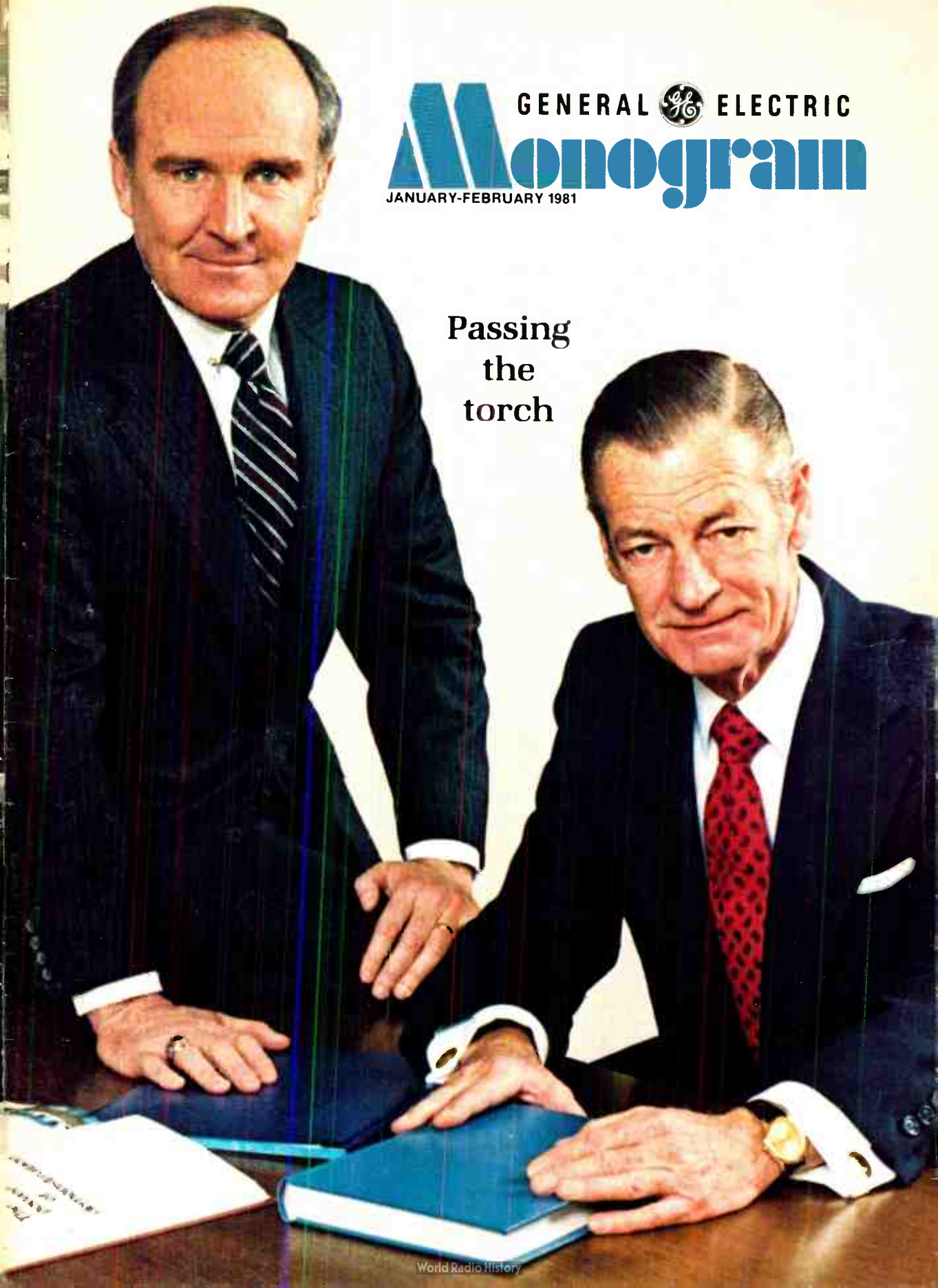
GENERAL ELECTRIC

Monogram

JANUARY-FEBRUARY 1981

Passing the torch



GENERAL ELECTRIC
Monogram

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On the cover: In December, GE Board Chairman Reg Jones announced his retirement, effective April 1. Jack Welch was named by the Board as Chairman-elect. For a story on the two leaders, with the 1981 Management Conference as a backdrop, see pages 2-7. Photo: Stan Blanchard.

The Monogram's purpose is to keep its readers informed on General Electric activities so that they may more effectively represent the Company in its relationships with the public. It is published bi-monthly by Corporate Employee Relations Operation—Frank P. Doyle, Vice President. Editorial supervision is by Frederick N. Robinson, Manager, Corporate Editorial Programs. Request permission to reprint articles from the Monogram Editor, Fairfield, Connecticut 06431.

THE COMPANY

Passing the torch

"REG, this is what we will remember most—your legacy of innovation and daring and creativity. You've set us off on a new course, a course that leads to high adventure for all of us in this innovative enterprise. And believe me, we're committed to making the most of it."

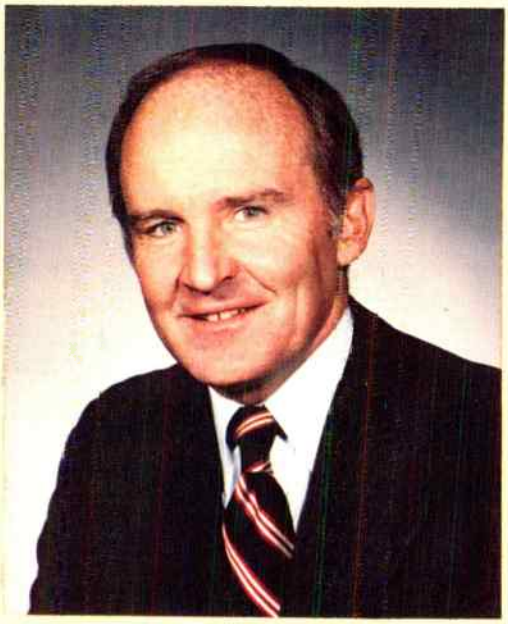
With this sentiment, Chairman-elect John F. Welch, Jr., introduced retiring Chairman Reginald H. Jones to the 1981 Belleair Management Conference.

It was Jones' last conference and his ninth since succeeding Fred J. Borch on Dec. 15, 1972, as General Electric's seventh chief executive officer. The conference was certainly his most emotional.

"Let me express my sincere thanks for the unstinting support and loyalty you have given me during my tenure," Jones said in his concluding remarks. "What successes and gains we have achieved are yours. I have been the fortunate fellow who had the privilege and the pleasure of representing you and being perhaps a catalyst who helped you fulfill your own destiny. You will forever have my heartfelt thanks."

As he quickly stepped down from the podium, Jones received a standing ovation.

Jones: A legacy of innovation, daring and creativity



Welch: Committed to making the most of that legacy

Retrospection is always part of the retirement scenario, and during his speech Reg Jones asked the conferees that "if you detect an occasional hint of sentiment or nostalgia, I beg your indulgence." He then cited what he felt were General Electric's achievements during his tenure as chief executive officer.

A "point of greatest satisfaction," said Jones, is the Company's record of "solid financial performance... growing our earnings about 14% a year, substantially faster than Standard & Poor's 400 stocks and the U.S. GNP. We had the pleasure of passing the billion-dollar mark in earnings, and we have a balance sheet that should give all of us confidence in our resources for the future."

Other achievements include:

Strategic planning. "There are many imitations, many companies who utter the shibboleth of strategic planning every time they meet with security analysts, but General Electric has made it work—and it is now a deeply imbedded element of our Company culture."

Entrepreneurship. "We've put together a new General Electric, a Company of entrepreneurs who have disposed of 73 tired businesses since I took office and developed or acquired more than 100 new ones."

A worldwide GE. "We have internationalized the Company, extending our marketing and manufacturing reach selectively—but aggressively."

Technological renaissance. "Of this we should be enormously proud, for it will have the most profound effect on our future."

Productivity. "We're launched on a productivity drive that should totally transform our factories and offices, and we've begun to build or retrain our human resources to accommodate the needs of the future."

The General Electric culture. "In a time when cultural values were eroding and such words as loyalty and honor almost became a joke, we deliberately strengthened the warm, unifying values that have marked the distinctive General Electric culture. And yet, while we honored our

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traditions, we have been at the forefront in developing the new breed of managers who are as much at home in Washington and the world as in the security of their private offices. If General Electric's leaders are valued and respected in the inner circles of government, business and academia—and they are—it's because of the tremendous support we have had from so many of you in establishing those credentials."

Speaking for the GE "Family," Chairman-elect Welch, in his introduction of Jones at Belleair, said:

"Within GE, within what could have become a large and arthritic bureaucracy, you have created a climate of entrepreneurship—a climate where people thrive on prudent risk and know they will be rewarded for their efforts.

"I think of the businesses created and the businesses acquired. The dramatic change in our earnings mix. The productivity drive. The battle to bring us into the electronics revolution. I think of your personal involvement with new ventures, your encouragement of managers who are willing to put it on the line. I think of the many ways in which you have transformed a Company that could have become old into a Company that can't wait for tomorrow."

"Intelligent, quick-minded and imaginative, yet pragmatic and possessed of sound common sense. Aggressive and perhaps impatient, yet orderly, logical and thoughtful. Focused on the future of our Company, yet sensitive and perceptive to the moods and expectations of society."

That portrait of John F. Welch, Jr., was made in January during the 1981 Management Conference by the man he is succeeding as Chairman of General Electric—Reginald H. Jones.

In his address to some 500 top Company managers gathered in the Belleview Biltmore Hotel in Belleair, Fla., Jones described Welch as the "prototype of the chief executive officer of the 1980s."

At 45, Welch is the youngest chief executive in General Electric's history—the eighth person to hold that post since the Company was founded.

The Belleair conference was the first time that Welch was able to meet with such a large number of fellow employees since his election by the Board of Directors as Chairman-elect. When

New responsibilities for vice chairmen

"John has internationalized the Company and has a world perspective missing from earlier administrations." *Reg Jones*

Reporting to John F. Burlingame:
International Sector
Power Systems Sector
Utah International, Inc.
Corporate Planning and Development Staff
Corporate Relations Staff

"Ed has amply proven his ability to create and grow businesses—the real business of General Electric." *Reg Jones*

Reporting to Edward E. Hood, Jr.:
Consumer Products and Services Sector
Industrial Products and Components Sector
Technical Systems and Materials Sector
Corporate Production and Operating Services
Corporate Technology Staff

the announcement had been made public in mid-December, Welch told the press that he was "the happiest man in America today" and "the most fortunate." To his GE colleagues at Belleair he repeated the quote, noting that "two weeks later, with some of the excitement behind us, I feel just the same—perhaps, if that's possible, even more so."

But looking out at the audience, at the people who will become his charges on April 1, Welch soberly added: "Beyond this very real emotion, I do understand the responsibility. I'm confident of my strengths and, more importantly, I'm gaining a better understanding of my limitations every day."

The son of a Boston & Maine railroad conductor, Jack Welch grew up in Salem, Mass. He was one of the top students academically in his graduating class in high school and still found time to captain both the golf and hockey teams and to play baseball.

In 1960, following graduation from the University of Massachusetts with a degree in chemical engineering and from the University of Illinois with advanced degrees, including a doctorate in chemical engineering, he joined General Electric as a process development specialist in Pittsfield's Chemical Development Operation.

From 1962 to 1965, he was responsible for the technical development of Noryl® resin. In 1965 he was promoted to manager of this new business. Three years later, he was named manager of the Chemical Development Operation. Welch's first general manager's position came in June 1968, when he was put in charge of the Plastics Business Department. He was then general manager of the Chemical and Metallurgical Division for four months before his election in February 1972 as a vice president. In 1973 he became vice president and group executive of the Components and Materials Group.

The next major move took place in December 1977, when he was promoted to senior vice president and sector executive of the Consumer Products and Services Sector and, at the same time, vice chairman of the General Electric Credit Corporation.

He became a Company vice chairman on Sept. 1, 1979.

"If we are to meet our goals in a troubled and difficult environment," Reg Jones said in his closing remarks at Belleair, "Jack will have to be demanding of you. But he will be supportive and considerate of you because he will seek your counsel and will listen. His success is inseparably linked with yours. Knowing and appreciating you as I do, I count on you to accord him the loyalty and support you have always given me."

Leadership in the Eighties

The 1981 Management Conference hears Reg Jones' call for a new breed of manager.

If American business is to survive the 1980s—forecast to be as turbulent as a typhoon—a new breed of manager is demanded.

And that manager, according to GE Board Chairman Reginald H. Jones, is going to need every ounce of courage, every touch of cool that can be mustered in the years ahead. "The world had its troubles in the 1970s, but I have a feeling that we'll be looking back on them as mere warm-ups for the complications of the 1980s."

Jones' warning came in his concluding remarks at the 1981 Management Conference at Belleair, Fla. Meeting with more than 500 top-level General Electric managers for the last time, he painted a sharp portrait of that breed of manager who will, in his eyes, shepherd business to a bright future.

"The winner's edge," he said, "the competitive advantage will go to those companies that have the kind of management needed to cope with the new and more complex challenges of the 1980s. And in my opinion, that's the kind of management we have assembled in this room—leaders for the world's most complex industrial enterprise."

What skills will the new breed of manager need in the years ahead?

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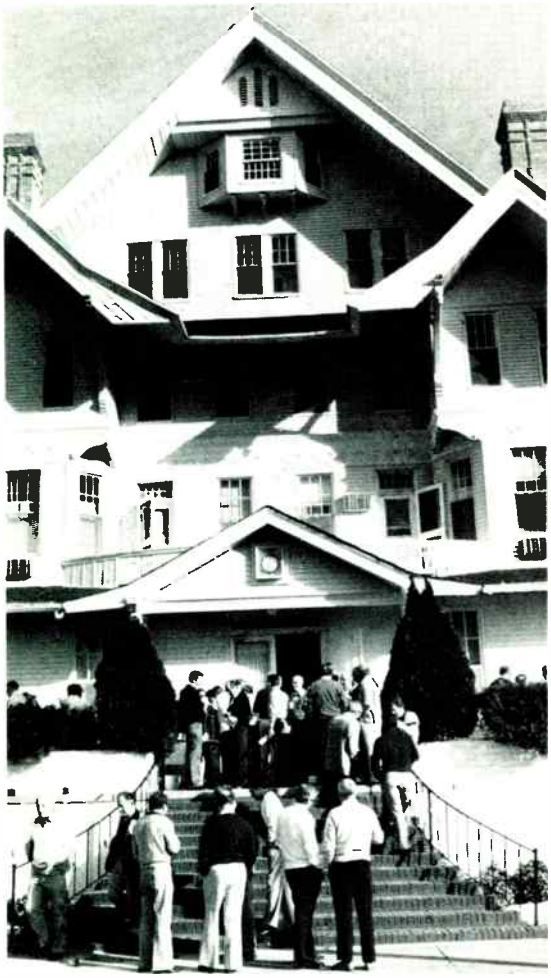


Along with reports by top GE executives, informal discussions such as the one above are key ingredients of the annual Belleair meeting.

"First of all," pointed out Jones, "the basic operational and entrepreneurial skills that a manager learns in the highly diversified and decentralized components of General Electric. We need entrepreneurs who are willing to take well-considered business risks—and at the same time know how to work in harmony with a larger business entity. The intellectual requirements are light-years beyond the requirements of less complex organizations."

He continued:

Financial sophistication. "People who cannot merely endure, but prevail in an environment of double-digit inflation and wildly gyrating international currencies. People who live by the harsh standards of inflation-adjusted accounting. People who understand that the balance sheet is every bit as important as the profit and loss statement."

Technical sophistication. "Wall Streeters think of us as the aging wonderboys of the electromechanical age, but they're waiting to see whether we can make it into the electronics age. We're going to show them that General Electric is determined to be the beneficiary, not the victim, of the microelectronics revolution. You must all advance our technological renaissance."

International habits of thought. "The illusion that we could concentrate on the huge United States market and let the rest of the world go by disappeared forever in the 1970s. General Electric is a *world-class* company, and it needs world-class managers."

Social conscience. "We are now seen—properly, I think—as a social institution, with responsibilities to society that go beyond the need to make money for our share owners. We are stewards for a unique configuration of productive assets that is significant to the nation and indeed to the future of humankind. We must see to it that these assets are not squandered, mismanaged or directed toward socially destructive ends."

Sensitive to society's expectations. "So the competitive advantage will also lie with managements that are sensitive to the expectations of society, with respect first to a quality product or service of real value, but then also with respect to clean air and water, toxic wastes, occupational safety, product safety and reliability, equal opportunity and many other issues that formerly had a lower priority."

Political activism. "And because governments everywhere are a much more intrusive factor in business life, our managers in the '80s will necessarily have habits of political activism that would, in an earlier day, have been regarded merely as a diversion from the real work of managing. On this matter I speak from deep personal conviction. General Electric has earned a position of leadership in the business community because the whole organization is permeated with politically conscious managers. I hope we will not abandon that heritage in the busy times ahead."

Ethical integrity. "But none of our managers will have very much credibility with a highly skeptical public unless we also demonstrate a

trait that has ancient roots in General Electric. I refer to the trait of ethical integrity."

Moral center. "People more or less expect technical competence and economic performance from the large corporations. They are looking for something more: some evidence that we are operating from principles higher than mere expediency; some assurance of a moral center. Without that moral center, our public franchise is at risk."

And what kind of Company will the new breed of manager have in the turbulent 1980s?

"Obviously," noted Jones, "we will be big — with all the advantages and disadvantages that go with such high visibility.

"But size is not the most important criterion. What's different about General Electric — what gives us our unique potential for social as well as economic performance — is our mode of operation. General Electric is not merely in the electrical business, or any other particular business. This Company has moved forward into a new dimension of industrial capability that Wall Street is only vaguely beginning to comprehend. We are in the business of creating businesses. Yes, creating businesses to anticipate and serve the needs of a changing world. We have assembled what may be the most diversified body of talents in the world, and organized them into components that are each pushing and probing for new and profitable ways to put those talents to work.

"What businesses we will be in — what new sources of earnings will emerge — is something that no one can foresee with certainty. Some of the main lines of opportunity are already visible, but others are still over the horizon — perhaps even now, in your fertile minds."

Welcome to General Electric's amazing worlds of electronics

With that greeting, Belleair conferees were invited to tour a truly amazing exhibit. Covering about 7,000 square feet at the hotel, the exhibit included more than 100 displays showing how electronics technology is being applied across the Company.

The examples were divided into the six key worlds of electronics:

- The World of Products;
- The World of Productivity;
- The World of Services;
- The World of Human Resources;
- The World of Technical Resources;
- The World of Emerging Technologies.

The exhibit had a two-fold purpose: to update GE management on the Company's progress in these worlds of electronics; and to stimulate managers into thinking about ways they can apply the new electronics in their products, processes and services.

Segments of the exhibit, which was designed specifically for Belleair, will reappear at the Technical Management Conference later this year and at various trade shows and Company locations.

Monographs

Star-gazing. Students at Rensselaer Polytechnic Institute have become starry-eyed this year because of a recent gift from GE: this 16-inch-diameter reflecting telescope.

The Company purchased the telescope in 1963 for its Radio Optical Observatory (now called Earth Station Laboratory) in Schenectady, where it was used to observe satellites and faint stars.

Shown here at the dedication inside the newly renovated Hirsch Observatory at RPI are (l-r) Donald Hirsch, class of '65; RPI president and GE Director George M. Low; and GE's Dr. Leroy S. Moody, research and development manager, Materials Science and Engineering.

Billion-dollar record. The Leasing and Industrial Loan (LIL) Department of GE Credit Corporation became the first financial institution in the world to purchase and lease a billion dollars' worth of capital equipment in one year.

Included in the $1.1 billion of leasing in 1980 are 15 commercial aircraft, 33 helicopters, 14,000 rail cars, barges and locomotives. The LIL portfolio now includes equipment with an original purchase price of $4.8 billion.

A significant aspect of the billion-dollar record for GE employees is that the increased investment tax credit from these purchases will result in more than $10 million of contributions to the GE Employee Stock Ownership Plan.

Lighting up with LEO. This 26-foot-long van embarked on a three-year Lighting Education Odyssey in January. Sponsored by the Lighting Business Group, the LEO van is a sophisticated conference room on wheels, designed to inform selected audiences about new strides in energy-efficient lighting.

Starting in the southeastern United States, the LEO van will carry its message to government leaders, commercial and industrial users, electric utilities, lighting designers, architects, consulting engineers and electrical distributors. It utilizes video tapes, computer graphics and live demonstrations to present solutions to lighting and energy needs.

In addition to the big van, there'll be six smaller (but similarly equipped) vans, one for each of the six GE regional lamp offices in Boston, Atlanta, Detroit, Chicago, Dallas and Oakland.

The LEO vans follow on the tread marks of the nine Lamp Progress Express vans, which traveled more than 500,000 miles and brought the lighting energy conservation story to more than 100,000 people during the past four years.

Fire when ready. That's a 16-inch battleship gun from the U.S.S. *Colorado* being loaded by Joe Rocco of Cleveland's Tungsten Products Plant. Purchased from the U.S. Navy in 1960, the 60-foot, 115-ton gun was shortened to 20 feet and converted into a hydropress for molding tungsten and molybdenum parts.

"We can make just about any shape you can come up with," says Rocco, shown here loading the gun with molds containing tungsten powder. After closing the breech, he "fires away," pumping up water pressure inside the barrel to 35,000 psi. The powder is compressed in the mold and later sintered in a furnace for maximum density.

Battleship guns, such as this World War II forward turret gun, make perfect presses because their walls are built of many layers of metal, designed to withstand the tremendous internal pressures when firing shells.

Town meetings can be fun. A group of 70 top high-school students from the Delaware Valley recently enjoyed a unique four-day meeting: the third annual Town Meeting on Tomorrow (TMOT), sponsored by General Electric's Aerospace Business Group.

Held in Valley Forge, Pa., TMOT gives young people an introduction to the free enterprise system and an insight into how it affects their lives. This year's program included meetings and discussions with government, civic and business leaders, including many GE managers in fields where the students have shown a career interest. A special session with three Philadelphia sports personalities — Phillies catcher Tim McCarver, sportscaster Don Tollefson and Eagles linebacker Reggie Wilkes (shown here standing l-r in the back row) — covered the business of sports.

The students also toured the GE Space Center at Valley Forge and the Company's Reentry Systems Division headquarters in Philadelphia.

Honors. General Electric's Arthur M. Bueche, Senior VP for Corporate Technology, co-chaired President-elect Reagan's technology task force to help formulate policies concerning scientific and technological matters.

• Board Chairman Reginald H. Jones received the 1980 Service to Democracy Award from The American Assembly, which brings together distinguished representatives from different sectors of the society to examine issues of national importance and to recommend courses of action.

• *Materials Engineering* magazine presented its 1980 Grand Award to the GE Miniature Lamp Department for developing the new all-plastic halogen automobile headlamps.

• Schenectady's Dr. Robert A. Thompson, mechanical engineer in the Process Physics Program at the Research and Development Center, received the Blackall Machine Tool and Gage Award from American Society of Mechanical Engineers.

• Rice University named Jennings A. Massingill, manager of Generator Product Engineering, Large Steam Turbine-Generator Division at Schenectady, as its Outstanding Engineer of 1980.

Probing the galaxy

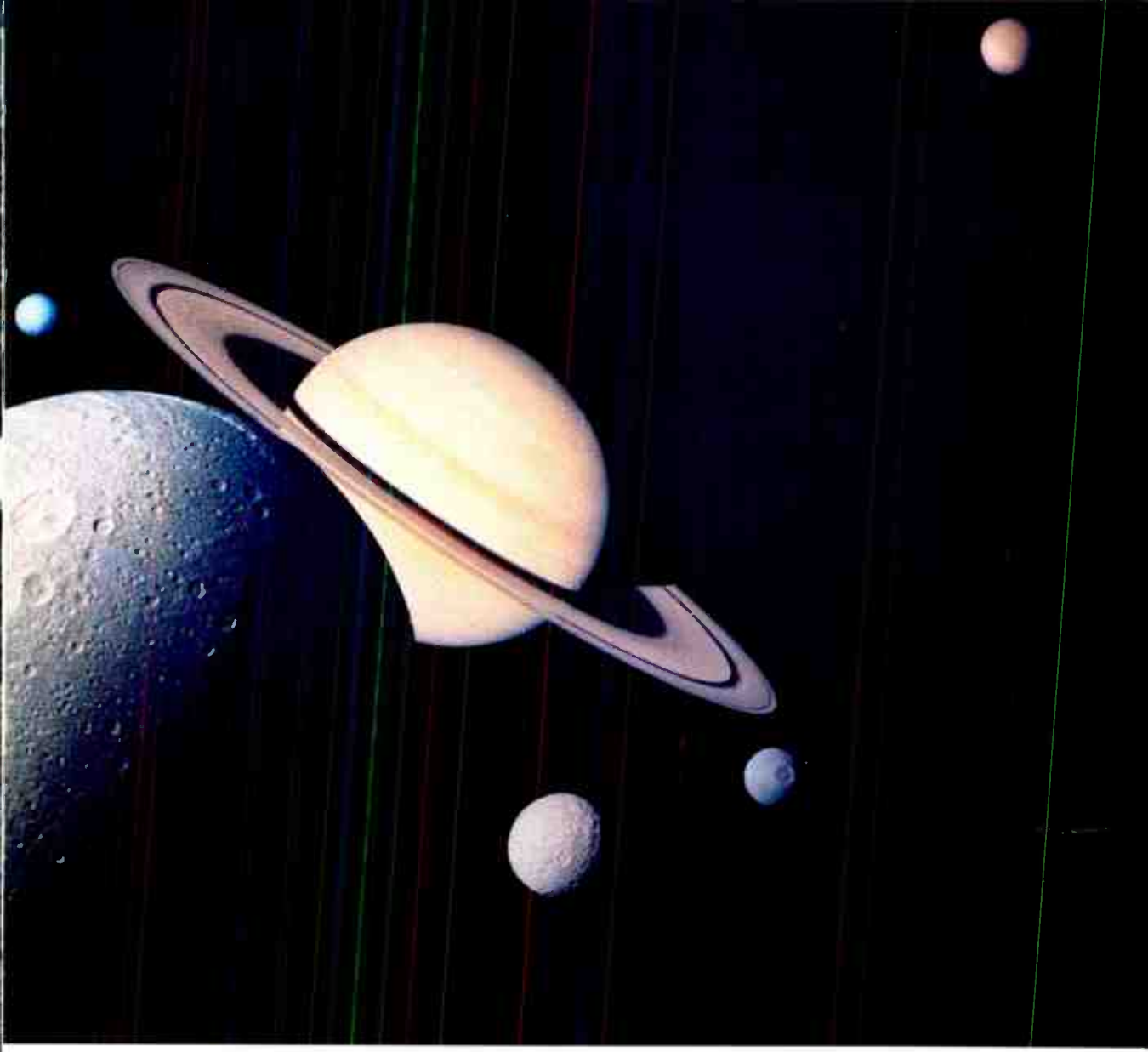
Almost a billion miles from earth, two GE-equipped spacecraft continue their fantastic voyage through the solar system — and beyond.

GE employees inspecting *Voyager* model at Jet Propulsion Laboratory, where they provide engineering support, are (l-r) Patrick Fitzgerald, Edward Nagle, Eugene Hanover and Howard Marderness.

Photo courtesy NASA

AS YOU READ THIS, *Voyager I* is hurtling through the blackness beyond Saturn at nearly 64,000 miles per hour. Its destiny: to escape the solar system in 1989 and drift silently in interstellar space.

At the same time, its identical twin — *Voyager II* — is fast approaching its own close encounter with Saturn, giving earth a second scintillating view of the mysterious ringed



A montage of *Voyager I* images shows Saturn rising behind Dione and surrounded by its rings and five other moons: Tethys and Mimas to the right, Enceladus and Rhea off Saturn's rings to the left, and Titan in its distant orbit at the top.

planet in August.

Two fantastic flights to discovery — both equipped by General Electric's Aerospace Business Group.

The *Voyager* probes, launched in 1977, are each powered by three multi-hundred-watt radioisotope thermoelectric generators from the Space Systems Division. "These units supply all the electrical power for *Voyager's* cameras, scientific instruments, communications equipment and maneuvers in space," notes Ernest W. Williams, manager, Nuclear and Conservation Programs at Valley Forge, Pa.

Using thermoelectric conversion, the 80-pound generators convert heat from the radioisotope directly into electricity currently producing about 430 watts of electric power aboard each probe. The generators are necessary because solar cells, the usual source of electric power for spacecraft orbiting the earth, are not effective at great distances from the sun. (*Voyager I* is more than 900 million miles from earth; its twin almost 800 million miles.)

In addition to generators, General Electric — through the Aircraft Equipment Division — supplied the computer command subsystem (CCS) and the multi-layer circuit boards for the flight data subsystem

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(FDS) aboard *Voyager*.

The CCS acts as spacecraft pilot, carrying out programmed commands that operate 10 scientific instruments, maneuver the craft and orient cameras during flight. It also receives instructions from earth for immediate or future changes in the flight plan.

However, because one-way communication between *Voyager* and earth would take about 85 minutes when the craft neared Saturn, the CCS was designed to check flight operations and, if necessary, make adjustments by itself. "*Voyager* is an automated machine with its own survival capability," adds GE's James E. Kushner, sales manager, Space Electronics Systems in Utica, N.Y.

The FDS, meanwhile, is the on-board data management system. It processes, for transmission to earth, all data acquired by the probes on their journeys to Jupiter and Saturn.

And what journeys they've been! Planned by the National Aeronautics and Space Administration (NASA) in the early '70s, the *Voyager* probes have stirred imaginations — and raised scientists' eyebrows — since their launchings.

Saturn, like Jupiter (*Monogram*, Sept.-Oct. '79), was full of surprises. Among the startling finds by *Voyager I:*

- There are hundreds of rings surrounding Saturn, instead of six, as previously believed;
- Braided rings, lopsided rings and dark "spokes" radiating from the planet through its brightest ring seem to defy the known laws of astronomy;
- At least 15 moons orbit the yellow-banded planet, including three that had never been seen before;
- Some of Saturn's moons are fractured and cratered almost to the point of disintegration;
- Titan, Saturn's largest moon, may have lakes of liquid nitrogen under a haze that's 175 miles thick;
- Wind speeds at Saturn's equator exceed 1,000 miles per hour, almost five times greater than wind speeds on Jupiter.

"Every day there was something new," recalls Edward Nagle, one of several GE employees providing technical support at the Jet Propulsion Laboratory (JPL), the *Voyager* mission control center in Pasadena, Calif. Adds Nagle: "I felt like a crew member on Christopher Columbus' ship when he discovered America."

Voyager II's visit to Saturn promises to be just as exciting. Because it's on a different trajectory, *Voyager II* will study some of the moons and parts of the rings that were bypassed by her sister spacecraft. *Voyager II* will then speed off for a 1986

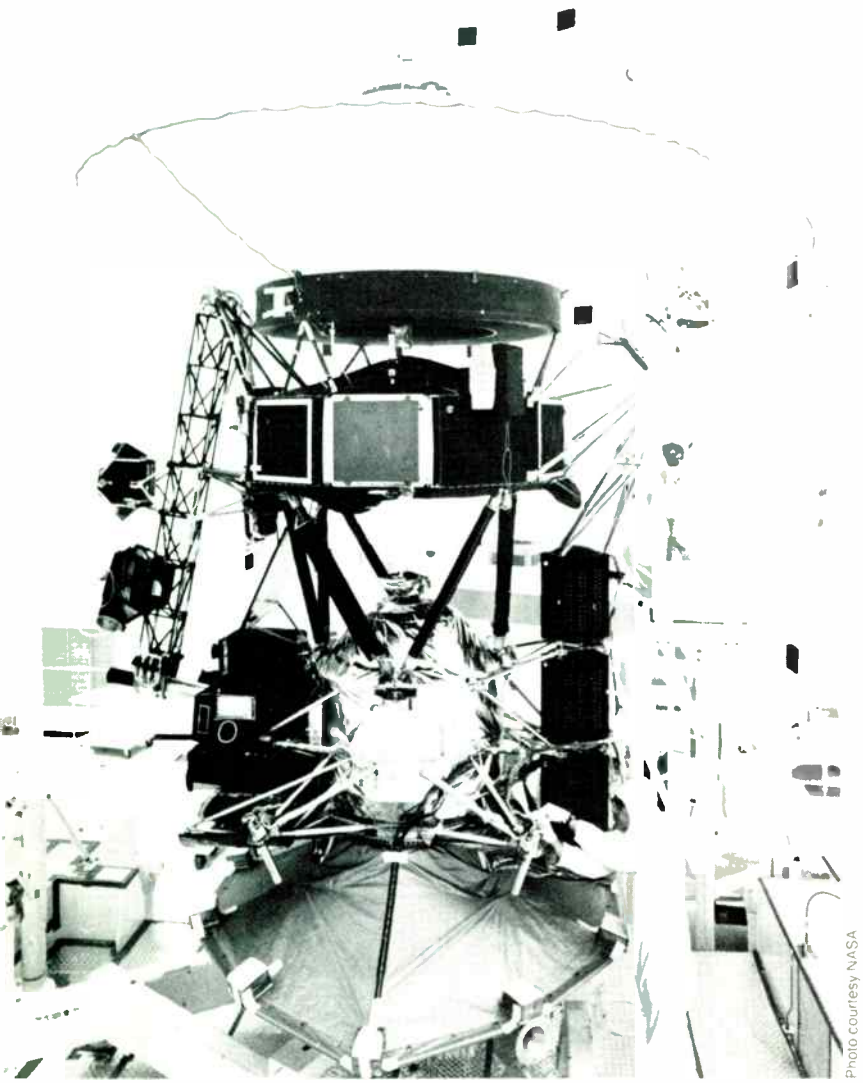


Photo courtesy NASA

***Voyager* probe, shown here being assembled at Cape Canaveral, Fla., weighs less than a small car. The bowl-shaped antenna on top is 12 feet in diameter.**

encounter with Uranus, and possibly even a 1989 encounter with the relatively unknown world of Neptune, some 2.8 billion miles from the sun.

While the *Voyager* spacecraft continue their 12-year odyssey through the solar system, two other space missions being equipped with General Electric components are scheduled for launch in the mid-'80s.

International Solar Polar, a joint effort by JPL and the European Space Agency, will put two satellites into orbit to study the sun's uncharted polar regions. Both satellites will be powered by new generators from Valley Forge's Advanced Energy Programs Department.

Another GE generator will power *Galileo* as it orbits Jupiter and drops a probe into the Jovian atmosphere. The probe, being built by General Electric's Re-entry Systems Division in Philadelphia, will enter the atmosphere at 107,000 miles per hour. Its descent slowed by parachute, the probe will study the structure and composition of Jupiter's atmosphere, which many scientists believe holds clues to the origin and development of the solar system.

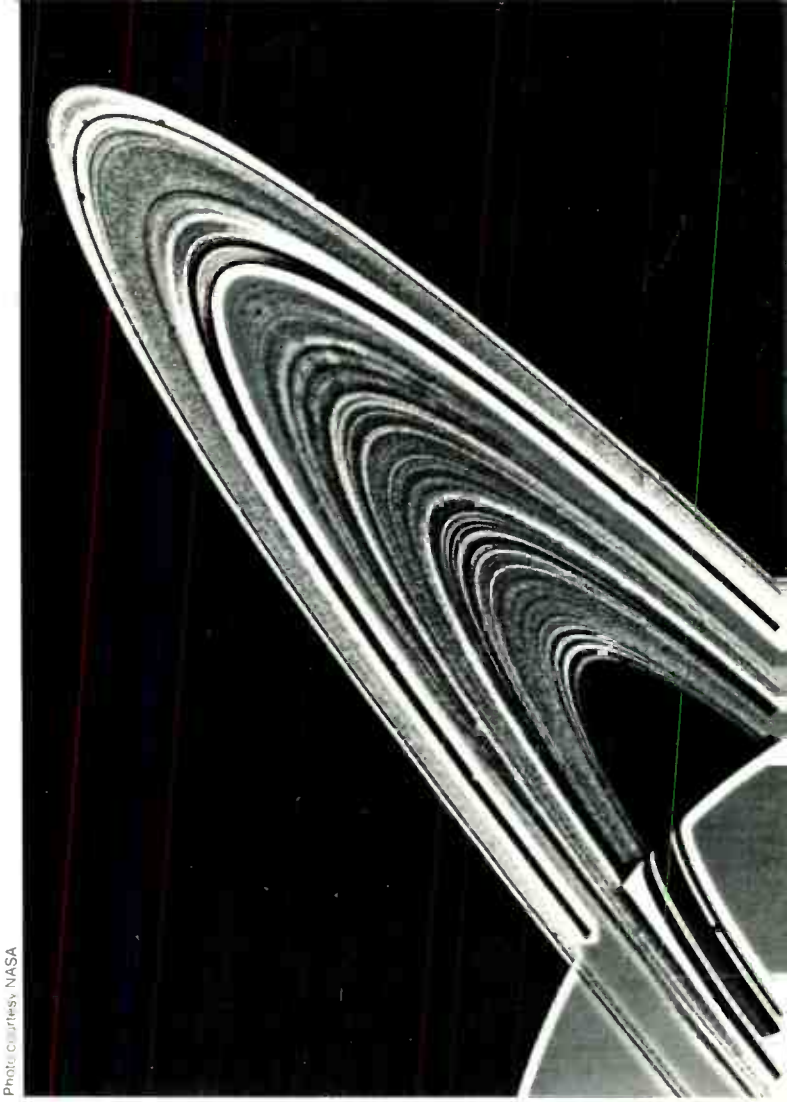
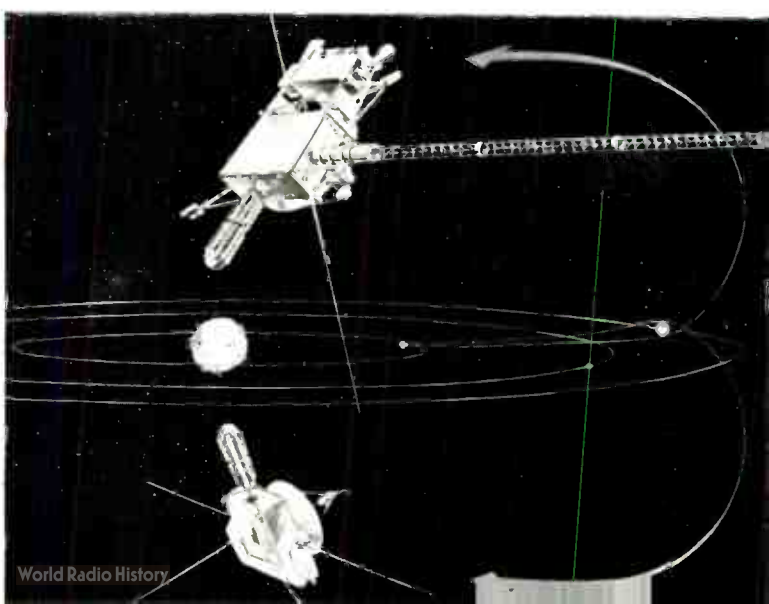


Photo courtesy NASA

The rings of Saturn, once believed to be only six in number, turned out to be extraordinarily complex when seen by *Voyager* at a range of five million miles. GE supplied the power source and computer control subsystem that made these images possible.



GE also is supplying components for the *Galileo* mission (above) and International Solar Polar (right).

RESEARCH

Predicting earthquakes

General Electric scientists believe radon gas may serve as warning signals of impending earthquakes.

AS ITALIANS in the mountain villages east of Naples were sitting down to their Sunday supper last Nov. 23, a vicious earthquake struck without warning.

Collapsing whole towns into rubble and killing thousands of people, it was the worst earthquake to hit Italy in more than a half-century. Yet the terrible death toll might have been avoided if the people there had been warned in time to flee to safer ground.

Unfortunately, earthquake prediction is not an exact science. Not yet, at least. But scientists are trying to change that, and are launching extensive studies of everything from alterations in the earth's surface tilt and magnetic field to changes in the ability of rock to convey sound waves. The new data will help them determine when, if, and to what extent earthquake prediction will ever be possible.

Among these scientists are two from General Electric's Research and Development Center in Schenectady — Drs. Robert L. Fleischer and Antonio Mogro-Campero. They have been investigating changes in the concentration of radon gas just below the earth's surface and the relationship of these changes to the incidence of earthquakes. (Radon is a gas released by the radioactive decay of uranium, a radioactive element found throughout the earth's crust.)

According to the GE scientists, changes in radon concentration are related to the motions of gases and liquids in the "subsurface atmosphere," which, in turn, are related to changing stresses deep within the earth's crust. Thus, radon concentration measurements may prove useful for predicting earthquakes — the release of these tremendous stresses.

The correlation between changes in the concentration of radon and impending earthquakes is now being tested at several sites around the world. But first, to understand earthquakes, you must know something about "plate tectonics" and "continental drift."

The earth's crust, according to most geologists, consists of several major plates and a few smaller ones — all in constant motion. The plates are pushed along at speeds of just a few centimeters a year by convection — a dynamic process that discharges heat from the earth's core.

This shifting of the plates — the boundaries of which contain the world's major seismic regions — has been going on almost since the creation of the earth and is the key to the theory of "continental drift." At one time there was just one land mass. But it broke up, and over the ages huge chunks drifted apart. Looking at a map today, you can see how the five continents could fit together like pieces in a jigsaw puzzle.

Left: The aftermath of Italy's severest earthquake in 65 years. Right: GE scientists Robert Fleischer (l) and Antonio Mogro-Campero.

High in the Adirondack Mountains of New York is Blue Mountain Lake, dotted with pine-covered islands and known for its seismic activity. It is here since 1975, and more recently at three sites along a major seismic belt in Alaska, that Fleischer and Mogro-Campero have been carrying out their radon experiments.

In a speech before the American Geophysical Union in December, Fleischer, detailing some results of these experiments, presented a theoretical model that demonstrated how radon gas could warn of an earthquake as much as 2,400 miles away. His explanation follows.

In this theoretical model, the earth is treated as a body composed of an elastic material containing a "stress center," the release of which would cause an earthquake. For years scientists have studied the effects of stress centers on various elastic materials, such as rocks, metals and plastics, and have developed a well-established theory that describes how the magnitude of the stress varies with distance from the central point.

On this basis, Fleischer has predicted the distances at which earthquakes of various magnitudes on the Richter scale should be able to exert stresses strong enough to affect radon flow in crustal rocks. His calculations show that a tremor registering 7.7 on the Richter scale should influence radon flow as far away as 2,400 miles.

He suggests that an extensive network of radon-monitoring stations would be useful in providing early warning of impending earthquakes. Such a network would help seismologists chart the outer limits of a region of radon anomalies. The impending earthquake would be expected to occur near its center.

Then, according to Fleischer, once the magnitude and location of the expected earthquake had been estimated, research performed by other scientists — who have related the duration of premonitory signals with magnitude — would allow the approximate time of the earthquake to be predicted.

"The flow of radon gas," Fleischer recently told the *Monogram*, "is certainly one of the factors that should be considered in predicting earthquakes."

And in Haicheng, China, in February 1975, indeed it was.

Chinese scientists, detecting warning signs — including sudden releases of radon gas — were able to warn the heavily populated city. Officials closed schools and shops and ordered an evacuation. Then in the night the ground began to tremble and a quake measuring 7.3 on the Richter scale struck. The death toll was low — about 300. Without warning, according to the Chinese, it would have been well over 100,000.

The return of the ceiling fan

IN 1882, just six years after the invention of the electric light bulb, the General Electric Company and its competitors were hard-pressed to meet the demand for one of the first electric appliances to win acceptance from consumers—the ceiling fan. So popular were these fans that, at the St. Louis World's Columbia Exhibition in 1893, a special commemorative model enjoyed record sales.

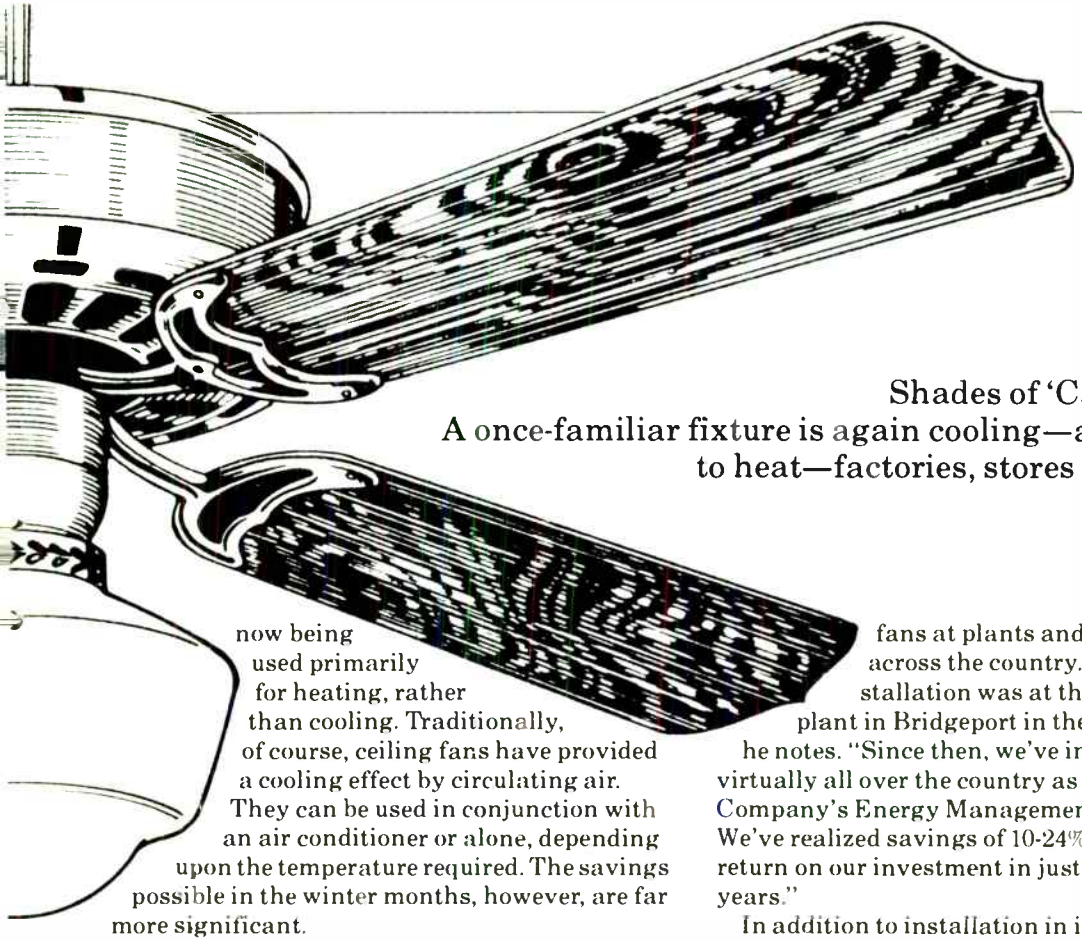
Throughout the early decades of the 20th century, ceiling fans circulated the air on luxury ships such as the *Titanic* and trains such as *The 20th Century Limited* and set off a craze when they revolved slowly over the heads of Humphrey Bogart and Ingrid Bergman in the 1942 movie, "Casablanca." In the southern United States, particularly, the fans were enormously successful, being used to cool the high-ceilinged rooms in plantation homes. It was only with the advent of air conditioning that sales of ceiling fans began to decline, and all but a few manufacturers went out of the business.

Today, however, ceiling fans are an idea whose time has come again. With fuel prices climbing ever higher, energy-conscious homeowners are finding that, in addition to recalling the charm of an earlier era, the fans offer substantial energy savings year-round. This awareness has spread to industrial and commercial users as well. Last year, domestic sales of ceiling fans totaled more than 5 million units. And, though General Electric no longer makes the fans, the Company is reaping the benefits of this new market through Fort Wayne's Specialty Motor Department, which provides the fan motors for some of the industry's leaders.

Says Guy F. Rhoades, manager—Marketing for the Specialty Motor Department: "The ceiling fan business has exploded with many new manufacturers entering the market. Specialty Motor is the leading producer of fan motors for the air conditioning industry, and we've modified existing motors for very low speeds and unique mechanical features to provide flexibility and cost savings for these new customers." He adds: "Quick attention to this emerging new market opportunity has provided significant volume growth for General Electric. Our sales to the ceiling fan industry increased more than sevenfold in 1980 and will more than double this year."

Perhaps the most intriguing aspect of the renewed interest in ceiling fans is that they are

More and more builders are beginning to use ceiling fans in new homes. Here, a combination fan/lighting fixture graces the kitchen of a model home in Fairfield, Conn.



Shades of 'Casablanca'! A once-familiar fixture is again cooling—and helping to heat—factories, stores and homes.

now being used primarily for heating, rather than cooling. Traditionally, of course, ceiling fans have provided a cooling effect by circulating air. They can be used in conjunction with an air conditioner or alone, depending upon the temperature required. The savings possible in the winter months, however, are far more significant.

Warm air rises and remains trapped near the roof, especially in a building with a high ceiling. The floor area, where workers are, is relatively cold. Ceiling fans set on reverse or slow speeds blow the warm air down so that less heat is required at floor level and, in doing so, also reduce the temperature differential inside and outside the roof, resulting in less heat loss.

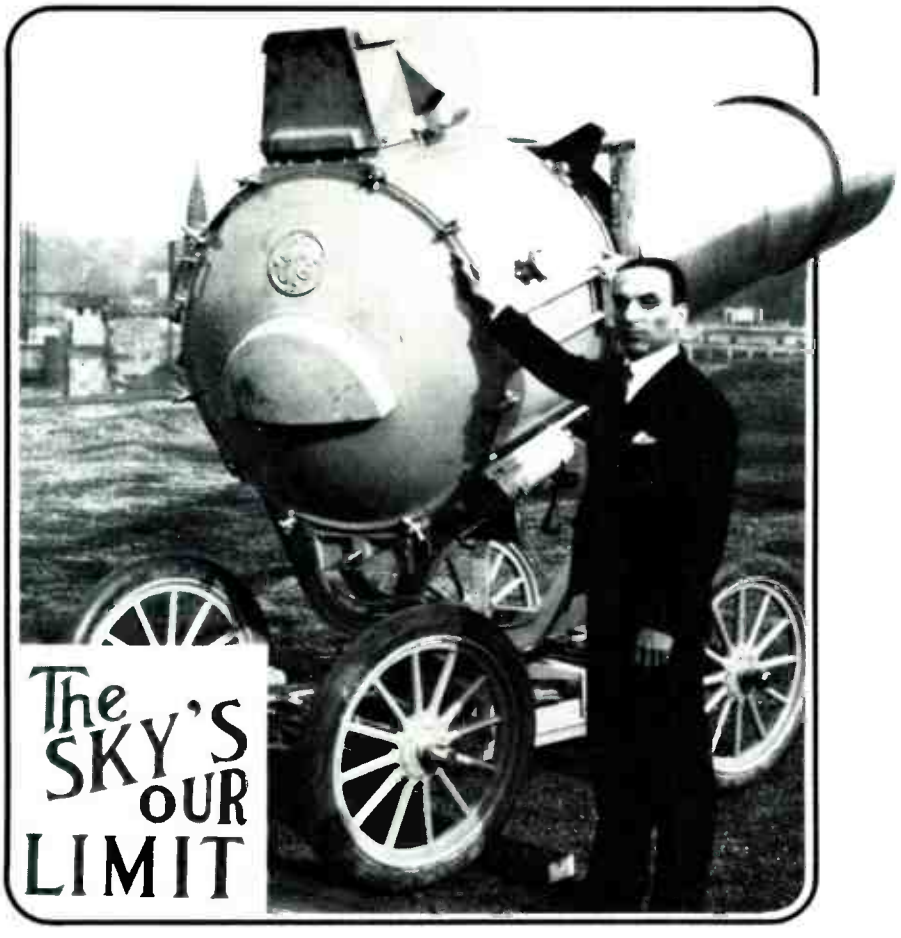
The energy-saving aspects of ceiling fans are borne out by Henry E. Heddesheimer, manager—Plant Engineering Consulting, who says that General Electric has tried out several types of fans at plants and warehouses across the country. "Our first installation was at the Wire & Cable plant in Bridgeport in the mid-1970s," he notes. "Since then, we've installed them virtually all over the country as part of the Company's Energy Management Program. We've realized savings of 10-24%, giving us a return on our investment in just one to three years."

In addition to installation in industrial plants and warehouses, the fans are being extensively used in commercial buildings such as greenhouses, hotels, supermarkets, gymnasiums, auditoriums and churches. It is in the consumer sector of the market, though, that most fan manufacturers see their real opportunity: approximately 90% of the fans being sold are designed to be part of lighting fixtures. Many companies are marketing the fans as "ceiling furniture," offering finishes, blades and accessories designed to match the decor of any room in the home.

At full speed, many fans use energy equivalent to that of only a 100-watt bulb and cost less than a penny an hour to operate, a fact which Houston Lighting and Power is advertising to persuade consumers to install them. Says Dennis Davenport, marketing manager for Casa-Blanca Fan Company, one of the largest U.S. manufacturers of ceiling fans: "It's not unusual for a family to start with a ceiling fan in their den or living room, and later add them to all the bedrooms. In addition to being energy-savers, these fans will someday be heirlooms."

Elaborate New Orleans-style ceiling fans are used for both cooling and circulating heat in the indoor courtyard at Springfield, Mo.'s Hilton Inn. The courtyard boasts a terrace restaurant, pool and putting green.

GE's historical photos: **2**



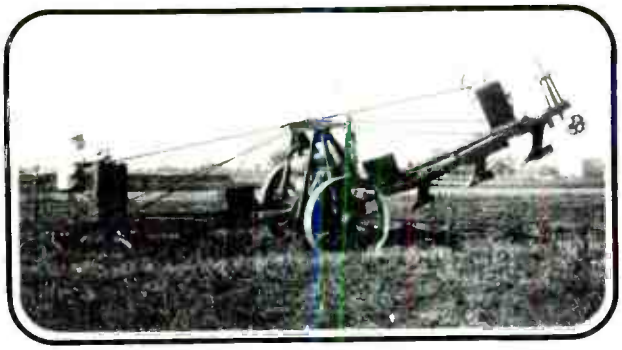
Aerograph projector was a device that could put advertising images or other messages onto clouds. Placard sums up estimate of business's potential.

Marvels that never made it

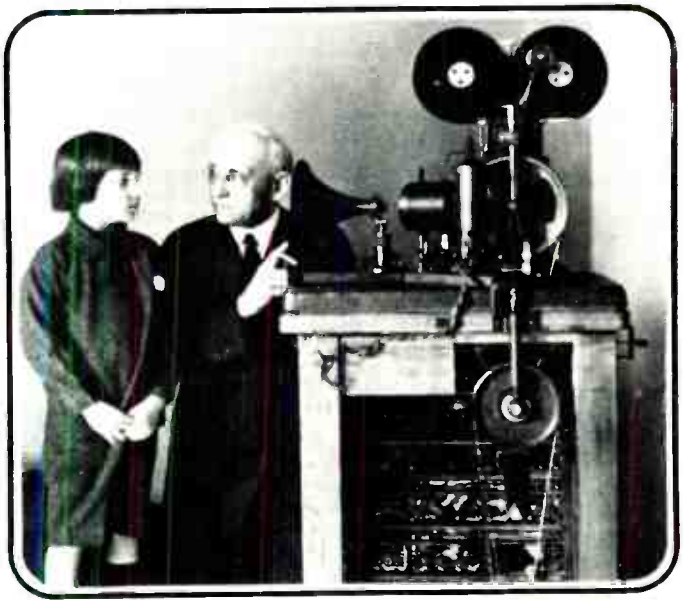
Even a cursory look through General Electric's historical photo file, now being restored and catalogued, impresses one with the restless imaginations of GE people down through the years.

Not all the fruits of this creativity have endured. Inevitably, some developments that must have seemed exciting and promising to their creators have bitten the dust.

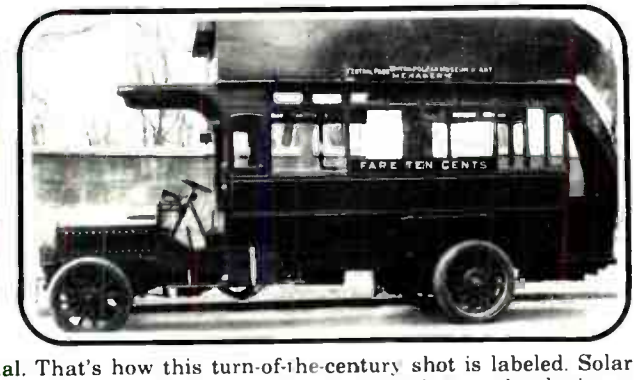
Here, in a continuing series of treasures from the GE file, is a sampling of innovations that never got off the ground, marvels that never made it.



Electric plow. Early on, GE people kept trying to develop a business in farm machinery. Was this an example? There's no telling—the two-word caption and this image are all that remain. **Combination.** A table fan and portable lamp in one busy unit.



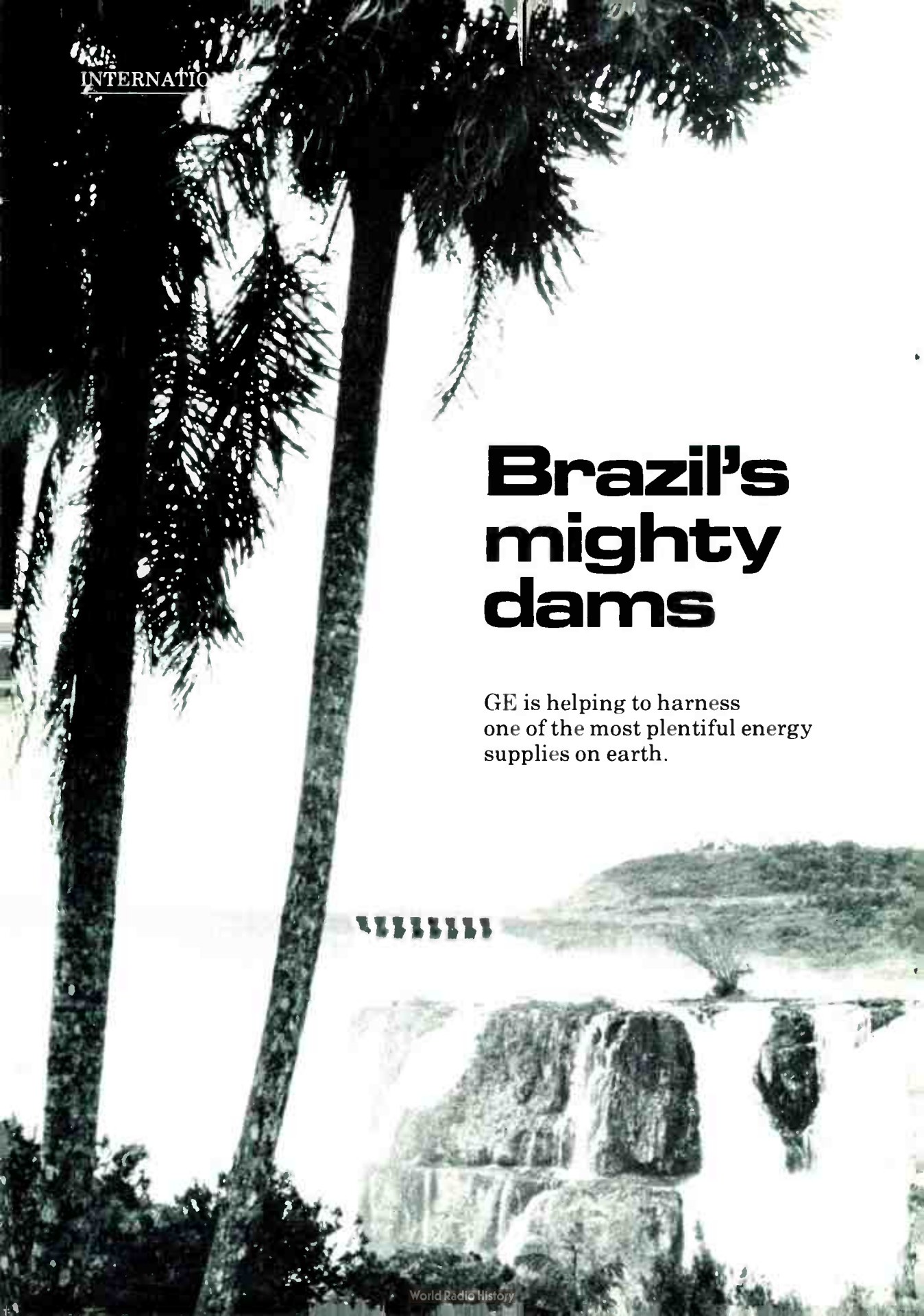
Pallaphotophone invented by C. A. Hoxie, shown here with child star Jackie Coogan, almost set GE up as a producer of talking movie equipment. Almost.



Solar heating—experimental. That's how this turn-of-the-century shot is labeled. Solar researchers, take note. **Gas-electric bus.** GE researchers concentrating on developing a hybrid car should know there's nothing new under the sun. This hybrid was active circa 1910.

Brazil's mighty dams

GE is helping to harness one of the most plentiful energy supplies on earth.



One of many current hydroelectric projects, Salto Santiago includes hydraulic turbines designed and built under an agreement between Dominion Engineering Works and GE do Brasil.

BRAZIL, one of the mightiest countries in the world, runs on water.

Its border, from the snow-capped slopes of the Andes on the west to the Atlantic Ocean and from Venezuela and the mountainous Guyanas in the north to the Paraguay River in the south, encompasses 3.3 million square miles, 113 million people and 25% of the earth's hydroelectric potential.

Naturally, the Brazilians, with such vast water resources—including the 3,900-mile Amazon River, with its tributaries stretching into every corner of the land like veins in a leaf—chose hydrogeneration to supply nearly all of their country's electricity.

In 1965, for example, 73% of Brazil's electricity came from hydrogeneration. Today that figure is a whopping 84% and by 1985 it is expected to reach 89%.

This push for water power has, since 1962, provided significant business opportunities for General Electric. As the Company entered the 1980s, it had 20% of Brazil's hydro market. This thrust is being led by General Electric do Brasil

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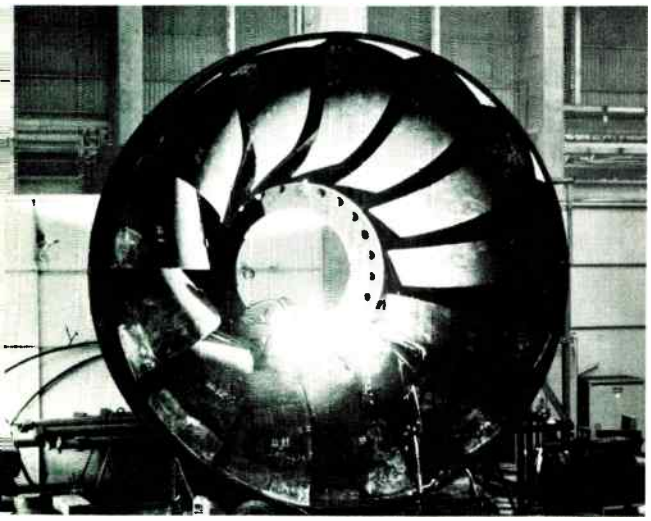
Six giant Penstock pipes (l), constructed by SADE-Brazil, link Salto Santiago's dam with its powerhouse. Right, hydrogenerators for Itumbiara plant being manufactured at GE do Brasil's Campinas facility.



Hydraulic turbine, being manufactured at GE's Campinas, Brazil plant, converts water power to electricity.

S.A., Sul Americana de Engenharia S.A. (SADE-Brazil), a Company overseas construction affiliate, with support provided by Canadian General Electric Ltd. and its subsidiary, Dominion Engineering Works.

The following is a brief rundown on some of the hydro projects in which GE is currently involved:

Salto Santiago. General Electric do Brasil and Dominion Engineering supplied four 333-MW hydraulic turbines (among the most powerful ever made in Brazil), under a $15 million contract, and SADE-Brazil is completing a $7 million construction contract. Located on the Iguaçu River in Brazil's burgeoning southern region, Salto Santiago will increase the region's generating capacity by more than 25%.

Itumbiara. General Electric do Brasil is supplying six 365-MVA hydrogenerators worth $24 million to this project, which is located on the winding Paranaíba River in central Brazil. Itumbiara's strategic location between the country's capital and São Paulo underlines its vital significance to the central-west and southwest regions of Brazil: one-half of the country's population lives there, consuming about 75% of the country's electricity.

Porto Primavera. Being built on the Paraná River in the populous central-south region of Brazil, the Porto Primavera project will provide the first order for Vigesa, the new joint venture company formed by General Electric and the Brazilian firm Villares. The $56 million order is for seven 112-MVA hydrogenerators, to be delivered from 1985 to 1989.

Tucuruí. The most challenging site for the transportation and erection of a General Electric hydrogenerator will be on the River Tocantins, in the heart of the Amazon jungle. The Amazon and many of its tributaries, such as Tocantins, still flow through some of the world's remotest real estate. Under a $17 million contract, two 350-MVA hydrogenerators will provide power for iron mining and aluminum refining. The first will be installed in 1983.

Boa Esperanca. Located on the Parnaiba (not to be confused with the Paranaíba which is some 500 to 600 miles to the south) River, this project is intended primarily to provide electrification to rural northern Brazil. Under a $10 million contract, General Electric will provide two 67-MVA hydrogenerators and two 65-MW turbines to Boa Esperanca, which is expected to be in operation by 1984.

Itaipu. SADE-Brazil is participating in a consortium that is building this, the world's largest hydroelectric power plant. Scheduled to be completed by 1984, the plant is being constructed on the Paraná River, the second longest river in South America, as a joint venture by Brazil and Paraguay. Itaipu is approximately 370 miles downstream from the Jupia power plant, the first large Brazilian hydroelectric installation in which General Electric was involved.

Over the next six years, SADE, which has been involved in Brazilian water projects for some two decades now, expects to construct 19 hydroelectric power plants in Brazil, totaling 18,000 MW.

Kurt Meier, general manager—Industrial Operations at General Electric do Brasil, formerly operation manager for Heavy Apparatus Operation, sums up Brazil's commitment to hydro power: "In a world where petroleum and minerals are frequently the common expressions of a country's natural wealth, few think of water as a resource of importance. Yet water—or more correctly, hydroelectric potential—could well be Brazil's ace card in a country notably lacking in petroleum resources."

PEOPLE

Wrecks and ruins

Digging into history has been both fun and rewarding for several amateur explorers from General Electric.

Robert Newman examines some of his artifacts.

A VISIT TO Robert Newman's home is a journey through history. Every room, wall, shelf and corner contains some artifact of civilization: Greco-Roman oil lamps dating back to 100 B.C., Persian pottery from 2000 B.C., a Peruvian water bowl from 300 A.D., an Osiris figure from 18th-dynasty Egypt (circa 1500 B.C.) and bead necklaces from primitive cultures along the upper Amazon. There's even part of a Hindu prayer cart standing in the bathroom.

"I've been to every major archaeological site outside China," says Newman, who was manager of Corporate Planning Services before retiring in 1975. "My major interest is learning about the roots of civilization. By studying the past, we can come to a better understanding of our current problems and opportunities."

Among the artifacts Newman has dug up or purchased during the past 30 years, his Greek and Roman coin collections are his favorites. "If you think we have inflation today, look at what happened to the Romans," he says, holding up a Roman *As* (copper coin) that fills his palm. In his other hand is a newer *As*, this one the size of his fingernail. "After 200 years of war and expansion, their currency really did shrink," he adds.

A member of the American Institute of Archaeology, Newman has participated in several "digs," including a Cornell University expedition into the Chilean Andes in 1976. "We were trying to locate the southernmost outpost of the Inca Empire and to determine the degree of civilization there," he explains. "Near the Argentine border we found a fortification that existed from 1400 to 1500 A.D."

Exploring shipwrecks, instead of temples and fortifications, is Bruce Morton's hobby.

A business development manager for the Advanced Energy Programs Department in General Electric's Energy

(continued next page)

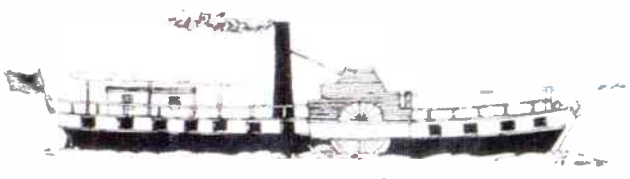
Bruce Morton explores the *Rhone*, sunk in 1867 hurricane.

Systems Technology Division at Valley Forge, Pa., Morton has explored and photographed several underwater wrecks in the Caribbean. His favorite is the *Rhone*, a 180-foot-long British royal mail packet that went down in an 1867 hurricane off Salt Island in the British Virgin Islands.

"It broke into three pieces on a slope that goes down 30 to 90 feet," says Morton, noting that some underwater scenes in the movie "The Deep" were shot there. "You can still find cannon, jars and bottles around the wreck."

Another diving spot of historical significance in the area is Norman Island, legendary site portrayed in Robert Louis Stevenson's classic tale, "Treasure Island." Although some people have found buried chests near there, Morton's only "treasure" was found under the front wheel of a rental car.

"I had finished a dive and was walking from the dock to my car when I saw this chain sticking out of the ground," he recalls. "I thought it was aluminum." It turned out to be a gold necklace, worth about $800 at today's prices.



A different kind of treasure, the remains of the oldest intact steamboat hull in the world, drew General Electric's Jack Chase and seven other Vermont divers into Lake Champlain last summer.

The 13th steamship ever built, the *Phoenix* ferried passengers between Whitehall, N.Y., and Saint Jean, Quebec, during the early 1800s. On the evening of Sept. 5, 1819, tragedy struck. A candle left burning in the galley tipped over and, within minutes, the ship was ablaze. Six persons perished; 41 were saved. Still burning, the vessel came to rest on a reef,

Jack Chase, another GE diver, enters Lake Champlain to survey charred remains of the *Phoenix*.

Ladd Petroleum's Don Nordstrom gets his weekend "highs" by making replicas of Indian rock art.

then drifted off and sank, her exact whereabouts lost for one-and-a-half centuries.

Then, on the fire's 159th anniversary, a diving instructor spotted the wreckage of a large boat and the "Phoenix Project" was born. "We received a grant from the state of Vermont to take measurements and develop recovery techniques," notes Chase, a senior sales representative in the Armament Systems Department at Burlington, Vt.

Chase and his fellow divers located the charred remains, resting in the cold, murky waters on a slope from 60 to 100 feet deep. They surveyed the wreckage, using a grid system to relate ribs, keel and other structures to each other.

"It's in amazingly good condition," reports Chase, who designed the underwater surveying method. "It will give us a wealth of knowledge about steamboat construction and nautical living in the old days."

The *Phoenix* isn't the only historical treasure in Lake Champlain. There are more than 100 shipwrecks waiting to be discovered, including three of Benedict Arnold's gunboats from the Revolutionary War battle at Valcour Island. Also submerged in the lake, which used to be much shallower, could be other archaeological finds: old Indian campsites.

Ancient Indian campsites can also be found throughout the American Southwest. About 10,000 years ago, a group of Indians called Clovis man (after the town where their chipped arrowhead "points" were first found) roamed what is now New Mexico, Arizona, Colorado and Utah.

Today, Don Nordstrom is hot on their trail. A senior staff accountant with Utah International's Ladd Petroleum Corporation in Denver, Nordstrom has been an avocational archaeologist for 25 years. He helped organize the Montana State Archaeological Society; he's worked with professional archaeologists from the Smithsonian Institution and other groups; and, in May 1980, he became only the fifth "amateur" to receive Colorado's State Archaeologists' Award.

Nordstrom spends his weekends and vacations in a 400-square-mile corner of Colorado, searching for bones, beads and other artifacts. "I'd like to be the first to find a skeleton of Clovis man," he admits. "Of course, to be sure it's genuine, he'd have to be clutching a Clovis point and lying under a mammoth's skeleton."

What Nordstrom usually finds are petroglyphs (Indian rock art). He makes faithful replicas of the rock carvings by covering them with thin layers of latex to form a mold. He then fills the mold with plaster of Paris and paints the reproduction, preserving the valuable artifacts for posterity.

Vandals and erosion form a deadly combination for many petroglyphs, which is why the work of Nordstrom and another Utah International employee, Sally Hadlock, is so important.

"My husband and I have been recording petroglyphs for the past 18 years," says Hadlock, a receptionist at Utah's San Juan mine in New Mexico. The Hadlocks carefully mark the location and description of each petroglyph on a form, photograph the carving and file their record with the Laboratory of Anthropology in Santa Fe.

Some of the petroglyphs they've found in the canyons of New Mexico go back 1,200 years to the Anasazi (Ancient Ones). Others were made by the Pueblo and Navajo, who migrated into the area. "There are all kinds of geometric designs and stick figures," she adds. "Some depict myths and legends, others relate to Indian ceremonies. They were used in rituals, to commemorate events, even to promote success in hunting."

Utah International's Sally Hadlock checks petroglyph.

As for herself, Hadlock says it takes a lot of work and study to learn about the petroglyphs and their Indian artists. But it's worth the effort, she adds. "You feel you've really accomplished something when you discover a drawing that's been there for 1,000 years."

Our man at the market

As a New York Stock Exchange specialist, George Dinsmore maintains a "fair and orderly" market in GE shares.

YOU WON'T find his name on the payroll, meet him in the cafeteria, or pass him in the corridor. Yet George Dinsmore works hard for the benefit of General Electric share owners.

Dinsmore uses his talents and resources as a New York Stock Exchange (NYSE) specialist to maintain a fair and orderly market in GE shares. His efforts benefit the thousands of investors, among them many GE employees and pensioners, who have an interest in GE shares.

If you were to visit the NYSE between 10 a.m. and 4 p.m. on a typical weekday, you'd find Dinsmore standing at the outside rim of one of the many trading posts on the Exchange floor. While hundreds of brokers, clerks and pages scurry from post to post, Dinsmore and about 380 other specialists on the floor stay at their posts, conducting business with other member brokers.

(Each of the more than 1,550 corporations listed on the Exchange has its shares assigned to at least one of the 63 specialists' units. Dinsmore's unit, Stokes, Hoyt & Co., handles the shares of General Electric as well as 45 other issues.)

What does a specialist like Dinsmore do?

To answer that question, let's first look at how stocks are traded on the Exchange. The NYSE is a two-way auction market where bids are raised and offers lowered until the buyer and seller meet at a mutual price. The forces of supply and demand determine prices.

Sometimes, however, supply and demand for shares of a cer-

tain stock may not match exactly. For instance, brokers representing public customers may have more shares to sell than public customers are willing to buy. Acting as a buffer between temporary imbalances in supply and demand is the specialist.

In his role as principal (or dealer) for his own account, the specialist tries to maintain fair and orderly markets in the stocks assigned to him. When there is a temporary disparity between supply and demand, the specialist buys or sells for his own account so that the price of the transaction will be close to the preceding transaction. This enables the stock to move from one price to another without unreasonable price fluctuations. In doing so, the specialist contributes to the liquidity of the market, that is, the ready ability of buyers and sellers to find trading partners.

Occasionally, the specialist must make both the best bid and the best offer in order to provide liquidity in certain issues, especially the less active ones. This is part of his market-making responsibilities. In addition, while not expected to prevent the price of a stock from rising or declining, the specialist is expected to maintain some price continuity. In practice, this means that the normal variation between successive sales at the Exchange is 25 cents or less.

Although expected to buy or sell for his own account to maintain fair and orderly markets, the specialist does not usually initiate trades. Nor is he permitted to buy or sell a stock at a specific price if other brokers have entrusted him with "limit orders" to be satisfied at that price, or a better price.

"Limit orders"—given to brokers requesting that a stock purchase or sale be made at a specific price—are usually left with specialists since brokers on the Exchange floor may have many orders to fill and can't always wait at a specialist's post until a stock reaches the price requested by the customer.

These orders are written in the "book"—a 5-by-11-inch looseleaf notebook—which specialists keep for each of their assigned stocks. In the book, the specialist records, by price and in time sequence received, the buy and sell "limit orders" left by brokers. Once the price indicated in the book is reached in the market, the specialist represents the order on behalf of the broker. The investor is not charged an extra fee for this service; instead, the specialist receives part of the broker's commission.

While performing his functions, the specialist speaks in a verbal shorthand used only on the stock market. The following recent dialogue is typical:

"How's General Electric?" asked a broker approaching Post 6, where General Electric shares (stock symbol GE) are traded.

"Three-quarters; one. Twenty by fifty," replied Dinsmore.

In the language of the trading floor, Dinsmore had described the market in General Electric common stock at that moment. In effect, he said that he, or a broker in the crowd, was willing to buy GE stock at $60.75 ("three-quarters") per share and sell it at $61 ("one") per share.

The inquiring broker understood that the dollar amount was $60 per share because that figure was displayed above the trading post on a marker showing the last sale price of the stock—$60.875. The broker also understood that Dinsmore represented orders to buy 2,000 shares of stock and sell 5,000 shares. That information came from the second part of his quote ("twenty by fifty"), quotes usually given in hundred-share multiples.

Analyzing the market and his customer's order, the broker made a bid. "One for sixty," he

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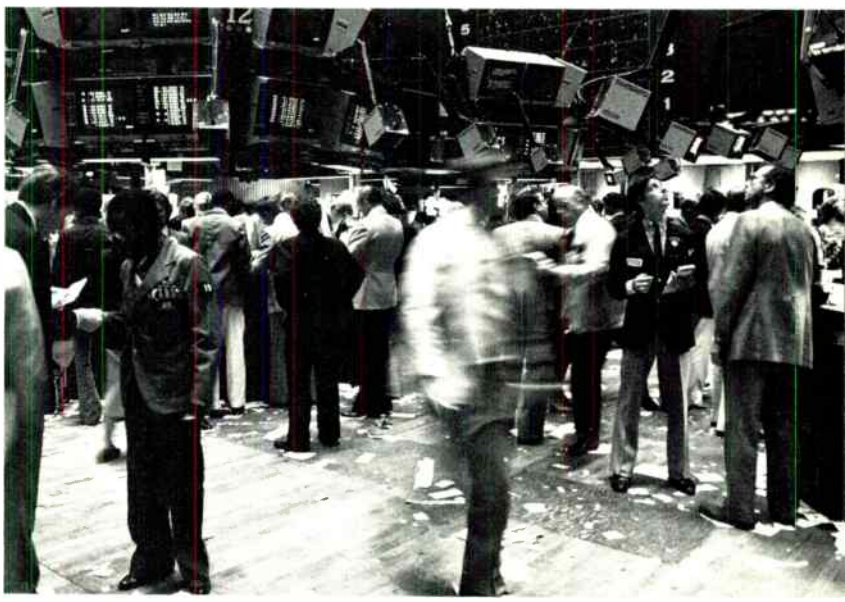

Brokers set a hectic pace at New York Stock Exchange.

said, aiming to purchase 6,000 shares at $61 per share.

"Sold!" answered Dinsmore. He then told the broker the name of the brokerage firm whose 5,000 shares had been offered for sale, and gave his own firm's name for the remaining 1,000 shares.

Dinsmore's clerk, standing inside the rim of the trading post, made the necessary changes in the GE book to reflect the sale. At the same time, the marker was electronically changed to the sale price and a computer card record of the transaction inserted into an optical scanner near the post. The scanner sped the information to computers that drive the Exchange's ticker tape network. In a matter of seconds, 6,000 shares of General Electric worth $366,000 were traded and a record of the transaction was flashed around the world via the high-speed ticker.

Since specialists are required to step into the market to offset temporary imbalances in supply and demand, they often take risks not required of other dealers. During market downturns, for instance, specialists can suffer substantial personal losses.

By adding to the efficiency and orderliness of the marketplace, however, specialists like George Dinsmore have made a major contribution to the growth of American industry. Because share owners can buy and sell securities on the NYSE conveniently, corporations have been able to raise the money needed to finance expansion, to modernize plant and equipment, to build new and better production tools, and to develop new products and services.

This, in turn, may often assist American corporations in increasing their profitability.

Organization Changes

CORPORATE

Raymond F. Letts, VP—Corporate Operating Services

CONSUMER PRODUCTS AND SERVICES SECTOR

James R. Birle, VP and General Manager—Air Conditioning Business Division

Bernard P. Long, VP and General Manager—Consumer Financing Division, GECC

Francis M. Scricco, Staff Executive—Consumer Products and Services Strategic Planning and Development Operation

Manuel Hunter, General Manager—Television Engineering Department

Roger N. Keesee, General Manager—Television Manufacturing Department

INTERNATIONAL SECTOR

Rodger E. Farrell, General Manager—Andean Countries Business Division

Sergio Tieppo, President and General Manager—Maquinarias Venequip S.A.

POWER SYSTEMS SECTOR

Robert G. Beadle, General Manager—Engineering and Programs Department, Installation and Service Engineering Business Division

Billy D. Campbell, General Manager—Central Service Department, I&SE

Bradley T. Cox, Jr., General Manager—Southern Service Department, I&SE

James T. Flynn, General Manager—Northeast Service Department, I&SE

Tommy D. Whitaker, General Manager—Western Service Department, I&SE

TECHNICAL SYSTEMS AND MATERIALS SECTOR

John D. Opie elected a Vice President

Allan J. Rosenberg elected a Vice President

Arthur J. Marks, VP and General Manager—GEIS Marketing Department

James E. Dykes, General Manager—General Electric Microelectronics Center

W. George Krall, General Manager—Aircraft Engine Manufacturing Division

Widening the energy horizon

EVER SINCE Thomas Edison developed his "Long-waisted Mary Ann" generators to produce power for his incandescent lighting systems, it has been commonplace to identify energy with electric utilities and to foresee the energy market's expansion as inevitably tied to utility load growth.

That the utilities continue to be an important and valued group of customers is made clear by Herman R. Hill, Executive VP and Sector Executive of the Power Systems Sector: "Electric utilities have a critical role in helping society meet its future obligations. If the U.S., for example, doesn't do something about its capability for generating electric power in the next five years, we're going to have blackouts in this country. And we'll lack the power needed to provide new jobs for youth and upward mobility for minorities. There are still enormous opportunities for GE in helping the utilities."

Hill also noted that his Sector and other Company Sectors are making a broader—much broader—assessment of the energy market's potential, one that goes beyond the needs of the utilities.

GE Chairman Reginald H. Jones signaled this vital change in the Company's perspective at GE's latest meeting with financial analysts.

"Few people realize that the traditional utility market is less than 10% of the total energy market," he said. He invited the assembled analysts to step back and take a global look at energy from two viewpoints: energy supply and energy conservation.

Even to limit one's view to the fuel aspect of energy supply, he noted, is to focus on a market that is "much larger than the utility portion which has been our traditional stronghold. Services, systems, products and materials that are fuel-related represent a 1980 market of nearly $1 trillion."

He added that "no matter which fuels are extracted, transported or converted—and no matter who does it—this is a huge market for GE, a market not tied to utility load growth."

And energy supply is only one side of "the opportunity coin" for General Electric. The other side: energy conservation.

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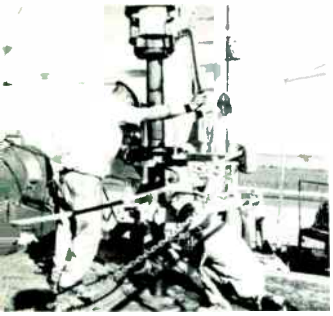
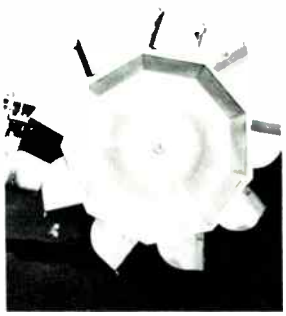
From energy supply to energy conservation...



Oil rigs



Mining

Electric wheels

Locomotives

Chairman Jones quickly ticked off examples of the Company's stake: dishwashers that use 10% less hot water... a refrigerator that uses 30% less energy than its smaller predecessor... the Halarc light bulb that uses two-thirds less electricity and lasts five times longer than today's standard bulb... fuel-efficient aircraft engines that are spurring the airlines to a vast re-equipment cycle... energy-saving electric motors and drives that can save the equivalent of one million barrels of oil lost each day through inefficiencies.

Energy supply and energy conservation—Reg Jones made it plain that GE management sees the combination of the two adding up to a vast spectrum of potentialities for growth.

For more detail on the broad energy spectrum envisioned by the GE Chairman, *Monogram* reporters talked with managers charged with responsibility for translating these opportunities into new business development.

Utah International's share in the energy-related span of GE businesses was discussed by Alexander M. Wilson, Chairman of the Board of the Company's natural resources affiliate.

"Utah's contribution is to mine steam coal and, through the operation of our affiliate, Ladd Petroleum, to extract the oil and natural gas that are key elements in energy supply," Wilson said. "The outlook for these businesses is good. Our confidence in their future is evident in the increased funding we've allocated for exploration and development."

Wilson cited Ladd's growth as "very significant to Utah. Ladd is among the top 20 independents. Its real strength is in the professionalism of its people. Their exploration success rate is much better than that of the industry, in large part because they're simply better at using some of the advanced exploration, evaluation and development technologies. Their competence enables them to take risks that make others hesitate."

Utah is moving to become an even more important factor in steam coal. "We're pursuing two strategies in the U.S.," Wilson explained. "In the West, our mines produce primarily at the point of use—supplying utility power stations adjacent to the mines. In the East, our strategy is to rely on rail transport to bring the coal to the market. Utah will soon open its first underground mine—to serve Eastern markets."

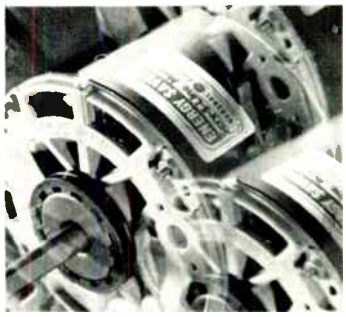
Coal exports figure prominently in Utah's future, according to Wilson. "The opportunities we see for exports to Western Europe appear to be good. The basic rail transportation part of the infrastructure is already in place. There's a need for better Eastern coal ports in the U.S. and we're helping to solve this problem."

Equipment to extract and transport fuels is the province of the Industrial Products and Components Sector. Executive VP and Sector Executive James A. Baker told the *Monogram:* "Energy needs provide growth opportunities for our greatly diversified businesses. Oil well drilling rigs, for example, use traction motors from Erie, controls and drive systems from Salem, generators from Schenectady and various components from other operations."

It's the same with coal mining. "The large draglines and shovels used in stripping away the overburden to reveal the coal seams represent a big potential market for our drive systems, including motors, generators and controls. Many of the large trucks that haul the coal are powered by GE electric wheel systems. And, because coal needs to be hauled, the U.S. locomotive market is forecast to improve in the 1980s. We estimate that the railroads will need some 1,600 new locomotives every year in this

Turbine-generators

Meters



Energy-saving motors

Halarc® light bulb

decade—that's a 60% higher average than in the '70s."

The Sector also sees big opportunities in energy conservation. Said Baker: "One of the applications that looks very good to us is that of energy-saving motors. Ours is a totally new design that saves 10-to-15% of the energy required to run the motor. Over the life span of these motors, that difference can mean real savings to customers. And with motors accounting for 60-to-65% of the electrical energy used in the U.S., we see a terrific potential for saving oil. We have other energy-conserving products, including programmable lighting controls and ac adjustable-speed drives that enable motors to turn at the exact speed required to do the job. So, both energy supply and energy conservation will provide favorable opportunities in the markets served by this Sector."

Fresh thinking about energy opportunities is also evident in a talk with Power Systems Sector's Herm Hill. "To meet one of this country's biggest needs—the reduction of oil imports—we've emphasized, and we will continue to emphasize, nuclear power and coal," he observed. "With the nuclear power industry still in its holding pattern, coal is particularly important in this nation's outlook, because it's the resource we've got the most of. Our Sector is very active in the search to make coal usable in forms compatible with environmental protection."

One important direction for this search, Hill said, is the Cool Water gasification project (*Monogram*, Nov.-Dec. '80), in which GE is participating. "The objective here is to convert coal to synthetic gas, which is then used to produce electricity in a combined-cycle plant—one that combines steam and gas turbines. We believe this holds promise as the cleanest and most efficient way to produce electricity from coal."

A long-established technology that is entering a real growth phase, according to Hill, is that of cogeneration—the generation of electricity as an accompaniment to industrial processes. "As we see it, industry will be forced, from a cost standpoint, to use exhaust heat to generate its own power, selling excess power to the utilities. Cogeneration is gaining recognition as the best way, given today's technology, by which industry can contain its energy costs. For us, as the leaders in developing this technology, the uptrend means opportunities in combined-cycle equipment, in direct burning and gasification of coal and the use of scrubbers for cleanup. We also believe that new capabilities for gas cleanup are of great importance as the nation moves to coal as a fuel for industrial and utility applications. We recently signed an agreement in principle with Envirotech Corporation that would add environmental cleanup capability to the Installation and Service Engineering Division."

Herm Hill is confident that no matter what direction energy takes, GE will serve the market. "We're evaluating a wide range of advanced energy technologies, including solar, geothermal, ocean thermal energy conversion, and the development of utility-scale batteries. Whatever emerges, we intend to be a key factor."

Summing up his energy survey for the analysts, Reg Jones pointed out that "massive investments will be directed toward new energy-efficient equipment and processes, coal conversion systems, transportation systems, and equipment and services to ensure environmental compatibility. General Electric is and will continue to be the leading-edge company positioned to gain from those trends."

GENERAL ELECTRIC

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CT FOR CHINA. In recent years the biggest medical news coming from the People's Republic of China (PRC) concerned acupuncture, the ancient Chinese therapeutic art of "needling" a patient. But the Chinese also utilize modern medical technology, including this CT (computed tomography) scanner from General Electric's Medical Systems Business Division.

Installed recently at Beijing (Peking) Hospital, it's the first fast scanner purchased by the Chinese. The GE system, which diagnoses an average of 11 Chinese patients per day, can perform a head or body scan in just five seconds, compared to two minutes for competitive systems in China.

GE now has more than 500 CT scanners installed in some 25 countries around the globe.