.

As a Corps professional, you'll apply all the techniques of modern technology—systems analysis, computer technology, advanced materials research, and more—to the improvement of our construction capability. And you'll be a member of the *largest* engineering/construction team in the world.

If you want to get things done, start by writing to us *now*. We'll send you all the information you need to make a career of it, with *us*.

An equal opportunity employer m/f

---

# **CORPS OF ENGINEERS**

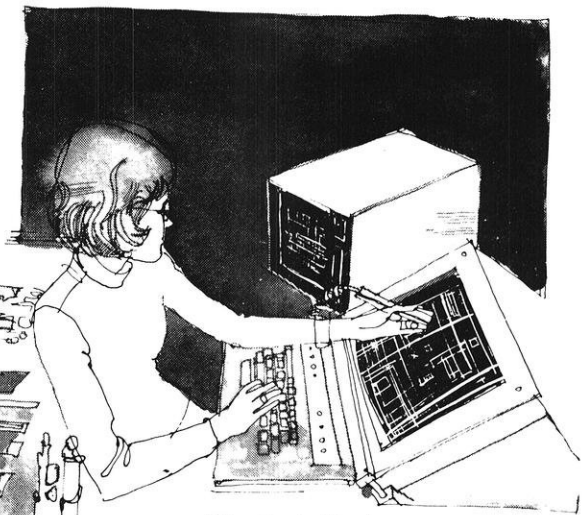
---

Department of the Army, Washington, D. C. 20314

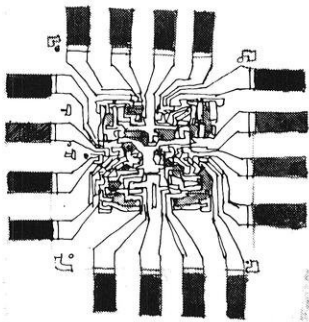
# At Western Electric, we put science to work.



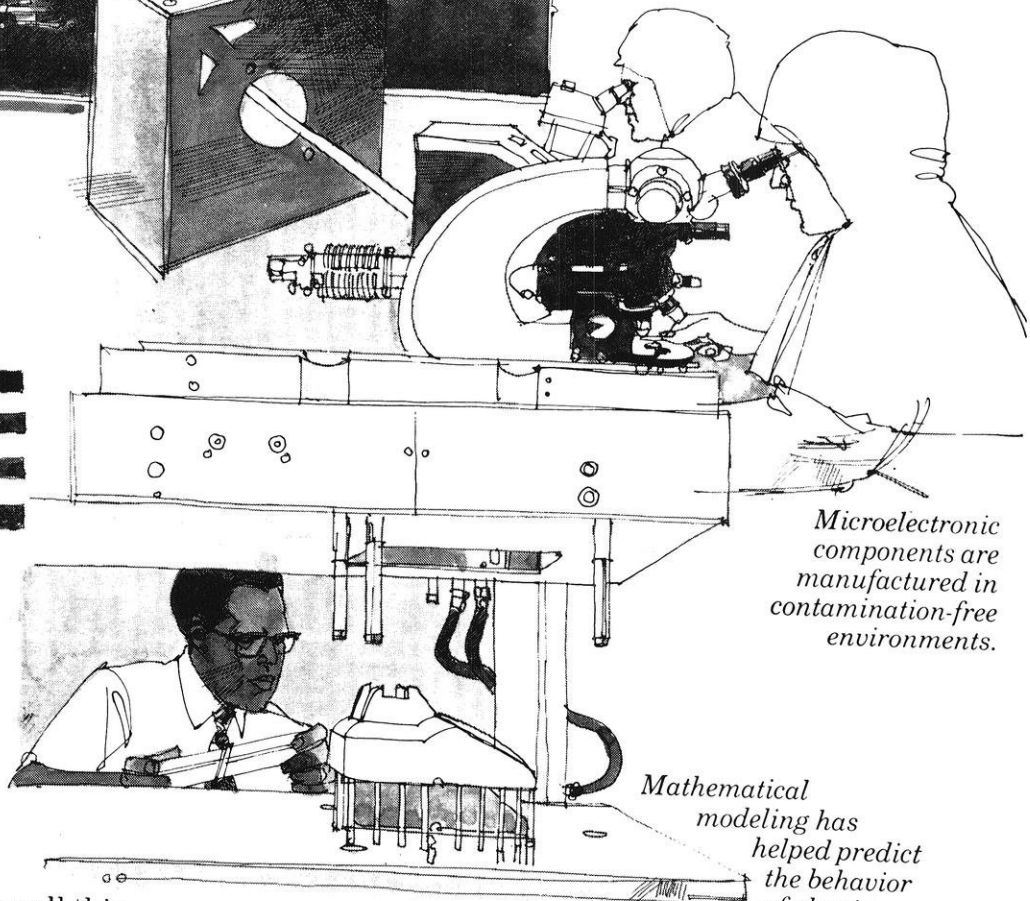
*Lasers are used  
in a variety of ways—  
from measuring  
to drilling and welding.*



*The installation diagrams for  
telephone switching centers have been  
generated through computer graphics.*



*Like transistors  
before them, integrated  
circuits are spreading  
into every nook and  
cranny of the  
Bell System.*



*Microelectronic  
components are  
manufactured in  
contamination-free  
environments.*



*Mathematical  
modeling has  
helped predict  
the behavior  
of plastics  
in injection molding.*

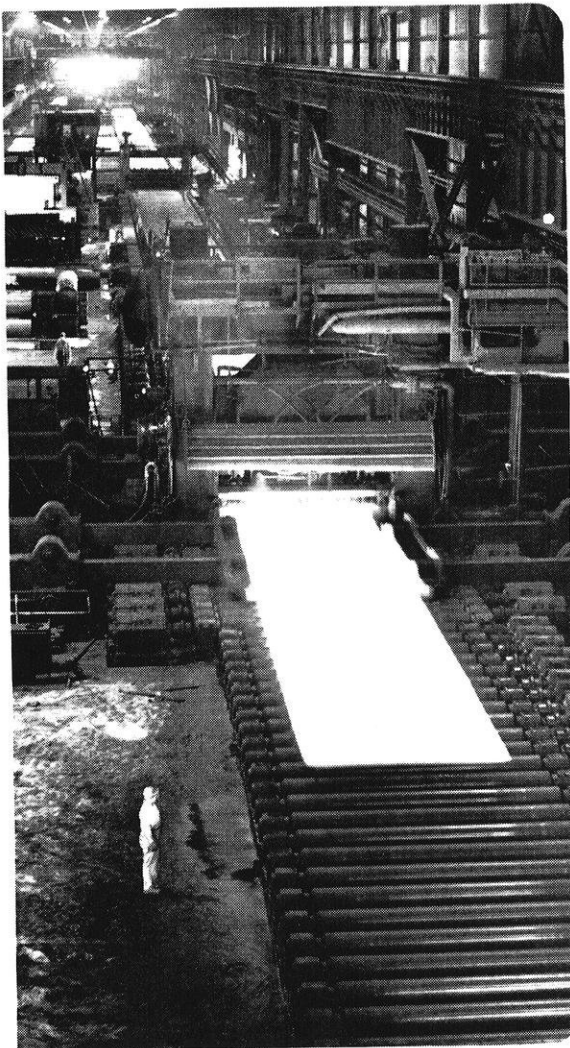
Managing all this  
is a new breed of talented people. Whatever  
their specialties, they also have to be  
comfortable working in other fundamental  
disciplines once left only to "pure  
scientists". At Western Electric, we put  
science to work.



## Western Electric

**We make things that bring people closer.**

# supertankers, sure!



## **We design and build them. And we also roll the steel plates they're made from.**

Bethlehem has lots of projects "on the ways"—not all are related to shipbuilding. And there are plenty of opportunities for engineers to launch meaningful careers.

We need a good crew to keep moving full speed ahead—in shipbuilding and ship repair work, in ship

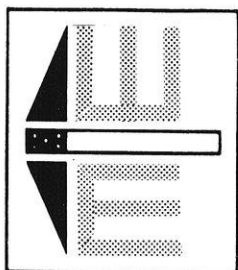
engineering and design; in production supervision, in quality and process control assignments in our steel plants; and in many other technical areas. Why not explore *your* chances of signing on with Bethlehem?

Watch for our recruiter's visit. Meantime, pick up a copy of our

booklet "Bethlehem Steel's Loop Course" at your placement office. Or write: Director—College Relations, Bethlehem Steel Corporation, Bethlehem, PA 18016.



an equal opportunity employer



## Definition of an Engineer

**“A**n engineer is one who passes as an exacting expert on the strength of being able to turn out, with prolific fortitude, strings of incomprehensible formulae calculated with micrometric precision from extremely vague assumptions which are based on debatable figures acquired from inconclusive tests and quite incomplete experiments, carried out with instruments of problematic accuracy by persons of doubtful reliability and rather dubious mentality with the particular anticipation of disconcerting and annoying everyone outside of their own fraternity.”

# wisconsin engineer

PUBLISHED BY THE ENGINEERING STUDENTS of the UNIVERSITY OF WISCONSIN

## STAFF

Peter Scheer ..... Editor  
Judy Endejan Associate Editor  
Doug Hearth .... Photography  
Jeff Kratz ..... Staff  
Wayne Hochrein ..... Staff  
Peggy Lawrence ..... Staff  
Jan Goldin ..... Staff  
Bruce Handley ..... Staff  
Doug Janousek ..... Staff  
Glenn Russell ..... Staff  
Susan T. Hessel ..... Staff

## BUSINESS STAFF

Dan Seidel ..... Business  
manager  
Bill Fuhrmann ..... Staff  
Cheryl Moe ..... Staff

## STUDENT ADVISOR

..... Don Johnson

## BOARD OF DIRECTORS

Prof. George R. Sell  
Prof. Howard J. Schwebke  
Assoc. Prof. C. A. Ranous  
Assoc. Prof. Raymond B. Esser  
Prof. Wayne K. Neill  
Prof. Charles G. Salmon  
Asst. to Dean, Mr. Hosman  
Asst. Prof. Richard Moll

## CONTENTS

<b>Dean's Page</b> .....	<b>4</b>
<i>By Dean W. Robert Marshall</i>	
<b>Pyramidology</b> .....	<b>7</b>
<i>By Glenn Russel</i>	
<b>To Salt Or Not To Salt</b> .....	<b>14</b>
<i>By Wayne Hochrein</i>	
<b>The Book Corner</b> .....	<b>16</b>
<i>By Bruce Handley</i>	
<b>New Technology Invades Newsroom</b> .....	<b>18</b>
<i>By Susan T. Hessel</i>	
<b>Spring Interview Dates</b> .....	<b>22</b>

\*Cover photo by Doug Hearth ..... Detail of Rodin's  
"The Bughers of Calais," Hirshhorn Museum, Washington D.C.

## Member of Engineering College Magazines Associated

Chairman: FRED R. WAGNER, University of Utah, Salt Lake City, Utah.  
Publishers Representatives: LITTEL-MURRAY-BARNHILL, INC., 60 East 42nd St., New York, NY 10017 and 221 N. La Salle St., Chicago, IL 60601.  
\*\*\*\*\*

Second Class Postage Paid at Madison, Wisconsin, under the Act of March 3, 1879. Acceptance for mailing at a special rate of postage provided for in Section 1103, Act of Oct. 3, 1917, authorized Oct. 21, 1918.

Published six times a year, Oct., Nov., (Dec.-Jan), Feb., Mar., Apr., by the Wisconsin Engineering Journal Assn. Subscriptions: one year—\$2.00; two years—\$3.75; three years—\$5.25; four years—\$6.50. Single copies are 35 cents per copy. 276 Mechanical Engineering Bldg., Madison, Wis. 53706. Office Phone (608) 262-3494.

All rights reserved. Reproduction in whole or part without written permission is prohibited. Copyright applied for 1972.

# The socio-technical engineer

**E**ngineering students, practicing engineers, and the engineering profession are encountering their greatest opportunities of this century. The remaining decades of the 20th Century will offer more challenges and satisfactions from problem solutions to engineers than any prior period. Strange as it may seem, the challenges will stem from society's growing distrust of engineering and technology. Today society continues to believe that the problems of energy and the environment have been caused by engineering, the profession which has been the ingenious discoverer of radio, television, jet transportation, chemical process plants, nuclear energy, satellite remote sensing, biomedical engineering, etc. And indeed the engineers did develop these benefits for mankind. It is distressing to contemplate that the critics of engineering are not better informed about what engineers do, and what the social benefits of engineering have been.

The problem of society's lack of understanding of technology has become a matter of great concern to engineering educators. In fact, it could be the greatest problem facing the engineering profession during the last decades of this century. In this connection, our College of Engineering is endeavoring to take a leadership role in providing education for engineering students and non-engineering students about the complex relations between society and technology. The College of Engineering program, under a Sloan Foundation Grant, has developed new interactions and understanding among engineering faculty and social science faculty. This will result in new courses in the College which will enhance the educational and career opportunities of engineering students in the next decade.

In addition to the new educational directions being developed under the Sloan Grant, several departments of the College



Dean

W. Robert

Marshall

of Engineering are teaching an increasing number of university students outside of the College. As an example, a course for non-engineers entitled "Introduction to Materials Science" attracts on the order of 150 non-engineering students from many departments outside of engineering. Art students are filling our classes in welding; courses dealing with energy and the environment are providing an understanding of the important relationships between these two areas with enrollments coming from English majors, journalists, political scientists, etc. Equally important, our own graduates from engineering are moving into nontraditional career areas for engineers. For example, one of our graduates has been working with the Wisconsin Legislative Council during the past several months and has made valuable technical contributions. Other graduates are entering the medical and health care field, where engineering can be applied to the improvement of health care and the rehabilitation and saving of lives. The Cerebral Palsy Communication Group in the College of Engineering is a direct out-

growth of the efforts of engineering students to assist the unfortunate victims of this disorder. Finally, the faculty of the College are involved in participating in public hearings and in the presentation of short courses and continuing education programs for the benefit of the public and for engineers in practice.

This is a very incomplete recitation of the extensive new directions which the College of Engineering has been taking over the past four years. It omits extensive reference to our leadership role in the education of minority students and the growing attraction of engineering as a career for women. However, it seems appropriate at this time to provide the reader of the *Wisconsin Engineer* with some evidence of the new social and technological directions of our College of Engineering.

It is fitting to conclude by noting that our College has been ranked eighth among the top ten Engineering Colleges of the United States. I congratulate our faculty and staff, and especially our students.



## We're looking for people who are looking for the good life.

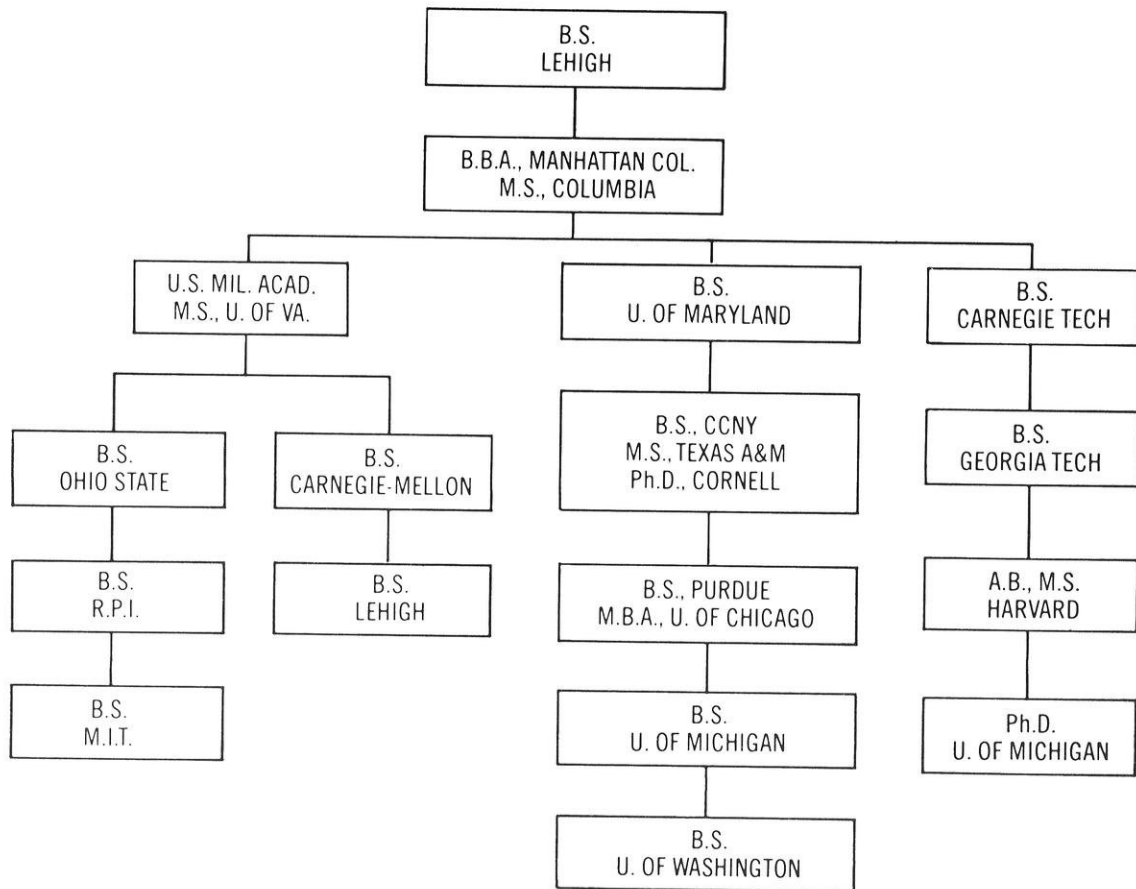
People who have waited long enough. People who have spent years discovering their talents. And even more time expanding them. Perfecting them. Now they're ready. Not for a soft life. But a good life. One where their own mind and ability set the goals. Where their own energy attacks the task. And their own unbiased judgement evaluates the results. A life without forced conformity. Without boring routine. Without organization charts. Or artificial constraints. A life where they can continue to grow. And, too, a life that stretches far beyond self-interest. We're looking for people who know life is fragile. Their own and the world's. We are The Dow Chemical Company. We need people with scientific, engineering, manufacturing and marketing backgrounds who will direct their talents, enthusiasm and ideas to the development of our products and systems for the good life. And we don't want to limit them. If that sounds like the life for you, or someone you know, get in touch with us . . . Recruiting and College Relations, P.O. Box 1713-E, Midland, Mich. 48640.

\*Trademark of The Dow Chemical Company  
Dow is an Equal Opportunity Employer—male/female.



**DOW CHEMICAL U.S.A.**

# Why Babcock & Wilcox is known as an engineers' company.



## Engineering top management is just one of many reasons why B&W is the company for engineers.

At Babcock & Wilcox, there are unusual opportunities for graduating engineers to work with people committed to technical leadership. You can quickly get involved in areas where B&W is making a real impact.

For instance, we're a major manufacturer of nuclear and fossil-fuel steam systems, the world's largest supplier of specialty tubular products and ceramic fibers. And we're becoming a significant force in computers and control systems, machine tools, coal gasification and industrial automation.

With over \$1 billion in shipments a year and a backlog of \$3 billion plus, you won't spend much time in training programs. We need creative engineering types who can meet the most demanding standards, take responsibility. And we offer rewards to match. Don't take our word for it. Just look at how some of our engineers have done.

Take the first step. See your Placement Director or write to: Manager, College Recruiting, Babcock & Wilcox, 161 East 42nd Street, New York, New York 10017.

**Babcock & Wilcox**

# PYRAMIDOLOGY

by Glenn Russel  
of the Engineer Staff

---

*"Religious initiate lies in a sarcophagus as his spirit flies through the spiritual spheres of space."*

---



**A**lthough pyramids may be found in several places throughout the world, including Central America and Britain, the most famous and by far the most studied pyramids are found in the northern Nile River Valley of Egypt. The enigmatic nature of these structures has drawn men to explore and study them for many centuries. Are these pyramids tombs, or observatories, or temples? Or are the pyramids a sort of time capsule made by a highly advanced civilization containing the secrets of the universe?

To answer such questions, pyramidologists have turned to one pyramid in particular, the Great Pyramid of Cheops. From base to tip, it measures 485 feet. It is the largest of the six pyramid Giza Complex located on a rocky plateau ten miles west of modern day Cairo. It is built of 2,300,000 stones weighing roughly two-and-one-half tons each. The exact method used to raise these massive blocks into place is not known. However, it is speculated that the builders used relatively advanced construction techniques making extensive use of levers and pulleys.

No records as to the exact date or length of construction survive, but the Great Pyramid was probably constructed over 4,000 years ago and took 20 years to build. Many thousands of laborers, probably slaves, were required for such a task. In its prime the pyramid was covered with a highly polished mantle of limestone which could be seen for many miles. The casing stones of this mantle were worked to within one one-hundredth inch of perfect, so perfect that the thinnest piece of paper could not be introduced into the crack between two stones. It was not until recent times that such accuracy could be duplicated. This mantle was destroyed in the 800's when Arabs removed it in order to rebuild cities destroyed in an earthquake. It is in this rough condition that

the pyramids have remained up to our present time.

For many years men have thought that the measurements of the earth were somehow incorporated into the Great Pyramid. Mathematicians such as Isaac Newton have tried to relate the unit measure of the pyramid to the measure of one degree on the earth's surface. Although inaccurate measurements of the pyramid's dimensions have hindered the work, some interesting coincidences have recently come to light.

It is now known that the Great Pyramid is a rendition of the northern hemisphere, oriented to true north, with each spherical quadrant projected onto a flat triangle. The base of the pyramid corresponds to the equator and the

system of measures based on the degrees of the earth. The pyramid is so accurate that it even incorporates the phenomenon that a degree of latitude is shortest near the equator and longest near the pole.

The results of such an accurate system of measurements would have been very detailed maps to set boundaries or facilitate exploration if the Egyptians so desired. This suggests a possible relationship between all the pyramids in Egypt, being part of some elaborate mapping system. Able to be seen from afar, they would make excellent reference points for surveyors to set boundaries with. As one may notice, this measuring system is related to a temporal system in that it is based on the polar axis of the planet



**The great pyramid of Cheops located at Giza.**

top corresponds to the North Pole. For this to be possible, there must exist a  $\pi$  relationship between the base and the height of the pyramid. This is the oldest recording of  $\pi$  known to man.

In order to transfer such a spherical surface into a flat one, the famous Golden Section constant was also used. The Greeks were later to make use of this constant in their architecture as well. The pyramids, then, incorporate a

around which it rotates every day.

The builders of the Great Pyramid apparently realized this and incorporated many temporal relationships into the structure. For example, the perimeter, measured from corner to corner, of the base equals 36,524 pyramid inches which is the exact length of a solar year, 365.24 days. It was also found that the sides of the pyramid are slightly concave in-

Pictures on pages 7, 9, and 10 courtesy of **Secrets of the Great Pyramid** (c) 1971 by Peter Tompkins. Reprinted by permission of Harper & Row, Publishers, Inc.

ward. It was then postulated that not only the solar year was recorded in the perimeter, but also the sidereal year and anomalistic year, if you take the inward curve into account when measuring the perimeter. A sidereal year is the time it takes for a star to show in the same place in the sky and an anomalistic year is the time required for the earth to make a complete revolution around the sun and return to the same point in its orbit. The figures for these year measurements are slightly different than the solar year, which is the time between two successive equinoxes.

Also, the sums of the diagonals for the various levels or "steps" of the pyramid give a good average for the length of the great year, which is the time it takes the earth to make a complete gyration in wobble of its axis in relation to the plane of its orbit.

Not only does the pyramid have temporal measurements recorded into it, but it also acts as a good calender which can be consulted

from day to day. It acts as a sort of sundial, using the shadow cast on a paved area north of the pyramid. The paving stones were laid in such a fashion that they recorded the temporal divisions of the year.

---

***"For many years men have thought that the measurements of the earth were somehow incorporated into the Great Pyramid."***

---

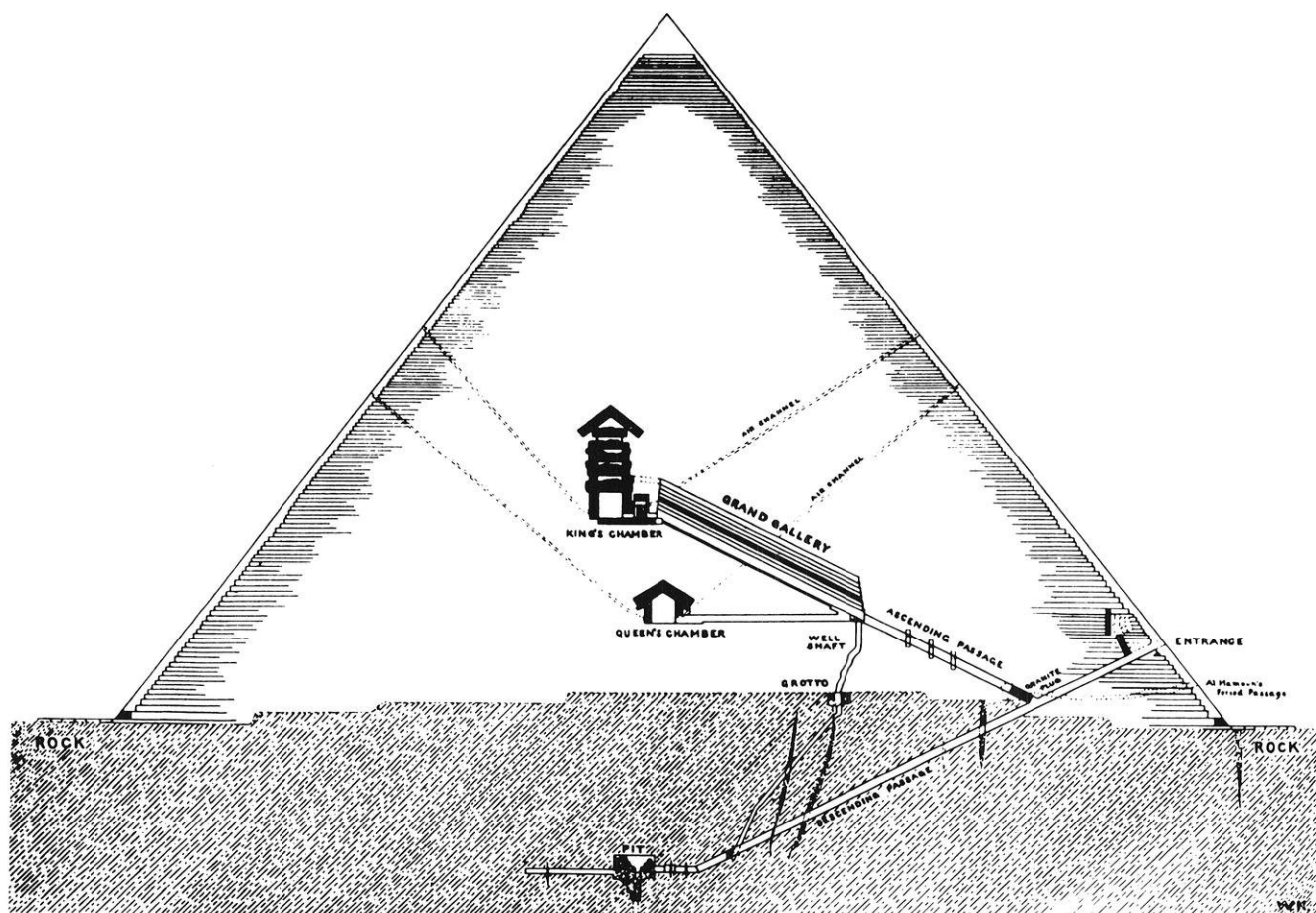
Only in winter would a shadow be cast to the north of the pyramid, so in the summer the Egyptians could have utilized the sun's reflection off the highly polished mantle to tell time on the same paving stones located to the north of the pyramid.

This points up an interesting phenomenon of the vernal

equinox, the mid point between the shadow casting and reflection casting parts of the year. At this point the diminishing shadow on the north side vanishes and the pyramid seems to "swallow" its own shadow. This shadow-reflection method of time measurement is accurate enough to measure a year to within a fraction of a day.

The Great Pyramid was at one time a very fine observatory. In order to make accurate stellar charts a meridian line, the line cutting the sky in half from north to south, needed to be measured and recorded. This line was found and then consolidated in a tunnel we now know as the descending passage, using the pole star to guide their digging. For that reason, if you stand in the descending passage you could see the pole star perfectly framed in the opening.

With this reference tunnel the rest of the pyramid could begin to be built, sighting up the tunnel at the pole star as the pyramid



The Great Pyramid showing its various passages and chambers.

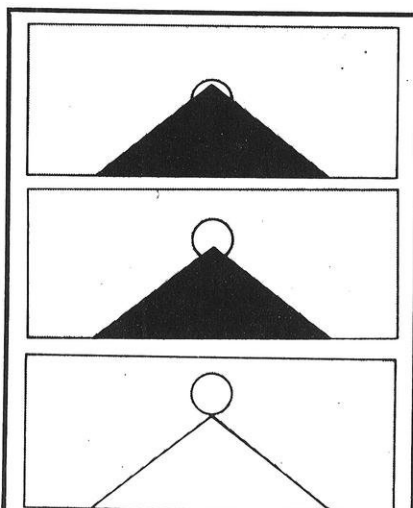
heightened. After a certain height, workers could no longer directly sight on the pole star, so they plugged the descending passage and created the ascending passage going up at the exact same angle that the descending passage goes down. Placing a pool of water at the juncture of the two passages would allow a builder to look down the ascending passage to the pool and see the pole star reflected in it. In this manner he could continue making accurate measurements using the pole star as a guide even though he could not directly see it.

At the top of the ascending passage is the sloping Grand Gallery, 157 feet long. Once this long narrow room was built, construction on the pyramid probably ceased leaving a truncated or chopped-off pyramid. The top of the Great Pyramid was not added until much later. Due to its method of construction, the true meridian of the sky would run right down the center of the opening as viewed from inside. This would create an observatory capable of making detailed steller maps, so detailed in fact, that the maps produced could not be duplicated until the advent of modern telescopes.

Grooves in the walls of the Grand Gallery suggest some moveable apparatus to determine such things as the declination of a star, which is analogous to latitude on the steller vault. The detailed steller maps that would result would be another aspect of the pyramid that would aid in navigation and exploration. Not only could the gallery-observatory be used at night, but also during the day to record the sun's shadow and act as a calendar.

One unsolved problem in the Great Pyramid is the sarcophagus in the king's chamber at the top of the Grand Gallery. It may easily not be a coffin, for no mummies have ever been found in any pyramid. It also may have been a repository for a system of weights and may have had the basic astronomical ratios of the solar system built into its dimensions. Measurements of the stone box do seem to suggest this, but damage done to the sarcophagus by modern tourists had made detailed study difficult.

The fact that the temperature inside the king's chamber is always constant supports the idea that the sarcophagus was part of some highly accurate system of weights and measures. One solu-



**At noon of the vernal equinox, the sun reaches an angle where the pyramid's shadow disappears and appears to be swallowed by the pyramid.**

tion to the sarcophagus is that it was a place of initiation for the religion of its time.

Legend has it that the initiate would lie in the sarcophagus and leave his body for three days in which time the gods would divulge to him the "great secret." It could have been the priests of this religion who designed the pyramid, the science and math necessary for such design being important aspects of their religion. Many ancient philosophers such as Sophocles, Plato, and Pythagoras hinted or admitted that they were initiates of this religion. Much of our modern mathematics is based on knowledge that the Greeks probably learned from this religion.

Recent discoveries have brought to light the fact that organic matter placed one third of the way up in a pyramid mummifies instead of putrifies. This phenomenon has even been used commercially for keeping milk fresh without refrigeration by putting it in a pyramid shaped container and for keeping a razor blade sharp for many times longer than its normal lifetime by storing it under a small pyramid between

shaves.

The possibility then exists that a pyramid is a lens capable of focusing energy simply because of its shape. This is supported by the story of Sir W. Siemens, a British inventor. While he and a friend were standing atop the Great Pyramid he noticed an acute ringing noise when he raised his hand with fingers outstretched. When he raised only his index finger he felt a distinct prickling sensation in it. He also received a slight electric shock when he attempted to drink from a bottle of wine he had with him. He then transformed this bottle into a crude Leyden jar by wrapping a piece of wet newspaper around it. Holding it over his head, the Leyden jar began to charge and eventually issue forth sparks. When this happened his Arab guide accused him of sorcery and tried to seize Siemens' companion. Siemens then lowered his charged bottle and gave the Arab such a jolt that it knocked him down. The Arab guide quickly picked himself up and ran down the side of the pyramid in terror.

There may be other undiscovered chambers in the Great Pyramid, but some strange characteristic, possibly the energy focusing phenomenon, has prevented cosmic ray analysis of the pyramid to determine if such chambers do exist. There may even be an underground labyrinth of halls and rooms that connect all the pyramids. Possibly the high priests lived in this underground domain. The Greek historian Herodotus speaks of this labyrinth in his writings. He describes the labyrinth as being even more fantastic than the pyramids themselves.

So we see that the Great Pyramid could have been a tomb, a temple, an observatory, or all of these and more. Whatever the case, the pyramids seem to be an elaborate time capsule built by a highly advanced race in order to record their knowledge. How much knowledge there is and how much we know of it is questionable. There may be facts or concepts recorded in the pyramid that we have not yet stumbled across in our modern scientific endeavors.

# Frank DeCaria has helped provide a better home for thousands of fish in Old Hickory Reservoir.

Frank DeCaria holds a BS-ChE from West Virginia University. He's twenty-four years old and has worked at Du Pont's Old Hickory plant near Nashville for just over two years now.

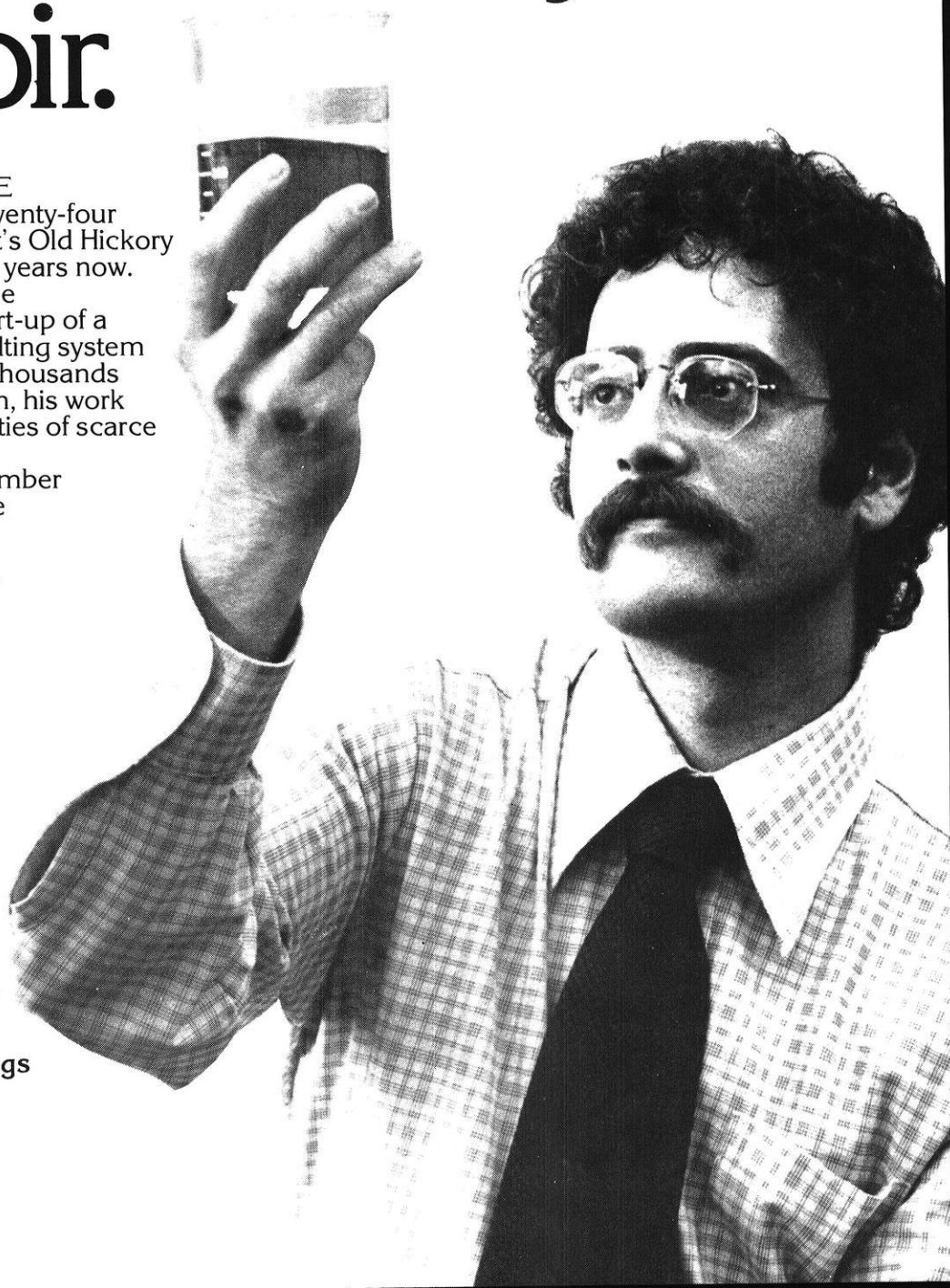
When Frank joined Du Pont, he immediately went to work on the start-up of a new waste treatment plant. The resulting system provides a cleaner environment for thousands of bass, bluegill, and carp. In addition, his work has helped concentrate trace quantities of scarce materials to recoverable levels.

At the moment, Frank is a member of a team working to make the waste treatment plant even more efficient. By 1983, he expects that the BOD discharge rate will have been further reduced to less than 10% of its current level.

Frank's contribution is not unique. Du Pont has a reputation for getting young engineers into the mainstream quickly.

If you'd like to work for a company where contributions really count and where you're more than just another number on a computer printout, do what Frank did. Talk to your Du Pont Personnel Representative. He'll show you how to help yourself while helping others. Du Pont Co., P.O. Box 24113, Wilmington, DE. 19898.

At Du Pont...there's a world of things you can do something about



An Equal Opportunity Employer, M/F.

A black and white photograph showing the rear quarter panel of a car. The car is light-colored, and the number '651' is printed in large, bold, black digits. To the left of the number is a rectangular taillight with a grid pattern. The car is parked on a dark, textured surface, possibly gravel or dirt. In the background, there is a dark, curved object, possibly a wheel or part of another vehicle, and some indistinct shapes that could be people or other vehicles in the distance.

**The Nuclear 500. Are you go**

**651**

ough to be one of them?

This year the Navy will seek about 500 of the country's top college graduates for its nuclear energy program. It's the most comprehensive training program available in today's most exciting energy field.

It's got to be. More than 70% of the country's nuclear reactors are operated by Navy men.

So our standards are extremely high. To qualify, you must have a solid background in engineering, math or physics. Be able to learn advanced technology at an accelerated pace. And, of course, have what it takes to become an officer in the U.S. Navy. If you're selected, you'll be paid a starting salary comparable to most salaries given junior executives in private companies. And be placed in a position of responsibility quickly.

If you're still in college, there are several special programs for you, including a full scholarship available for your junior and senior years.

Do you think you're good enough?

If so, mail the coupon. Or call our toll-free number, **800-841-8000** (in Georgia, 800-342-5855), anytime, day or night, and ask for the Nuclear Desk.



**Be someone special.  
Join the Nuclear Navy.**

# To Salt . . .

# or Not to Salt

by  
**Wayne Hochrein**  
of the  
**Engineer Staff**

**A**n American man once said if a man invented a better mouse trap people would beat a path to his door. As engineers we are constantly trying to make something that will do more, and work better and faster than before. But what constitutes better? How do we know what is better? This question can't be answered with a definition or hard fast rule.

As engineering students we are taught what is best engineering construction. But there is a need for people of all occupations to become involved and to make decisions for the benefit of people in the world around them. Engineers must help make these decisions because it is the responsibility of the engineer to keep other people aware of changes in technology.

An example of involved engineers is the University Salt Project. The University Salt Project is a study being done on direct and indirect problems on snow and traffic movement in Madison.

The Rivers and Lakes Commission requested the street division of the Department of Public Works submit a precise plan explaining a decrease in the use of salt on Madison streets for the winter of 1973-74. Using the Lake Wingra Water Shed area, in the winter of 1973-74 there was a city reduction of 1,936 tons of salt or (34%). In the Lake Wingra area there was 290.5 tons or 57.5% reduction.

The University Salt Project will obtain sufficient information to make reasonable judgements on the desirability of various alternatives for dealing with snow on

city streets. These alternatives basically involve salt, sand or mechanical removal.

Headed by Professor Howard Harrison of the Mechanical Engineering Department, different aspects are being investigated. These include environmental, industrial, engineering sociological and transportation areas.

The Project recommended the salt reduction policy be expanded into the University Bay Area for the winter of 1974-75.

Dr. Dan Willard, with the assistance of Prince Beach are investigating environmental aspects such as the salt effect on algae plumes or fish reproduction or the possibility salt could reach our water supply. This is done primarily through research dealing with studies done in Madison-type areas that answered similar questions.

Harrison, with Ken Rise, an undergraduate assistant, are studying the industrial aspects. They are looking at the work of the street department to learn how long snow removal takes for a given snowfall. Various alternatives and costs in terms of trucks, maintenance, fuel and man-hours.

Tom Heberlein, aided by Mike Prouty, is presently gathering information from the sociological point of view. The salting program directly involves the transportation of Madison citizens. Therefore their study will measure the public reaction to different snow removal alternatives. Public feedback will be obtained through surveys, hearings and juries.

The surveys attempt to find

people knowledgeable about the different snow removal methods. They will be asked about certain policy alternatives such as no salting, reducing speeds, purchasing new snow removal equipment, using other chemicals and other options.

Public hearings will also sample public opinion. These hearings aren't always fully representative, therefore other feedback juries will be formed. Juries consist of various people asked to come and spend time listening to various reports on the snow removal problem. They then give their ideas on the subject. They are salaried, as are juries in judicial proceedings. Random samples of opinion are also a possibility.

The transportation aspects of the project are being looked into by Prof. Herm Kuhn with two graduate students, Mike Lynett, and Ron Marshall. They will investigate physical systems damage, and the mobility and safety aspects.

Physical system damage would deal with decay of sign posts, roads and transportation vehicles.

The mobility and safety aspects would include change in accident frequency and transit time in the areas under study. Special attention will be given to safety.

This is being done by literature review. They will also interview taxi-cab and insurance companies, bus lines, and the major utilities firms.

Whatever these engineers discover, their community involvement will prove invaluable to the city of Madison.

# Some people are starving for more than a passing grade in English.

Many people we know couldn't stomach what some college students eat in one day.

Luke warm coffee.

Peanut butter on crackers.

Beer.

Two chocolate bars.

And a hamburger.

But for millions even this epicurean nightmare would be a welcome feast. It's no secret, hunger is one of the major problems facing many people in the world.

And helping nations produce more food is something FMC can do very well.

We can engineer giant land reclamation programs.

To increase agricultural production we make machines that prepare the soil and plant the seeds, enabling large acreages to be worked efficiently.

To protect the crop from pests and disease we produce special agricultural chemicals, such as Furadan®, an insecticide-nematocide that's boosting the yields of rice, alfalfa, corn, peanuts and

sugarcane.

We make mechanical harvesters for special crops such as tomatoes, corn, peas and beans and to help make low-cost food possible, we make automatic food canning and freezing equipment.

We even design machines to form and fill bags and boxes, and manufacture many types of transparent films for packaging.

And while we don't have the final solution to the hunger problem, we do offer more ways and means of growing, harvesting, processing and packaging food than any other single company in the world.

Helping to feed hungry people is one of our major concerns, but it's not our only concern. We are also into pollution control equipment, fibers, cranes, material handling systems, power transmission equipment and much more.

See us on campus or write for further information.

FMC Corporation, 200 East Randolph Drive, Chicago 60601.  
An Equal Opportunity Employer.

## **FMC**



# "A Canticle for Liebowitz"

*by Walter M. Miller, Jr.*

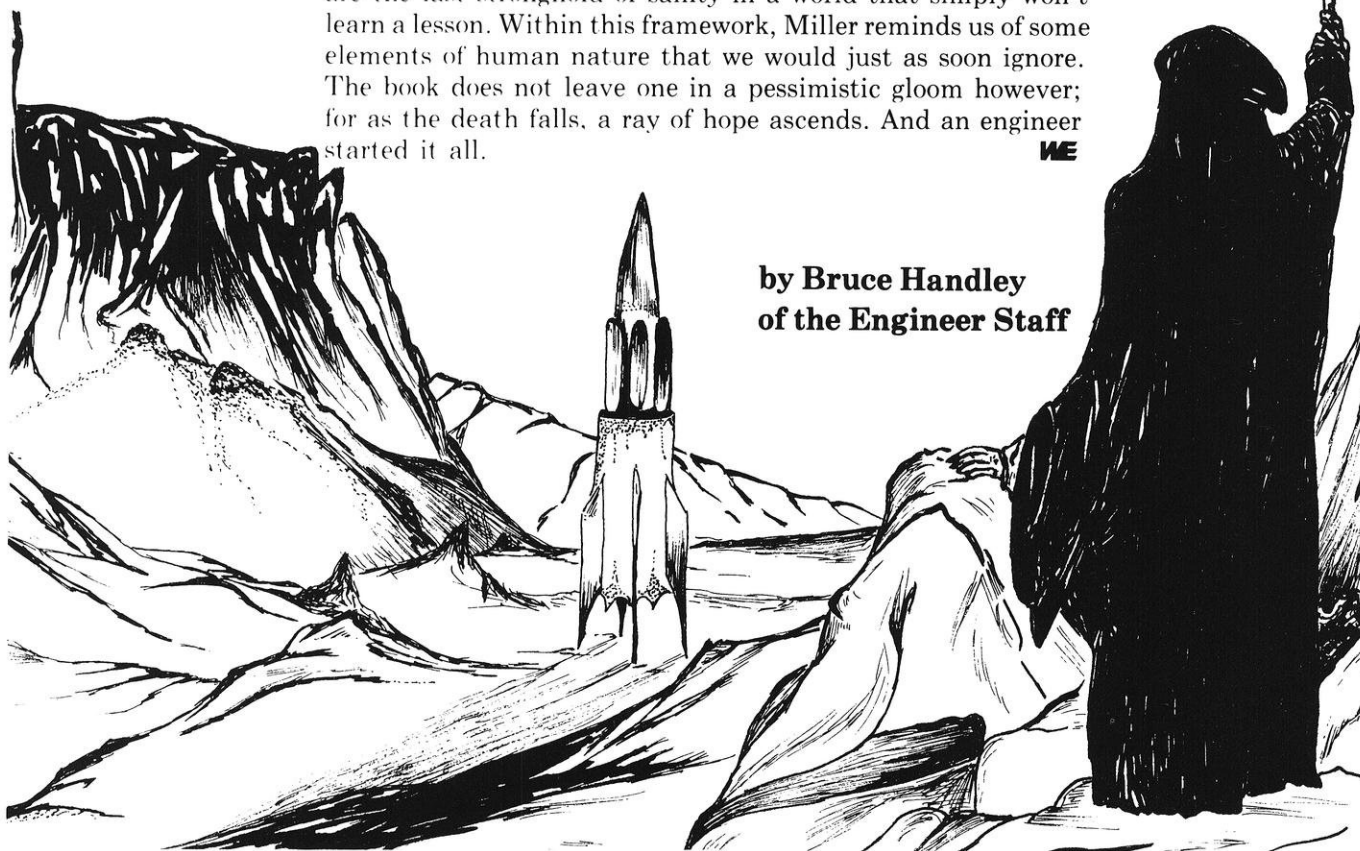
"And Satan spoke unto a certain prince, saying: 'Fear not to use the sword, for the wise men have deceived you in saying that the world would be destroyed thereby.'"

And thus it began, again. The cycle of a cataclysmic history retraces itself. Are we trapped on a vicious merry-go-round of destruction and rebirth, destined to burn civilization to a cinder again and again? This is the question that Miller poses as he relates the events of over 1800 years of earth's history. The narrative starts several centuries after a nuclear holocaust that decimates the world's population. The world endures another Dark Age in which the only glimmer of hope lies with the Order of Saint Liebowitz, a religious order dedicated to the preservation of human history. The patron saint of the order, Saint Liebowitz, was an electrical engineer who founded the order after the "Flame Deluge" and who was martyred during the ensuing Simplification, a time of book-burning and mass murder in which nearly all technology was destroyed. The few books which remained were the sacred trust of the order. Over the span of the next 700 years, we see the whole of human history repeated. Miller takes us through the Age of Darkness, the rise of the city-states, and the coming of the war-lords. He sketches the rebirth of science and the rapid rise of technology as the cryptic texts in the order's libraries are deciphered. As we watch the rebirth of mankind, we see the seeds of destruction sown again. The Cold War environment makes another appearance and mankind rushes inexorably toward yet another Armageddon. The brothers of the Order of Saint Liebowitz, in their long and patient attempt to preserve mankind's history, manage to surpass even this obstacle. But that story is left to the reader.

Miller's success in relating to us 1800 years of history, and maintaining a smooth continuity besides, is undebatable. In the realistically done background of a religious order, Miller integrates the rational and the irrational. The brothers are the last stronghold of sanity in a world that simply won't learn a lesson. Within this framework, Miller reminds us of some elements of human nature that we would just as soon ignore. The book does not leave one in a pessimistic gloom however; for as the death falls, a ray of hope ascends. And an engineer started it all.

**WE**

**by Bruce Handley  
of the Engineer Staff**



# now that you have an engineering degree, we'd like to offer you an engineering career.

Sargent & Lundy's entire business is engineering and engineering is exactly what we would hire you to do. We are the nation's largest consulting and design engineering firm and specialize in projects for the electric utility industry. The industry and ourselves are growing continuously and we have an increasing need for graduates with bachelor and advanced degrees in many engineering disciplines.

If an engineering career is your plan, we would like to talk with you. Please make an appointment through your placement office to interview with us. Our company representative will be on the Madison campus, February 19, 1975.



Thomas G. Longlais, B.S., 1969, Michigan Technological University; M.S., 1972, University of Wisconsin, Civil Engineering. Presently, assistant chief structural design engineer, Structural Design and Drafting Division.

"I think your time would be well spent by talking to Sargent & Lundy. Here, I'm not only asked, but allowed to do the work I trained myself to do."

**SARGENT & LUNDY**  
ENGINEERS

55 East Monroe Street, Chicago, Illinois 60603 • (312) 269-2000.

An equal opportunity employer.

---

# New Technology Invades Newsroom

*Computerized technology has crept into all walks of life from pharmacy to journalism. This month, the Engineer examines the use of a computerized Video Display Terminal (VDT) in operation in the newsroom of a medium-sized daily newspaper, The La Crosse Tribune. While the VDT has increased the efficiency of newspaper work, some feel that it has removed some of the glamour of the old-time newsroom. . . .*

**By  
Susan  
T.  
Hessel  
of the  
Engineer  
Staff**

**C**hange, most journalists would agree is good—except when it comes to their own newsroom. There they'd like to continue pounding out stories on old Royal or Underwood typewriters aged by long years of deadline work.

Newspaper management, on the other hand, looks toward ways to make more efficient the entire news operation from the newsroom to the composing room. And, much to the unhappiness of some reporters that involves giving up the trusted typewriter for Video Display Terminals (VDT) connected to computers.

The new VDT process, which virtually eliminates the composing room, has the reporter setting his own copy. This has allowed the Davenport (Iowa) Times Democrat to decrease the number of manhours required to print a newspaper page from 8.94 in 1966 to 1 hour in 1974.

Money is also saved in supplies. Since reporters work directly on the video screens, less copy paper

is needed. Further, computer costs have dropped radically in the last decade to a point when on some terminal, the cost is less than one dollar an hour. Computer time in the future is expected to cost even less. The La Crosse Tribune, La Crosse, Wis., is an example of a newspaper adopting the new technology. The Tribune, a paper of 36,000 circulation in a city of 51,000 people, is part of Lee Enterprises, a chain of 13 newspapers that will be completely electronically produced in five years.

Working with the Harris 2500, The Tribune will have by February 11 terminals costing \$150,000. Reporters will compose their stories on the video screens, the culmination of two years of change for the paper that began with a change to cold type and a new building built to handle a new \$500,000 offset printing press.

When the city hall reporter sits down at the terminal to write a story, he first fumbles around looking for the power switch. Then

he types in his name, which department the story is for and a "slug line" for his story about the mayor, —"Mayor's a Crook." That helps the editors, reporters, printers and newspaper libel attorney trace the story in the computer memory.

Then the reporter instructs the machine on the format the story should be printed in—i.e. format one is one column wide, 9 point

where the letter he types on the keyboard will go. The cursor then moves along as he types the story about the mayor embezzeling money from the city bank account.

If an error is made in writing the amount of money stolen, the reporter puts the cursor on the wrong figure and writes the new one over the old one.

If the reporter left out his

paragraph" and moves the cursor to that paragraph and it will disappear.

Paragraphs can be changed around if the editor thinks one of the crimes the mayor committed is more important than the other. Whole paragraphs of letters move around changing places like ants marching on the ground.

The lazy city hall reporter doesn't have to return the carriage himself because the computer automatically justifies the lines on the screen. The screen holds 12 lines in view at a time, but can be scrolled up and down to see what libel has been written already.

When the reporter is done, he sends it to the computer memory to be called by the city editor. The editor looks it over and sends it back to the reporter for additional work suggesting the reporter talk to other people besides the person the mayor defeated in his last election race.

At the copy desk, the story is then "called" again to read and search for errors. The headline is written and is passed to the computer again. All proofreading is done before photocomposition because few errors are made in that process. Photocomposition is the process of converting tapes punched through the keyboard into type.

The material displayed on the VDT is printed on magnetic type at a speed of 90 lines per minute, completing a process that means a story can still get in the paper ten minutes before the lockup deadline for an editor.

Stories can not be lost in the machine because of the recall mechanism. In addition, reporters will be able to get a "hard copy" of their story printed out by the computer for a permanent record.

This process is obviously quite an improvement from Johann Gutenberg's press invented in 1453. In an age when most newspaper readership is in the suburbs beyond the central city the process means later deadlines without hurting the ability to get the paper to those areas.

Wire service hard copy will be scanned by the news editor for stories of interest. They are then recalled from disc storage of wire lines connected with the system. A



**Mahlon Hinkson, chief printer for the University of Wisconsin Typographical Laboratory in Vilas Communications Arts Hall, operates a type composing machine. This sets type according to a computerized punch tape.**

type on a ten pica wide column. Other formats indicate other column widths or the cutlines that go under pictures. The idea is to eliminate the repetitive work by logging it in the computer memory.

The reporter then sets the cursor, or square of light, indicating

partner in crimes, he moves the cursor to the spot where he would like to put in a paragraph and pushes "insert" and then types the paragraph.

If the reporter decides the paragraph about the mayor beating his dog is not pertinent to the story, he pushes "delete

hard copy printout on a low speed line printer may be requested to be used for future reference purposes, background editorial writing.

Layout of pages will also be done on the Harris. The copy will be read in the machine in the exact point size of the type in the paper. The keyboard-directed cursor can move copy wherever the editor wants it. He can see immediately what will fit and what changes need to be made. The machine can do a whole range of editing such as fitting, movement of copy blocks and changes in point size.

Advertising, the real money maker of newspapers will be using the terminals just like news.

When a classified ad is taken, the Harris 2500 shows a blank form on the screen and the operator then fills in the correct information. The system will check automatically to make sure all necessary information is included such as stop and start dates.

Ads can be called for corrections, extension or kills. When the ads expire, the accounting information automatically is passed to the accounting department.

Display ads, or the bigger ads, can also be recalled to make corrections. When the layout on the screen is correct, the ad is taken back to the Harris 2500 system for on-line typesetting. The display ads can be produced without perforated tape cutting the handling and pasteup time.

Journalists are a dramatic group. Many claiming that computers destroy the romance of the profession. But, management says the real romance in the work is not in the kind of type the paper is printed by, but in the accomplishment of writing a good story.

Another concern is for workers displaced by eliminating the composing room. Strikes at the St. Louis Post-Dispatch, St. Louis Globe Democrat, Detroit News, Detroit Free Press and others have been directly related to the elimination of jobs. Printers unions are powerful and their strikes have destroyed newspapers in New York City.

How does the La Crosse Tribune handle these problems? The world is adaptability, according to publisher Kenneth Blanchard.

Those employees willing and able to learn new skills during the time of change will be guaranteed a job. A solid severance plan is given to those who don't want to retrain or who are young enough to get involved in a new career. The Tribune worked to get those people new jobs in the community, Blanchard said.

---

*"Advertising, the real money maker of newspapers, will be using the terminals just like news."*

---

"We try to take the printer who was trained in hot metal from our plant and retrain them to use cold type. This has been a problem in their mental thinking more than anything else," he said.

Sander Hook, the office manager of the Tribune, called the new equipment "word processors."

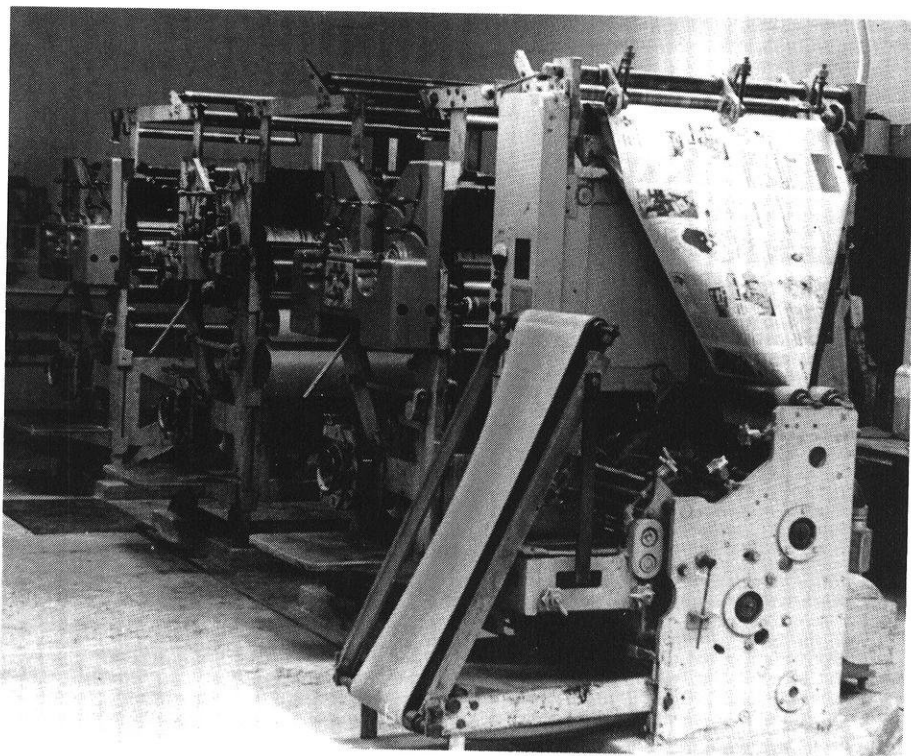
The advantage to this system is that the perforated tape punched to activate the cold type, no longer needs to be punched by hand by key punchers. This means those jobs are basically eliminated along with the cost of their salaries.

Since The Tribune got their offset press in August, 1973 the composing room, where the tape was punched, has gone from 32 people to 16.

The Tribune, according to Blanchard was one of the first newspapers to begin using perforated tapes in the midwest in 1949, indicating the paper has always been progressive in its technology.

"What this meant to all our people was they had to learn codes for copy to produce the tape that would drive the computer to set the type. They have become rather knowledgeable as a result of a learning process that included a lot of mistakes," Blanchard said.

There were never any secrets about what would be happening to the newspaper according, to Blanchard. At the Tribune, relationships on the staff are easy.



**The offset printing press, a quicker and cleaner printing method has revolutionized newspaper production. Pictured here is the offset press of the University of Wisconsin Typographical Laboratory in Vilas Communications Arts Hall.**



**A University of Wisconsin journalism student practices on the Hendrix Editing Machine, which is a Video Display Terminal (VDT). Her news copy appears on the screen before her.**

There are hierarchies, but not as steep as in other papers. Printers, the editor and reporters feel comfortable enough to sit down to eat lunch in the new \$1.5 million building's lunchroom.

"The lunchroom," says Blanchard, "is one of the best things we did at this building. It makes people accessible."

"We handled this in the right way. We tried to deal with change as we become a sophisticated system so that people really understand. We tried to tell them there is nothing they can't learn if they apply themselves," Blanchard continued.

The newspaper offered to train the staff by sending them to schools in photocomposition all over the country. Also, there is a real sense of importance for employees to feel a part of new plans. Blanchard said technological changes are threatening to the people affected by them. Not only do people worry about what will happen to their jobs but they also are reticent about the "mystery" of computers.

"We tried to take people and be

very humane about it. Very open. We tried to remove the mystery and doubts that people have," Blanchard explained. "Some people in the newsroom say they will not be able to operate the Harris 1100 (the temporary terminals in the newsroom that are used for some routine stories by the keypunch operators) and worry about the day the other terminals will be here and when the typewriters will be gone."

Richard Mial, 25, a reporter with the Tribune for three months, is an example of a reporter who is not looking forward to the new terminals—but one who is resigned to their coming.

"I worry that there will be fewer checks on our copy. I can't believe copy will be proofread as well," he said. "I have a real attachment to my typewriter. It's an Underwood that fits the image of a reporter so much more than computers."

"I know that they are coming and it is something that I have to accept. I know I will get used to them. But, I think I will always miss the romance connected with old newsrooms," he concluded.

Adjustment at the Tribune to

the changes in the newspaper has been very good, according to office manager Hook. Everyone still on the staff has retrained and will be kept on past the time when the other terminals arrive. The only people not retained will be part time tape perforators, he said.

"The people part has already taken place when we went from hot metal to photocomposition in 1972. The real crunch took place dropping the composing room personnel from 32 to 16."

Hook said the remaining staff has been very happy about the idea of new printing systems and they enjoy the new skills they have learned.

"We were out to avoid the kind of problems they had on metro newspapers. We never had any kind of adversary relationships with unions," he said.

Hook said employees who left went by their own choice. He felt the newspaper worked hard and fairly to find them good jobs elsewhere and good severance plans.

Robert Spacek, the Tribune technical services coordinator, is an example of a printer who over the years has been excited and interested in the new technology rather than frightened by it. He has become a supervisor in the plant in 10 years.

Spacek started with the Tribune in 1964 as a printer. Interested in electronics, Spacek took courses at Western Wisconsin Technical Institute and La Crosse technical school. The Tribune has since sent him to training schools in Boston, Davenport Ia., (the Lee Headquarters) and elsewhere in the country capitalizing on his interest and enthusiasm.

"Over all, it has been fantastic," Spacek said. "We had cooperation with really good management. They were really good in retraining people. They didn't really lay anybody off."

Spacek said jobs were eliminated through attrition. When people retired others were not hired in their places.

"All people had to do was retrain in the new process. All the people working in cold type processes now are glad to have the jobs they have. I like my job, that's for sure," he said.

# Interview dates

## *Spring 1975*

### **MONDAY, FEBRUARY 3**

Johnson Controls  
Koehring  
Marathon Electric  
N. L. Industries  
Rohm & Haas  
Wisconsin Electric Power (1 of 2)  
U. S. Patent (1 of 2)  
Action/Peace Corps/Vista (1 of 5)

### **TUESDAY, FEBRUARY 4**

Charmin Paper (1 of 2)  
Control Data (1 of 3)  
FMC - Northern Ordnance  
Hewlett Packard (1 of 2)  
Illinois Dept. Transp.-Div.  
Waterways  
Inst. of Paper Chemistry - In  
Chemistry  
Interstate Power  
Milwaukee Road  
U. S. Patent (2 of 2) if needed

### **WEDNESDAY, FEBRUARY 5**

Charmin Paper (2 of 2)  
General Dynamics  
General Electric (1 of 2)  
Hewlett Packard (2 of 2)

### **THURSDAY, FEBRUARY 6**

Borg Warner (Chemicals Div.)  
General Electric (2 of 2)  
IIT Research Institute  
Penn Controls  
Stauffer Chemicals  
Westinghouse (1 of 2)

### **FRIDAY, FEBRUARY 7**

Barber Colman  
Bucyrus Erie  
FMC - Chemical Div.  
FMC - Ind. Chemicals (Wyo.)  
Globe Engineering  
Illinois Tool Works (2 of 2)  
Mead Johnson (3 of 3)  
Rexnord  
Warner Swasey  
Westinghouse (2 of 2)  
U. S. Atomic Energy (2 of 2)—Now Energy R & D Adm.  
Corps of Engineers

### **MONDAY, FEBRUARY 10**

Atlantic Richfield  
Kohler (1 of 2)  
Oilgear Co.  
Olin Corp. (1 of 2)  
Scott Paper  
Uarco (1 of 2)  
Walker Mfg.  
Zimpro

### **TUESDAY, FEBRUARY 11**

American Electric Power  
Amoco Chemicals  
GTE Automatic Electric  
DuPont (1 of 2)  
Motorola (1 of 2)  
Olin (2 of 2)  
Union Carbide Corp. (5 divs.) (1 of 2)

### **WEDNESDAY, FEBRUARY 12**

Consolidation Coal (1 of 2)  
Continental Oil (1 of 2)  
DuPont (2 of 2)  
Lawrence Livermore  
Motorola (2 of 2)  
Nekoosa Edwards  
PPG (1 of 3)  
Union Carbide Corp. (2 of 2)

### **THURSDAY, FEBRUARY 13**

Ansul Co. (1 of 2)  
Cargill  
Clark, Dietz & Associates (1 of 2)  
Consolidation Coal (2 of 2) if needed  
Continental Oil Co. (2 of 2)  
Factory Mutual  
McDonnell Douglas (1 of 2)  
Mobil Oil (1 of 2)  
Shure Bros.  
Texaco (1 of 2)  
Underwriters Labs

### **FRIDAY, FEBRUARY 14**

Ansul Co. (2 of 2)  
Babcock & Wilcox  
Beloit Corp.  
Clark, Dietz & Associates (2 of 2)  
McDonnell Douglas (2 of 2)  
Modine Mfg.  
Texaco (2 of 2)

### **MONDAY, FEBRUARY 17**

Allen Bradley  
American Can  
American Natural Gas  
B. F. Goodrich  
Square D Co. (1 of 2)  
Std. Oil of California (1 of 3)  
Unico  
Upjohn  
Naval Nuclear Power Directorate

### **TUESDAY, FEBRUARY 18**

Bell System (1 of 4)  
Dow Chemical (2 of 3)  
Johnson's Wax  
National Steel  
Square D Co. (2 of 2)  
Std. Oil of California (2 of 3)  
Std. Oil of Ohio  
Trane Co. (1 of 4)

### **WEDNESDAY, FEBRUARY 19**

Bell System (2 of 4)  
Corning Glass (1 of 2)  
Dow Chemical (3 of 3)  
Falk Corp.  
National Cash Register  
Sargent & Lundy  
Shell Development  
Std. Oil of California (3 of 3)  
Trane Co. (2 of 4)

### **THURSDAY, FEBRUARY 20**

Corning Glass (2 of 2)  
Fluor Pioneer  
General Dynamics (Electric Boat Div.)  
E. F. Johnson  
Ladish  
Leeds & Northrup  
Los Angeles County  
Torrington  
Trane Co. (3 of 4)  
Waukesha Motor

### **FRIDAY, FEBRUARY 21**

Amoco Chemicals  
Broyles & Broyles  
Hamilton Standard  
Kimberly Clark  
Masonite  
Quaker Oats

St. Regis Paper  
 Snap-on-Tools  
 Union Oil  
 U. S. Army Material

### MONDAY, FEBRUARY 24

American Appraisal (1 of 2)  
 Combustion Engineering  
 Deere & Co. (1 of 2)  
 Eaton Corp.  
 Hercules  
 Pratt & Whitney (1 of 2)  
 Raytheon (1 of 2)  
 Tektronix  
 Wisconsin Public Service (1 of 2)  
 U. S. DOT - Federal Highway

### TUESDAY, FEBRUARY 25

Allis Chalmers (1 of 2)  
 Arthur Andersen  
 Deere & Co. (2 of 2)  
 Exxon (1 of 4)  
 Pratt & Whitney (2 of 2)  
 Procter & Gamble (4 divisions) (1 of 2)  
 Raytheon (2 of 2)  
 Wisconsin Public Service (2 of 2)  
 Naval Ordnance Labs

### WEDNESDAY, FEBRUARY 26

Allis Chalmers (2 of 2)  
 Alcoa  
 Exxon (2 of 4)  
 3M Co. (1 of 3)  
 Mirro Aluminum  
 Procter & Gamble (2 of 2)  
 SUMMER

### THURSDAY, FEBRUARY 27

Amer. Cast Iron  
 Carrier Corp.  
 Chicago Bridge & Iron  
 Container Corp. of America (2 of 2)  
 Exxon (2 of 4)  
 Honeywell (1 of 2)  
 3M Co. (2 of 3)  
 Wisconsin State Government

### FRIDAY, FEBRUARY 28

Baxter Labs  
 Borg Warner-Roy C. Ingersoll Research  
 Continental Can  
 Exxon (4 of 4)  
 Honeywell (2 of 2)  
 Limbach Co.  
 Oscar Mayer (4 of 4)  
 Republic Steel (2 of 2)  
 Westvaco

### MONDAY, MARCH 3

Argonne Labs R&D  
 Caterpillar (1 of 3)  
 Gulf Oil  
 Lakeside Labs  
 Litton Systems (1 of 2)  
 McQuay Perfex  
 Minnesota State  
 Nestle Co. (1 of 2)  
 Ohio Brass  
 Wisconsin Natural Gas  
 Wisconsin Power & Light (1 of 3)

### TUESDAY, MARCH 4

Louis Allis  
 Applied Physics (1 of 3)  
 Caterpillar (2 of 3)  
 Dairyland Power  
 I.B.M.  
 Litton Systems (2 of 2)  
 Oak Industries  
 Shell Companies (1 of 2)  
 Wisconsin Power and Light (2 of 3)

### WEDNESDAY, MARCH 5

Applied Physics (2 of 3)  
 City of Chicago  
 Collins Radio (1 of 2)  
 Heil Co. (2 of 2)  
 Hughes Aircraft  
 Indiana Dept. of Natural Resources  
 Mead Corp. (2 of 2)  
 National Cash Register

Shell Companies (2 of 2)  
 Sperry Univac-Data Processing (2 of 2)

### THURSDAY, MARCH 6

Collins Radio (2 of 2)  
 Harley Davidson  
 Fisher Controls  
 General Foods  
 Globe Union  
 Grede Foundries  
 Northern States Power  
 Peoples Gas  
 Rockwell International (1 of 2)  
 Sperry Univac-Defense Systems (2 of 2)  
 Xerox Corp.

### FRIDAY, MARCH 7

Battelle-Columbus (2 of 2)  
 Chicago North Western R. R.  
 Giddings & Lewis  
 M.C.A. Engineering  
 M.I.T. Lincoln Labs  
 Material Service  
 Reliance Electric  
 Rockwell International (2 of 2)

### MONDAY, MARCH 10

U.S.A.F. (1 of 2)

### TUESDAY, MARCH 11

U.S.A.F. (2 of 2)

### THURSDAY, MARCH 13

Procter & Gamble International (2 of 2)

### MONDAY, MARCH 17

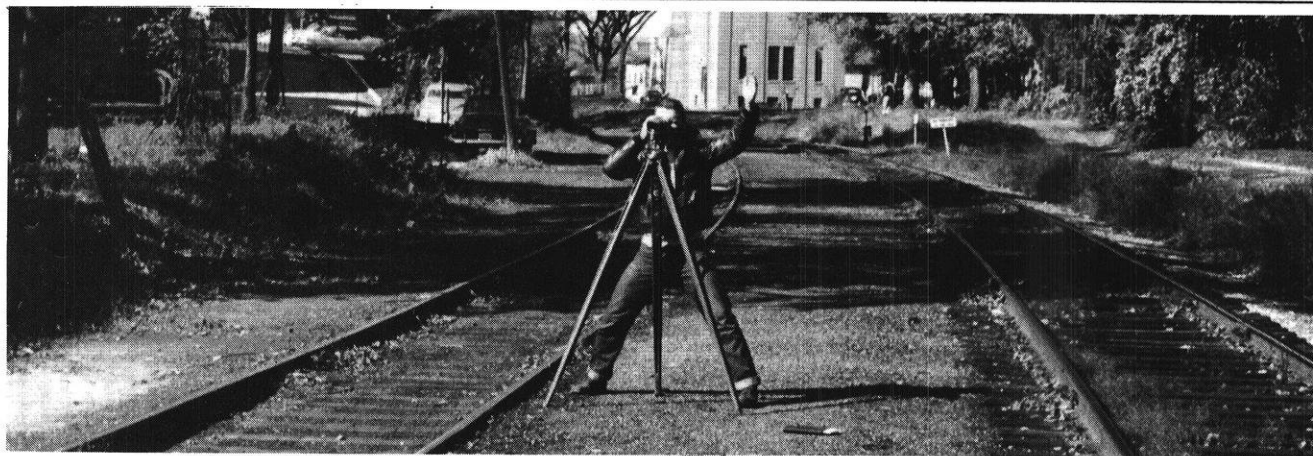
U. S. Marines (1 of 2)

### TUESDAY, MARCH 18

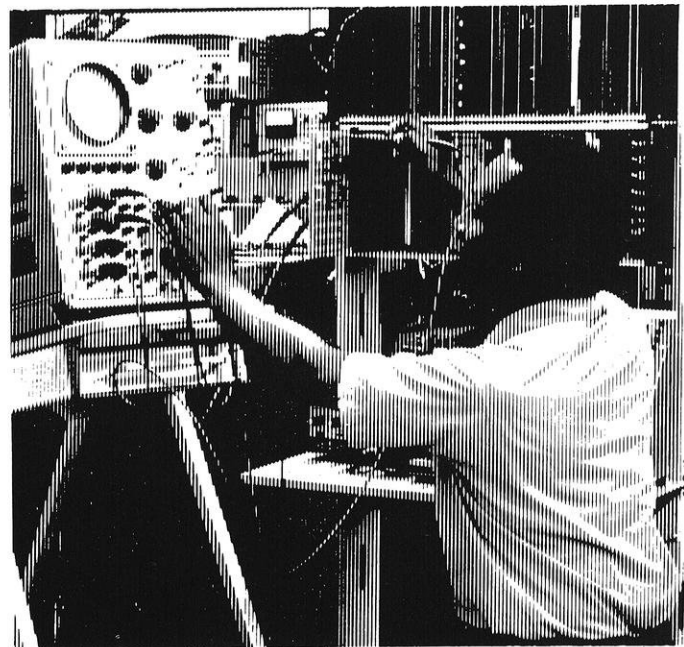
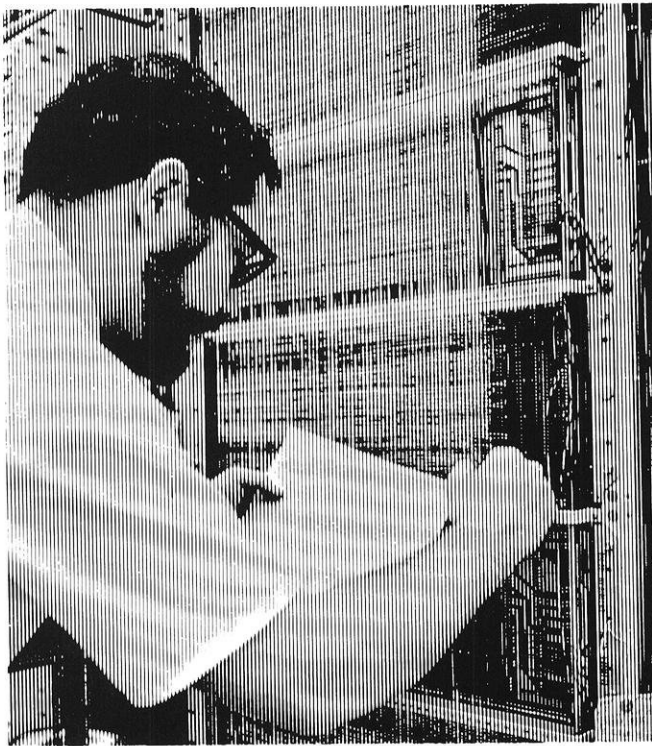
U. S. Marines (2 of 2)  
 U. S. Navy (1 of 2)

### WEDNESDAY, MARCH 19

U. S. Navy (2 of 2)



**LOOK FOR NEXT MONTH'S ISSUE FEATURING EXPO '75!**



## **17 GOOD REASONS TO START** **YOUR CAREER AT** **GTE AUTOMATIC ELECTRIC**

Why start out in the telecommunications industry? GTE AUTOMATIC ELECTRIC in particular? Because we're a dynamic company in a fast growing industry. Because we're creating, implementing, innovating, developing, progressing. Because we don't "slot" our new people, preferring to let them expand their skills in an exploratory atmosphere. Because we're diversified: nationally, internationally. Because we

offer small project groups. Because we need college trained graduates to help us continue our progressive ways. Because we hire without regard for sex, race, color, creed or national origin. But mostly because we provide the ideal environment for your career development. Send your resume to Coordinator of College Relations, GTE Automatic Electric, 400 North Wolf Road, Northlake, Illinois 60164 D-7.

**GTE AUTOMATIC  
ELECTRIC**

An Equal Opportunity Employer M/F

# What we're looking for hardest:

**B.S. or M.S. in Ch.E.**

**B.S. or M.S. in M.E.**

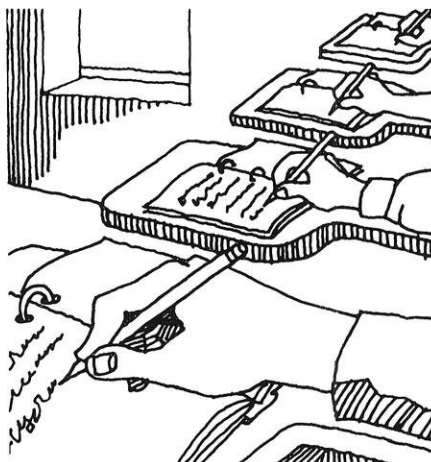
(Not that we want to scare off electrical engineers and industrial engineers. If you are one, ask us what's doing.)

# Who could probably do better elsewhere:



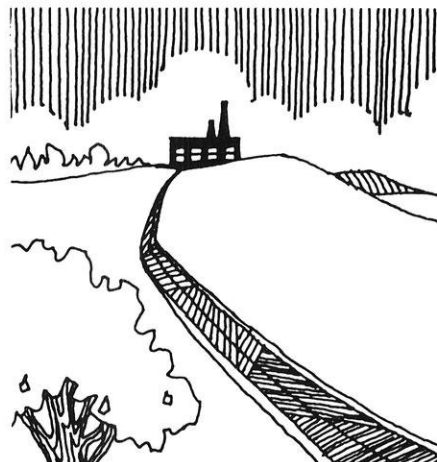
Prefers to live in no one locality for long.

(But we do often have openings for chemical engineers willing to migrate frequently while building a career in marketing.)



Wants lots more training before attacking real problems.

(We do try to scale your projects to your experience and beyond.)



Likes to keep a low profile.

(We don't operate as a collection of little plants scattered all over. You are in close daily contact with the big picture. You get to see where the interesting challenges are and to convince somebody you can meet them.)

Drop a note about yourself to  
**EASTMAN KODAK COMPANY**  
Business and Technical Personnel  
Rochester, N. Y. 14650



*An equal-opportunity employer f/m*

*Kodak engineers find their opportunities without moving far from  
Rochester, N.Y., Windsor, Colo., Kingsport, Tenn., Longview, Tex., or Columbia, S.C.*

# We're looking for engineers who were born to lead.

Are you the kind of engineer who has what it takes to move into management someday? If you are, you already know it.

Now what you need to know is which companies can offer you the best opportunities. We think you'll find General Electric is one.

We're a high technology company. And that means we have to have managers who understand technology — women and men — to run the place.

Today, over 60% of the top managers at General Electric hold technical degrees. In fact, over 65% of the college graduates we hired last year held technical degrees.

Of course, just leadership ability and a technical degree won't get you into management. First, you're going to need solid engineering experience and a broad understanding of business.

And we have a lot of ways to help you get it.

One is our Manufacturing Management Program. A two-year program of rotating assignments that gives you broad experience with different products and manufacturing processes.

Another is our Engineering Program. For engineers with an interest in product and systems design and development. There's also a Field Engineering Program, a Technical Marketing Program, plus a number of programs sponsored by product operations.

And all with just one aim. To give you all the responsibility and all the perspective you need to move into management. As fast as you can manage it.

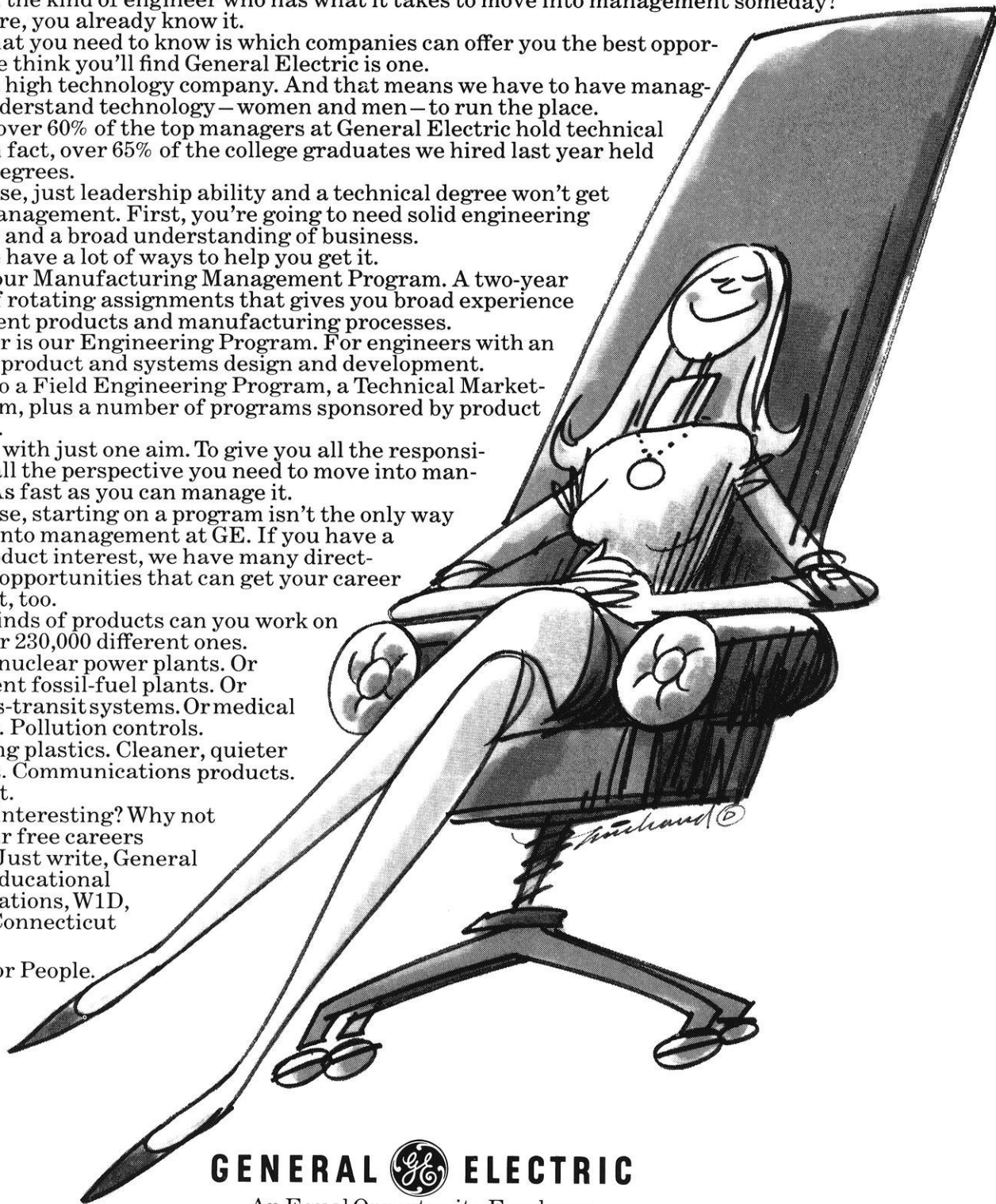
Of course, starting on a program isn't the only way to make it into management at GE. If you have a specific product interest, we have many direct-placement opportunities that can get your career started fast, too.

What kinds of products can you work on at GE? Over 230,000 different ones.

Maybe nuclear power plants. Or more efficient fossil-fuel plants. Or better mass-transit systems. Or medical equipment. Pollution controls. Engineering plastics. Cleaner, quieter jet engines. Communications products. You name it.

Sound interesting? Why not send for our free careers brochure? Just write, General Electric, Educational Communications, W1D, Fairfield, Connecticut 06431.

Progress for People.



**GENERAL  ELECTRIC**  
An Equal Opportunity Employer.