



GENERAL  ELECTRIC  
**Monogram**  
NOVEMBER—DECEMBER 1976

Coming—  
the vote  
on Utah

**PLUS:**  
Pushing energy  
options  
to the limit  
Relighting Carlsbad  
Caverns

# Energy: pushing the options 'to the outer limits'

"If this country had responded to Pearl Harbor the way it has to the energy crisis, we'd all be speaking Japanese by now!"

That was the quote chosen by GE Vice Chairman W. David Dance to sum up the U.S. energy situation in a talk October 21 to the Association of Edison Illuminating Companies. The title of his talk borrowed from

Albert Einstein to express it another way: "E=MC<sup>2</sup> (Energy Equals Mass Confusion Squared)."

Dave Dance's quips enlivened a presentation that was deadly serious at the core: that the U.S. energy problem "is very real and getting progressively worse." His look ahead, projecting the most favorable energy

trends, still indicates that by the end of the century the U.S. will face an enormous gap between energy needs and domestic production, leaving 50% more foreign oil to be supplied than was imported in 1975.

"From this redefinition of the energy problem," he told utility officials, "it's obvious we must push all of our energy options



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Edward H. Morgan, Jr., *Editor*; Linn A. Weiss, *Associate Editor*;  
Carol A. Olcha, *Editorial Assistant*; Ron V. Taylor Associates, *Design*

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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 Public Relations Operation—Douglas S. Moore, Vice President. Editorial supervision is by David W. Burke, Manager, Corporate Communications, and J. Herwie Haufler, Manager, Corporate Editorial Programs. Request permission to reprint articles from the Monogram Editor, Fairfield, Connecticut 06431. Copyright 1976, General Electric Company.

to the outer limits of realism. And I can assure you that General Electric is involved, one way or the other, in all of them, searching the world for the best technology.”

### ‘Yes’ on nuclear power

One important way of achieving energy security is by exercising the nuclear option. By their ballots November 2, American voters indicated they strongly favor nuclear power expansion. The nuclear industry won a decisive victory, with voters in six states soundly defeating initiatives aimed at restricting nuclear power plants. The six states were Arizona, Colorado, Montana, Ohio, Oregon and Washington.

Most nuclear measures lost by margins of two-to-one or better, paralleling a vote last June 8 in California where voters defeated the first such initiative—which became a model for the six proposals this fall. In California, the measure also failed by a two-to-one vote.

Nuclear initiative opponents this year successfully argued that these proposals banned nuclear plants, thus aggravating the energy shortage while stunting economic growth, increasing utility bills and costing construction jobs.

Commenting on the defeat of  
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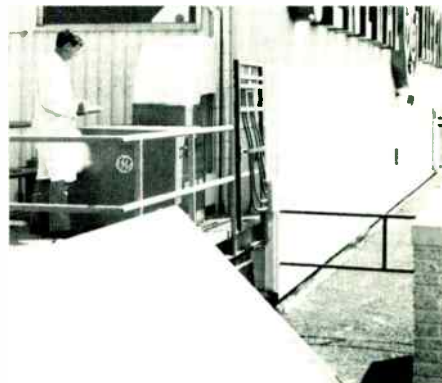
**Pioneering Technology:** GE fuel and fuel-bundle research on a liquid metal fast breeder reactor has been part of the ongoing development programs at the Fast Breeder Reactor Department in San Jose, Calif. Fast Breeder’s general manager, Dr. Robert B. Richards, believes that the breeder “is a logical and important next step in this nation’s electric power development.”

the anti-nuclear initiatives, George J. Stathakis, Vice President and General Manager of the Nuclear Energy Programs Division, said, "This public expression hopefully will be converted into political action

by the Executive branch and Congress, which will allow nuclear power to make its full contribution without delay."

In addition to GE's contribution to nuclear and other conventional power generation

technologies, the Company also is moving on a wide range of new technological fronts that relate to energy, as indicated by this *Monogram* survey of the most current newsmaking highlights.



## Bringing solar systems to market

Realism argues that economical, wide-scale use of solar energy is still years away, but specialists at GE's Space Division in Valley Forge, Pa., keep hammering away in their development of solar technologies.

Already, for the solar enthusiast who wants to put the sun's power to work in his house, GE's Central Air Conditioning Department and the Space Division are jointly offering an attractive new possibility: a solar-assisted heat pump. CAC dealers will install a solar collector system for \$7,000 plus the cost of a GE Weathertron® heat pump.

In the solar-assisted heat pump, fluid solar collectors heat water in a storage tank, and a hydronic (water-to-air) heat exchanger is applied to the heat pump system's supply duct.

The Space Division now has contracts to try out this concept on full-scale projects. Pennsylvania Power and Light will construct a "sample home"

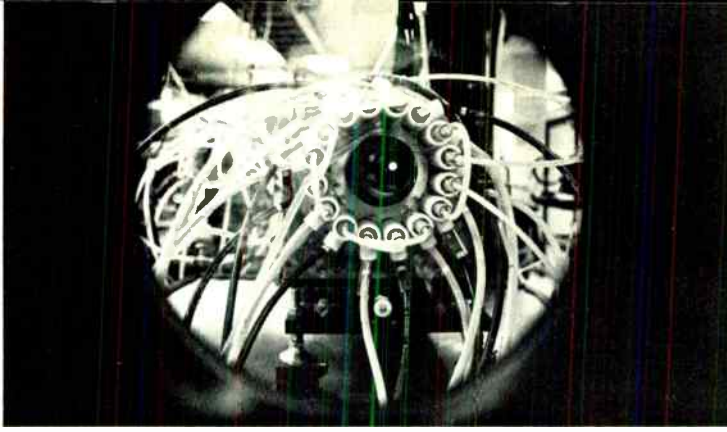
equipped with a solar-assisted Weathertron. Dallas Power and Light will build two houses, identical except that one will include a GE solar-assisted heat pump and domestic water heating system, while the other will use a conventional heat pump and water heater. As shown (above left), GE's Leonard A. Thaler already has the GE system at work in his Louisville home.

The Space Division has other solar projects making news. Through a \$5.7 million contract just awarded to GE by NASA, Space Division engineers are continuing to develop an all-solar advanced system that would supply both solar heating and air conditioning at previously unattained efficiency levels.

"Solar heating is not too difficult to provide," says B. J. (Bobby) Tharpe, manager of Advanced Energy Programs, "but solar air conditioning is much harder. With the success-

ful testing of a Rankine engine-driven solar heat pump (above right) and a new type of solar collector, we think we've found a breakthrough." The new collector is based on fluorescent lamp tube technology perfected by GE's Lamp Glass Products Department.

Another intriguing way the Space Division is seeking to harness the sun is by converting sunlight into electrical energy using photovoltaic cells. Among the more far-out ideas GE is exploring is the use of photovoltaic shingles. Says Milt Van Horn, marketing manager for Advanced Energy Programs: "They're like regular house shingles, except they're clear and have little solar cells impregnated in them. When the workman pounds in the nails, he automatically connects up an electrical circuit from one shingle to another. And when he gets his roof finished, all he has to do is put on a busbar and he's got a nifty power supply."



## Fusion: Hot prospect

The tantalizing thought of emulating the sun's fusion process to produce limitless energy has intrigued GE scientists for years. As early as 1957, the Company began conducting its own fusion research—the first industrial firm to do so—and today is participating in a University of Rochester laser fusion project (above) that also involves government cooperation.

Scientists at Rochester are producing the 10 to 100 million

degrees required for fusion by focusing strong laser beams on tiny glass spheres containing deuterium and tritium, thus causing rapid compression.

Progress the past year has been encouraging, according to Dr. Donald R. White, manager of the GE R&D Center's Optical Physics Branch, who coordinates GE efforts. Phase 2 of the project recently began with a new \$46.6 million program in Rochester's new Laboratory for

Laser Energetics, which will contain a 10-kilojoule laser system ranking with the world's largest.

"The feeling is that fusion will eventually be a competitive energy source," White says, "but much work remains. It won't be ready for any significant role in the energy picture before the end of the century."

The Company's participation in the joint laser fusion research project provides access to a much larger body of technology than could be achieved independently, explains Dr. White.

In another type of fusion research project, Schenectady's Energy Systems Programs Department was recently awarded an ERDA contract to study large superconducting magnetic systems for the Tokamak Fusion Experimental Power Reactor, scheduled for operation in the mid-1980s.

## Geysers power

In 1847, explorer William Elliott was hunting grizzly bears 75 miles north of San Francisco when he came upon geysers of steam in an area he described as "the gates of hell." Today, those fumaroles are scarcely in evidence because the geothermal steam has been put to work, supplying energy to make the Geysers Power Plant (right) the largest such installation in the world.

The first power generation unit at the Geysers was a GE 12,000-kilowatt turbine-generator installed in 1960. Since then, GE's Medium Steam Turbine Department, Lynn, Mass., has had a continuing interest in geothermal power generation. According to Kenneth A. Drewry, manager

of Domestic Power Generation Sales, a 135,000-kw unit now being shipped to the Geysers will be the world's largest geothermal-powered steam turbine-generator.

Geothermal energy is found in two forms: steam and high-pressure hot water. Because of low steam pressures and steam contamination that is as much as 100 times greater than in a conventional power boiler, turbine-generators must be specially designed. The market for geothermal equipment is currently small, but as Drewry points out, "from zero units to several units sold a year is worth considering." In addition to the Geysers, new fields are in California's Imperial Valley, Utah and New Mexico.

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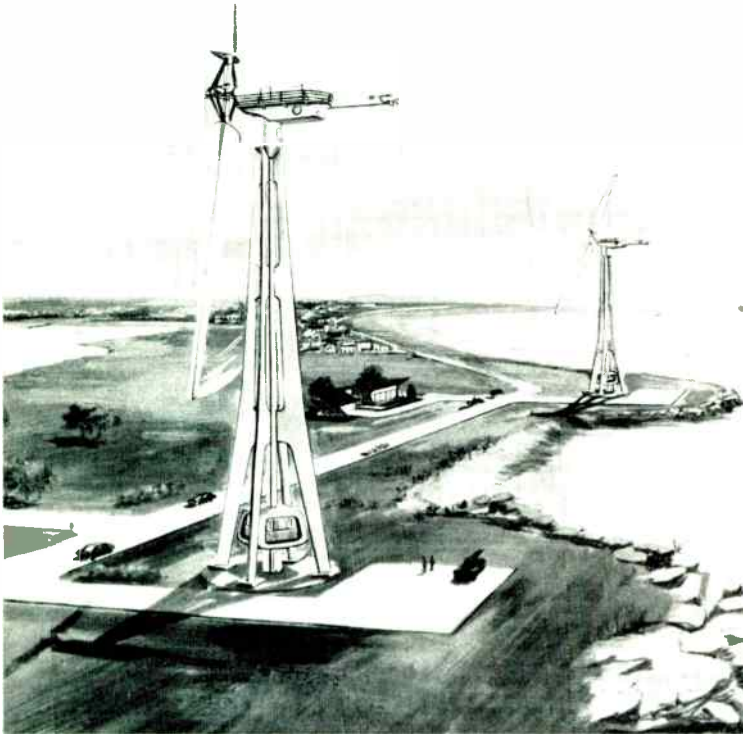


# Panoply of Progress

To be sure, energy advances do not have to be synonymous with these exotic new sources of electricity. What follows are “thumbnail sketches” of several other innovative GE energy approaches.

- **Coal’s metamorphosis:** Under a \$4 million ERDA contract, GE’s Energy Systems Programs Department is evaluating a new type of coal-fired combined-cycle power plant designed to generate electricity cleanly and efficiently. Energy Systems’ general manager, Elbert F. Lowell, says the new design promises to keep emissions significantly lower than Environmental Protection Agency requirements—as well as offering higher plant efficiency, reduced boiler size and cost, and reduced generating costs compared to conventional coal-fired units. In this system, coal is burned in a pressurized, fluidized bed of limestone or dolomite, with these minerals removing sulfur so that fewer dioxide emissions result.

- **Superbatteries:** Research on a rechargeable sodium-sulfur storage battery offering twice as much storage capacity as a standard lead-acid battery continues at GE’s R&D Center, recently augmented by a \$2.5 million contract from EPRI (Electric Power Research Institute). Targeted at the nation’s electric utilities for bulk-energy storage, the “super-battery” utilizes a solid ceramic (as opposed to liquid) electrolyte. Current research calls for a demonstration of a 10-kwh battery. Ten such batteries— assembled to form a 100-kwh battery module—could become



## New Wind Generator Technology

Sometime in 1978, the world’s largest windmill—a 1.5-megawatt wind turbine with blades some 150 feet in the air (above)—will begin delivering electricity directly into a utility system.

The job of building two such behemoths belongs to GE’s Space Division, which recently received a \$10 million contract from NASA and ERDA to study large wind turbines coupled to conventional power plants.

Studies of windpower already have been done by GE at Valley Forge and show, accord-

ing to Space’s Bobby Tharpe, that the wind energy option is potentially a viable one. “The idea of wind generators, of course, is very old. We hope that this program will show that units can be developed to generate competitively priced electricity.”


The new windmill will include two fiberglass blades, each 200 feet in diameter, that will rotate at speeds of 30-to-40 revolutions per minute. With average wind speeds of 18 mph, the machine should produce enough energy annually to supply more than 500 homes.

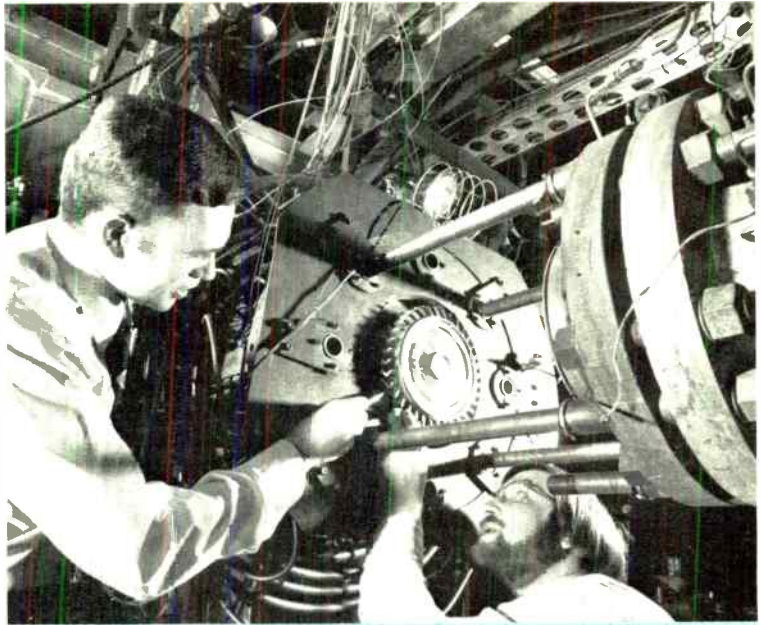
the basic building block of tomorrow's multi-megawatt utility battery systems.

- **The hydrogen alternative:** Hydrogen production already is a billion-dollar business, with ever increasing amounts needed in making ammonia fertilizer and for industrial uses.

But hydrogen as an alternative fuel for power generation? It's feasible, many believe, and ERDA recently awarded the Aircraft Equipment Products Division a \$200,000 contract to study large-scale hydrogen production as an energy source augmenting natural gas in utilities' peak demand periods.

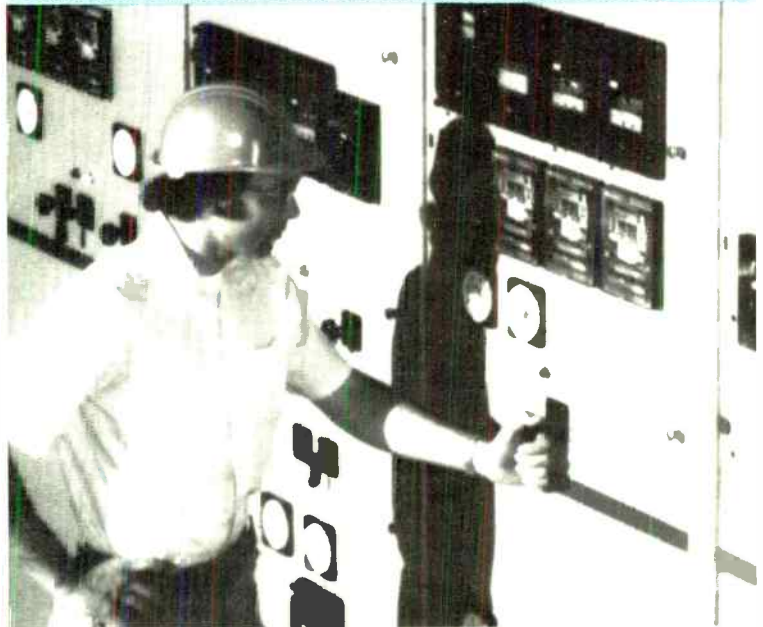
As a result of this study, ERDA is now considering a prototype 5-mw hydrogen pilot plant, scheduled for completion in 1983, which will use the GE "electrolysis" (decomposition of water) technique. This technology was an outgrowth of GE's fuel cell development for NASA's Gemini space program, which entailed combining hydrogen and oxygen in a controlled reaction to generate electricity. The technology later was adapted to produce hydrogen from water by reversing the fuel cell process.

GE's new hydrogen plant would produce and store hydrogen in metal hydride beds until needed, when either fuel cells or gas turbines would reconvert the hydrogen to electricity. "Commercial development of electrolytic hydrogen is a near-term prospect," states Frank J. O'Brien, program general manager—Direct Energy Conversion Programs. "We foresee the requirement emerging for large-scale electrolytic gas generators, probably within the next decade. These will produce industrial hydrogen and/or store excess energy from electric power plants." 



**Building advanced turbines:** GE's Gas Turbine Division has been awarded a \$3.1 million ERDA contract for work on a water-cooled gas turbine that would generate twice the power of present turbines, burn lower-grade fuels, and operate at temperatures 1000°F higher than present units.

**Switching to vacuum:** GE's Switchgear Business Department has developed a new method of power switching for utility electrical system protection, using high-voltage Power/Vac® Switchgear with GE vacuum interrupters, which uncouple electrical contacts inside a vacuum "bottle." Vacuum technology offers utilities standardized design, economy, space saving, and easy installation and maintenance.





Planning GE's special meeting at the Shakespeare Theatre: Eric H. Smith, left, Consultant-Share Owner Programs, CPRO; and Cecil S. Semple, VP-Corporate Customer Relations.

## Big event in GE's future comes to vote in December

At Stratford, Connecticut's American Shakespeare Theatre, the main drama on December 15 will be industrial: the vote by General Electric share owners on approval of a proposed merger by which Utah International Inc. would become a wholly-owned subsidiary of General Electric. On the same day, Utah's share owners will meet in San Francisco's Wells Fargo Bank building to vote their shares on the merger proposal.

The principal vehicle of communication for this potential milestone in GE history is a 176-page joint proxy statement sent to every share owner of record of both companies.

Employee share owners are encouraged to study the joint proxy statement's thick sheaf of densely-packed pages assembled to meet disclosure requirements of the Securities and Exchange Commission and to vote promptly. From the statement a share owner can learn intriguing facts on the business that would be added to GE's operations—a complex of inter-

related activities that engages Utah's 5,500 employees in a diversity of natural resources projects around the world.

The *Monogram* will cover the special meetings of General Electric and Utah International share owners in its next issue.



Utah's chairman Edmund W. Littlefield talks with GE's chairman Reginald H. Jones.



## New steps for the Board

In all its 84 years, General Electric's Board of Directors had invariably held its hundreds of meetings within the borders of the United States. But all that was changed recently when the Board scheduled its first non-U.S. meeting and plant tour.

The Board's venture across national borders gave recognition to the increasing international scope of the Company. The choice of country was natural enough: the Board went to Canada, where Canadian General Electric Co. Ltd., GE's largest affiliate, employs some 18,500 Canadians in a northern parallel of GE's own U.S. production capacities.

GE's Directors gave Canada their fullest attention: meetings of Board committees and of the full Board in Toronto; a dinner hosting Canadian government and business leaders, also in Toronto; a tour of CGE's Dominion Engineering Works, near Montreal; and a luncheon in Montreal with Canadian GE managers.

In another newsworthy step, the General Electric Board elected two new Directors: Gertrude G. Michelson and Lewis T. Preston.

Mrs. Michelson is Senior Vice President—Personnel, Labor and Consumer Relations, for Macy's in New York. She received a B.A. degree from Pennsylvania State University in 1945 and an LL.B. degree from Columbia University in 1947, the year she joined Macy's. In 1957 she was named Administrator of Staff Personnel at Macy's and was elected a vice president in 1963. She assumed her present position in 1972.

Mr. Preston is Vice Chairman of the Board and member of the Executive Committee of Morgan Guaranty Trust Company. A native of New York City, he served two years in the Marine Corps, graduated from Harvard University with a B.A. degree in 1951 and joined Morgan Guaranty Trust the same year.



Directors pick hard hats for Dominion tour.



New Directors: Gertrude Michelson ...



... and Lewis Preston.

## X-rays: up from Roentgen



When a physics professor named Wilhelm Conrad Roentgen, experimenting with cathode rays in a lab at

the University of Wurzburg in Bavaria in 1895, discovered “invisible light” rays that could penetrate flesh, cloth, wood or metal to produce a visible image on film, he acknowledged their mysterious quality by naming them for the mathematical “unknown quantity” symbol—“X.”

And the public announcement of his discovery generated near-hysteria in Victorian society. A London firm advertised “x-ray-proof clothing”; an American legislator introduced a law to bar the use of x-rays in opera glasses. And one reporter speculated on the possibility of photographing the human soul with x-rays.

Doctors, however, were quick to see the potential importance

of x-rays as a diagnostic aid.

So it was less than a year after Roentgen's announcement when the first crude x-ray machines for medical use were introduced in the United States by the Victor Electric Company of Chicago. Becoming affiliated with GE in 1920, Victor was the forerunner of today's Medical Systems Business Division—the country's largest manufacturer of medical and dental x-ray equipment.

Those machines, temperamental and unreliable, were little more than an x-ray-producing tube containing gas to carry electric current, with bare wiring, a switch and a table.

The giant step forward came in 1913, when Dr. William D. Coolidge, at General Electric's Research Laboratory, developed the first successful high-vacuum x-ray tube—the “hot cathode” or Coolidge tube. This new design provided stable operation and ability to predetermine and control radiation output. It is still the basic de-

sign for x-ray tubes worldwide.

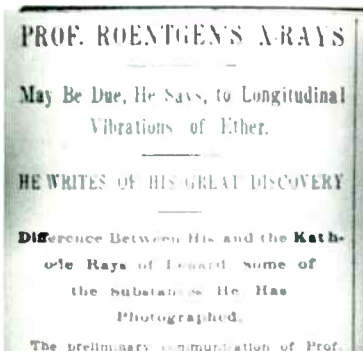
Thomas Edison contributed too, through x-ray research and discovery of better fluoroscopic substances.

During World War I, Dr. Coolidge spearheaded development of the first compact, lightweight x-ray units for use in military field hospitals. And in World War II, a new “cascade” tube—created by Dr. Coolidge, Dr. E. E. Charlton, W. F. Westendorp and others at the GE Research Laboratory for use in treatment of deep-seated cancers—was called into wartime service for non-destructive testing of steel castings and welds, and examination of shells in ordnance plants.

Today, no hospital is without an x-ray department; doctors and dentists depend on GE x-ray equipment for diagnosis; and x-ray is widely used in industry.

These photos from General Electric's historical collection highlight some of the “yesterdays” in x-ray's 81-year history.

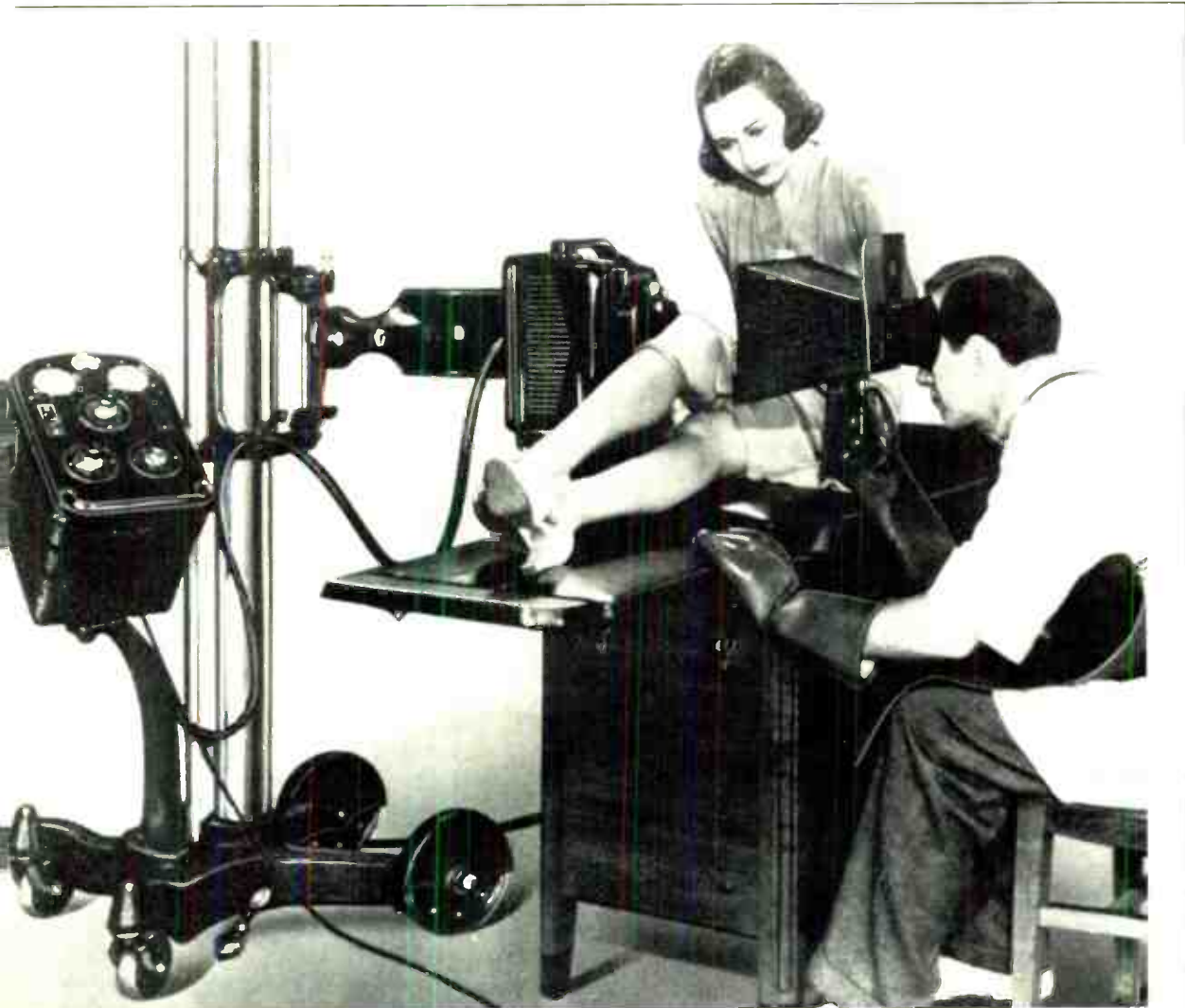
February 5-1896



X-ray is big news in 1896.



In 1934, GE x-ray aids diagnosis of Nizie the elephant's stiff leg.



"What's a joint like this doing on a girl like you?" might have been the radiologist's question in this 1940 scene of GE's mobile x-ray unit.



Dental x-ray — circa 1921.



GE x-ray leaders Drs. Ernest Charlton (left) and William Coolidge in 1939.

# Monographs

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**Barbara Walters on GE TV.** Prime-time entertainment programs are part of news anchorwoman Barbara Walters' contract with ABC, and General Electric has purchased full sponsorship of four Barbara Walters ABC specials, featuring interviews worldwide with people involved in politics, sports, entertainment and the arts. The Walters format calls for entertaining as well as informative exchanges that will provide new insights about



newsmakers. The first special will air Tuesday, Dec. 14 (10-11 p.m. EST).

**GE Theater Returns.** "The Secret Life of John Chapman" is the latest in the series of General Electric Theater specials, to be aired on CBS Monday, Dec. 27 (9:30-11 p.m. EST). Based on the book, *The Blue Collar Journal*, by John Coleman, the special examines the reasons compelling a college president to work as a ditch digger and short-order cook. It stars Ralph Waite, Susan Anspach and Pat Hingle.

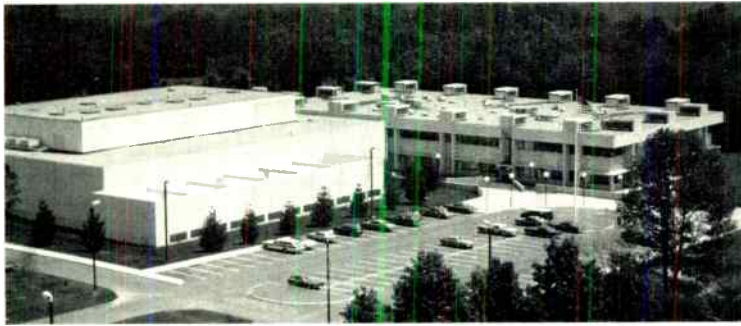


**Unscheduled Stopover.** When an injured Canada goose fell from its "V" migratory formation, it picked as its landing site the man-made habitat pond at Fairfield's Corporate Headquarters. Thence developed a problem—how to help it? Into the breach enter Lou Marsh, manager of Executive Communications and Conferences, and Joan Black, manager of Survey Operations, with breadscraps. A happy ending? The GEers have hopes their friend will soon be wintering in Florida.

**Making Christmas merrier.** Strings of Christmas lights have long been accepted as bright additions to the Yuletide tree. Less well known is the fact that many of the intricate hand-decorated unlighted ornaments also have GE lamp business origins. Krebs and Sohn,

Ltd., a West German firm that is the largest U.S. supplier of these ornaments, looks to GE's Lamp Parts and Equipment Sales Operation, based in Cleveland, to provide most of its U.S.-marketed high-quality glass shells, which are then decorated in Roswell, N.M.





Now it's 'Edison Park'. Lamp Business Division, creator of the original GE industrial park concept at Nela Park, has dedicated another industrial facility and named it after Thomas Edison, founder of the lighting business

and of the electrical industry. GE's Edison Park, 209 acres located at Twinsburg, Ohio, has the High Intensity and Quartz Lamp Department occupying its two buildings. Included in the Park: 90 acres of forest and a

new wildlife center. On hand for the dedication ceremonies were Edison's grandson, John Edison Sloane, center, with his wife and Robert V. Corning, VP and general manager, Lamp Business Division.

**Honors.** GE organizations and people continue to excel in diverse areas.

- General Electric has been honored by the Conference Board, an independent non-profit institution for business and economic research, for the Company's 60 years of continuous support since the Conference Board's founding. Conference Board Trustee Jack S. Parker, right, GE Vice Chairman, accepts the citation from Conference Board President Kenneth A. Randall.
- GE has received the top annual award for service to minority businesses, given by the National Business League. Accepting for GE was Fred H. Black of Corporate Employee Relations. He also served as 1976 Convention Chairman for the League, founded in 1898 by Booker T. Washington to encourage black business enterprises. GE Vice Chairman Jack S. Parker serves on the League's Board of Directors.
- Manager of Corporate Educational Relations Joseph M.



Bertotti was an industry representative on a major panel of the National Career Education Conference held at the Astorhall, Houston, Texas.

- Vice Chairman Parker has also taken on another distinguished post, accepting an invitation to become a member of the Economic Policy Council, formed to examine critical issues affecting long-term United States relationships with both the industrialized and developing countries from a wide variety of economic perspectives.
- An innovative packaging concept for electric clocks won first place for Norman E. Burke, Packaging Engineer for

Housewares and Audio Business Division's Ashland, Mass. plant, in a judging sponsored by *Package Engineering Magazine*.

- Henry W. Tulloch, Public Relations Manager for Data Communication Products Department in Waynesboro, Va. (below left), was honored by



Virginia Governor Mills E. Godwin (above right) for chairing an unusual part-time campaign that took him several days a week for a year. The task: Virginia's Spruce Up Campaign. It ultimately involved half a million people and got rid of 10,000 junk cars and 165 million cans.

# Carlsbad Caverns

Greatest show under earth  
gains new glow and drama with GE lamps

In this 75th year since Cowboy James Larkin White began the modern-day exploration of New Mexico's Carlsbad Caverns, the wonders of this most spectacular of the world's limestone caves have been made still more wondrous—with the use of General Electric lamps. Lighting consultant Raymond Grenald, AIA, has, with few exceptions, specified GE mercury vapor, fluorescent and incandescent lamps throughout in the first major relighting of Carlsbad Caverns since 1937.

Indians knew of the caverns and sought shelter in their entrance chambers. And early white settlers were aware of the cave. In fact, it would be difficult to be in the area and *not* be aware of Carlsbad Caverns, because each evening during the summer months a cloud of hundreds of thousands of bats issues from its mouth to begin their nightly forays among the moths and other insects of the Black and Pecos river valleys.

But it was Jim White who first realized the cave's scenic importance and who began to promote it as a place for tourists to visit.

He himself has set down his own account of how, in 1901, armed with a kerosene lantern and some coils of rope, he determined to explore

this great home of the bats. Fashioning a rope ladder, he went over the edge, alone, and probed further and further into the great shaft that opened up. "It seemed to me," he wrote, "that I was wandering into the very core of the Guadalupe Mountains."

He passed by the bats' own cavern and kept going "until I found myself in the mightiest wilderness of strange formations a cowboy ever laid eyes on. It was the first cave I was ever in, and I didn't know then that those formations had names like 'stalagmites.' But I did know, with the kind of instinct the Creator puts into a man, that there just wasn't another scene like this one in the whole world."

Visitors today still agree with Jim White's estimation. But instead of having to descend in a big metal bucket, as White's early visitors did, today's guests at Carlsbad Caverns—now a national park under the direction of the National Park Service—can take either of two easy courses: they can follow a well-defined, subtly lighted path down from the cave's natural entrance, or they can take an elevator that descends some 750 feet for a shorter tour of the subterranean "Big Room."

Either way, they are soon transported into one of the world's great natural fantasy lands. Dripping water, dissolving and redepositing tiny rock crystals, has over eons filled Carlsbad's caverns with the strangest shapes imaginable, as though Mother Nature had taken up sculpturing and had gone mad with excitement over all the fabulous forms she could create in stone.

Today the Carlsbad experience is made still more intriguing by the new lights. Before, the illumination was largely incandescent flat lighting. Officials of the National Park Service recognized that this illumination of the cave was "unnatural." Says Grenald: "Natural colors were obscured and hidden. Light always came from trailside, so there was a great sameness, which tended to minimize the natural variations

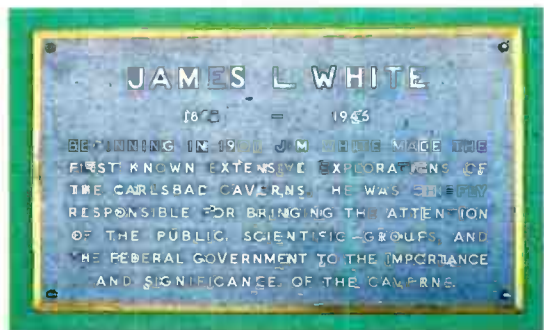


Lighting consultant Raymond Grenald, AIA, who specified GE lamps in new lighting of Carlsbad.



National Park Service ranger shows young visitor one of the strange formations shaped by falling water in Carlsbad Caverns. Visitors generally tour

the cave on their own, following the well-defined paths and listening to descriptions of the cave's wonders on individual radio-receiver tour guides.



Plaque in Carlsbad Caverns National Park Visitor Center recalls Cowboy Jim White, who pioneered exploration of the caverns. Right: Painted Grotto.



*(continued on page 16)*



Scene in the cave's "Big Room" shows how new lighting makes use of different types of lamps, mercury vapor and fluorescent as well as incandescent, and

different tints—from cool blue to warm white—to achieve both dramatic highlights and "relaxation periods" for the eyes.

in size and distance." Also, the heat of the lamps added to an unwanted drying of the cave, and in a few places the lights were causing algae to grow.

Grenald walked the cave in both directions some ten times to memorize its configuration. Then he set to work. "I wanted to communicate the spectacular nature of the formations. They're awe-inspiring: 20 miles of caves and 3½ miles of trails, with overwhelming images at every turn."

Using different types and natural tints of lighting, he planned to light the cave in stages, highlighting dramatic formations, opening up spaces, lighting the walls behind formations to

emphasize separations and define forms more sharply. "Controlled variations in lighting were part of the plan. To prevent 'museum fatigue', where the senses are so overwhelmed with stimuli that a state of near-sleep is induced, I planned 'relaxation periods' where the level of illumination goes down and the colors are more subdued. Then you round a corner and pow!—you're hit in the eye with something dramatically enhanced with light."

The variations in color also add to the excitement. Grenald: "I used seven different GE lamps to bring out the cave's natural colors. For example, in the caverns you can look into spaces a quarter-of-a-mile deep. I placed 40-watt fluorescents, progressively shifting from warm





The National Park Service has built an amphitheater for crowds attending an extra show each summer evening. It's the bat flight, when incredible numbers of small bats spiral out of their own unlighted cave within Carlsbad and stream over the rim of the escarpment for a night of foraging on flying insects.



white to daylight blue to enhance the feeling of depth. This phenomenon is observed in nature when we view mountains or even tall buildings receding in the distance.”

Since some of the installation sites were high in the wall, the lamps were placed by members of the staff who were skilled in climbing in caves. “Two of them took hours to scale one wall,” Grenald recalls. “The visitor cannot realize how high some of those great domes are. We’ve lighted some spaces never seen before.”

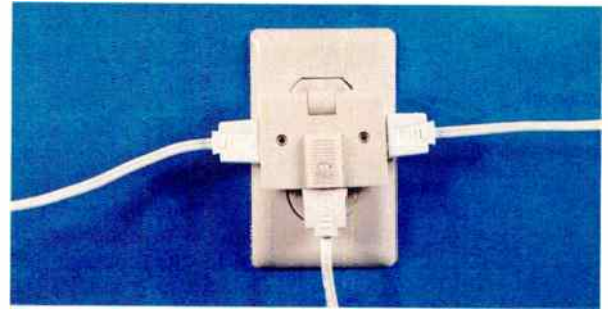
As he worked out his lighting system, Grenald tested lamps from all manufacturers. He chose GE. For one key reason, he found GE lamps superior in color rendition. He was especially

pleased with the qualities of GE Deluxe Warm White Chroma 50 and Chroma 75 lamps. Also, some special lamps he needed are made only by GE. “Since water made this cave, I wanted to emphasize it wherever it exists. Low-voltage GE lamps made drops of water falling from 200 feet look like diamonds. Blue-tinted lights, placed into very deep holes, increased the awareness of depth. People stare, transfixed, into what once went unnoticed. All in all, the GE lights helped with my overall purpose: to sustain the visitor’s interest throughout his tour and to leave images that will linger in memory for the rest of his life.”

It’s the kind of objective that Jim White, if he were here to listen, would be sure to endorse. 



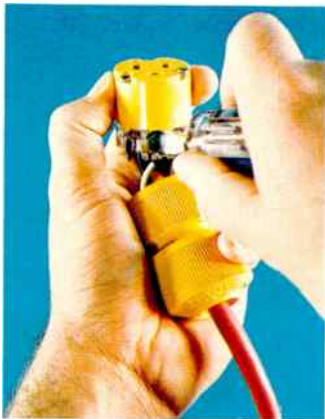
**Safety Caps.** Electrical outlets can now be "child-proofed" with GE's plastic outlet guards.



**Wall Hugger® 3-Tap.** Keep electric cords snug against the wall using this slimline plug.



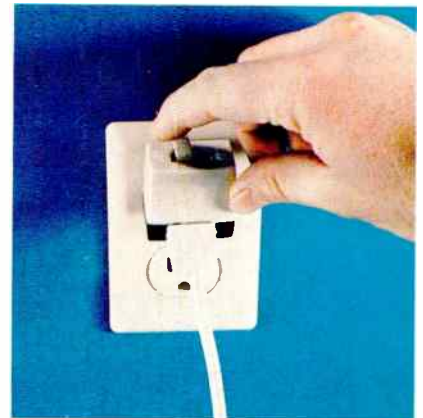
Highly visible GE displays feature dozens of GE wiring devices.



**Plugs and Connectors.** These incorporate a gadget that holds tight to electrical cords.



**Nursery Nightlight.** Handy decorator lights include Teddy, Bunny, Kitty and Puppy.



**Plug-In Cord Switch.** Remote control of electrical equipment is simple with GE's wall switch.

## Those ingenious GE wiring devices

To keep on growing,  
this Providence-based business  
comes up with as many  
as 100 new products a year

If you think wiring devices are just wall plugs and light switches, look more closely at the variety of products being marketed by General Electric's Wiring Device Department. It's virtually impossible to scan GE's product catalog or visit a store display and not find *some* ingenious twist you'll want to put to use in your own home.

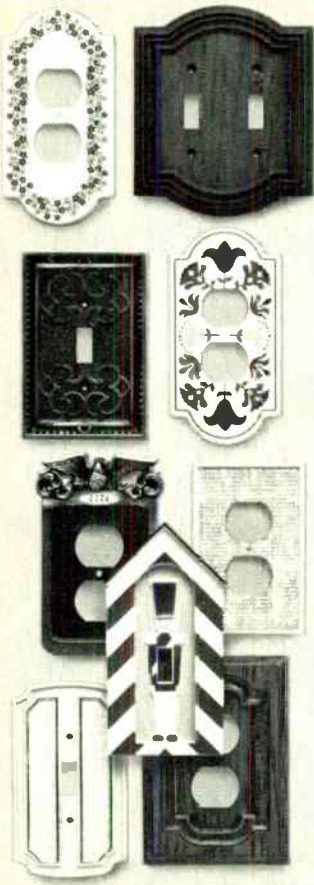
Try the sampling at left and on the following pages. It represents just a few of the thousands of different products in Wiring Device's current catalog.

**Designer Collection™ Wallplates.** Breaking all-time wallplate sales records the past two years have been GE's 30 separate styles of wallplates. Designs range from Mediterranean to mod, and include plates with Stars and Stripes, clowns and carousels, and abstracts. Most wallplates cost less than \$2.

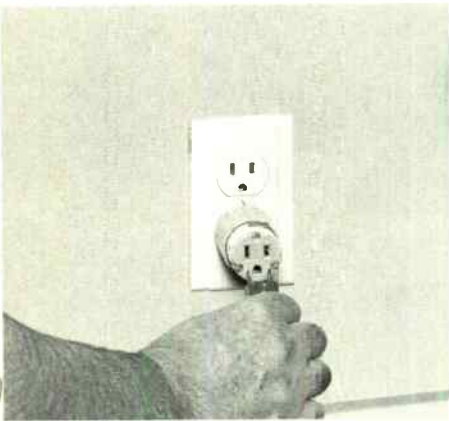
**Wall Hugger® 3-Tap.** This slim 3-outlet tap keeps electric cords close to the wall and comes in two versions, either plain (\$.99) or with a neon locator light (\$1.59).

**Safety Caps.** Made of plastic, GE's safety caps help "childproof" electrical outlets by sealing them against insertion of dangerous objects. Packets of eight are 73 cents each.

**Plugs and Connectors.** These employ a gadget that holds on to the electrical cord "like a bull alligator." Wiring Device's enclosed, fully-insulated cord grip is designed to accept a wide range of cord sizes. Easy to wire, its jaws grip  
*(continued next page)*



**Designer Collection™ Wallplates.** GE wallplates offer styles as diverse as Sculptura™, Turn-Ons™ and Artistry.



**Voltage Spike Protector.** GE's VSP offers electrical voltage surge protection.



**Door Chimes.** GE's new one- or two-button Caroler chimes can add to homemakers' Christmas enjoyment this year.

tightly yet don't damage cord insulation, and the 15-to-30 amp devices range in price from \$4 to \$5.

**Nursery Nightlights.** Certainly in time for Christmas are GE's new Pet Parade™ nursery nightlights, offering such cheery decorations as Teddy, Bunny, Kitty and Puppy (\$1.99 each). Mickey Mouse and Donald Duck also are available (\$1.35).

**Plug-In Cord Switch.** This handy switch provides convenient wall control of such plug-in items as appliances and extension cords, and is great for remote control of Christmas tree lights (\$1.65).

**Voltage Spike Protector.** GE's VSP guards TV sets, or other solid-state products which are not internally protected, from high-voltage surges caused by motor-driven appliances or nearby lightning. Since even small "spikes" gradually shorten the life of solid-state components, the VSP has applications everywhere, and is simply

plugged into an electrical outlet; stereo, radio or TV is plugged into the VSP. Suggested retail price is \$9.95.

**Door Chimes.** In August, Wiring Device introduced 11 chime models combining a full range of decorative styles and tonal qualities. These include the country's first "C" and "D" size battery-powered door chimes, for quick home installation without costly rewiring. Most chimes are priced under \$20, and operate on either self-contained batteries or on a transformer connected to house current. GE's elegant Maestro model includes an 8-tone chime with vibrato resonance.

**Room Dimmers.** Wiring Device's hottest promotional product now is a selection of six types of room dimmer switches, which offer variable brightness controls for incandescent lights. These not only allow selective mood lighting for dining, relaxing or entertaining, but also provide home security lighting and save electricity. Suggested retail prices range from \$3.69 to \$11.99.

**Home and Shop Utility Light.** Just out on the market is a new GE utility light, which updates the industry's traditional phenolic plastic handle by offering a GE Valox® handle. The light comes with either a 15-ft. cord (\$7.25) or a 25-ft. cord (\$8.95) and includes a convenience outlet in the handle.

To appreciate the magnitude of Wiring Device's product scope, one merely has to count the more than 2000 catalog products, with 530 new industrial products added in the past two years, and in excess of 100 planned for 1977. "Business is excellent," states David M. Engelman, Wiring Device general manager. "Our combined consumer-industrial sales are up substantially through September, with the industrial construction business particularly strong."

Engelman stresses that product safety is uppermost among GE's manufacturing priorities: "Every new product is pre-tested, products already marketed are continually reviewed, and any customer complaint is promptly checked."

Observes Engelman: "A large part of our advertising effort is actually spent simplifying packaging instructions. We want understandable, 'how to' information with our products." He notes that many wiring devices were designed explicitly as safety items: GE's "child-

proof" TamperGuard™ extension cords; safety caps for sealing electric outlets; and a new industrial market Leakage Current Tester designed to test for stray currents in appliances and equipment.

Wiring Device's product improvements have been numerous. For hospitals, they include heavier electrical contacts, beefed-up wall receptacles and clear plastic housings for quick trouble-shooting. For contractors, there are green and orange Day-Glo safety stickers affixed to all receptacles, listing proper use with aluminum, copper or copper-clad wire. For all markets, "lips" have been added to plugs so they can't be inserted upside down.

The Wiring Device Department today employs more than 1500 people at seven plants, and is part of GE's Contractor Equipment Business Division. It traces its history back to Edison and through the Monowatt Electric Corporation which operated as a GE affiliate from 1929 to 1950. The Providence factory is still known locally as the Monowatt plant—so named for the one-watt German Christmas tree lights which the firm formerly imported.

Wiring Device's market is now balanced between consumer and industrial, and the department offers some 500 consumer and 1500 industrial products. Remarks Engelman: "With merchandising patterns changing, we're constantly studying new market ventures. By building new and better items, we stand our best


chance of maintaining brand identity."

Wiring Device's consumer sales force includes resident salesmen assigned to four regional sales offices. They call on chain and independent distribution channels serving hardware stores, home improvement centers, food/drug chains, variety stores and discount houses. Highly visible GE product displays appear in nearly 100,000 stores.

The department's industrial sales are achieved through GE's Apparatus Distribution Sales Division (ADSD) team, which sells to electrical distributors.

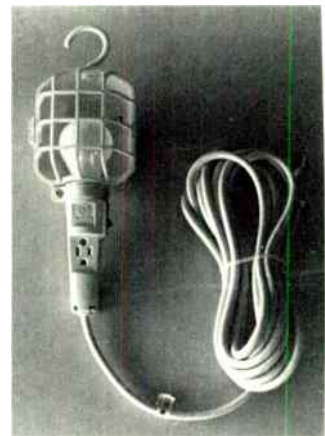
"While GE now enjoys strong acceptance in the consumer business," comments Engelman, "the industrial construction market is presently our growth business. Wiring Device's goal is to capture an increasing share here, with quality products the key."

Next month, Wiring Device will introduce what will be its most sophisticated offering. It's a completely pre-wired remote control system offering automatic switching by time clocks and other control devices. The low-voltage remote control lighting panels combine control components and circuit breakers into one convenient assembly, and sales will be aimed at the large building contractor market.

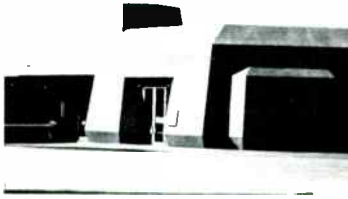
Engelman makes it plain that the department is intent on maintaining GE brand identity in all commercial, industrial, marine and maintenance markets. "It's a challenge we expect to meet because of the continued ingenuity of the department's people." 



**Room Dimmers.** Six types of GE dimmer switches offer variable brightness controls, provide security lighting, save electricity and contribute to dining and entertainment enjoyment.



**Home and Shop Utility Light.** This new light includes a Valox plastic handle with outlet.



# Berkeley's New Energy Exhibit

A GE donation helps explain the relationship between energy resources and energy needs



Using an interactive learning module, a youngster tests his knowledge of this country's various energy sources.

Children at display modules, playing a game that teaches them the economics of various energy alternatives—it's happening daily at the new Energy Exhibit at the University of California-Berkeley's Lawrence Hall of Science, thanks in part to a donation from the General Electric Foundation.

And also thanks to a number of GE people who, under the supervision of J. S. (Steve) Barber, Manager-Promotion and Advertising Programs for San Jose's Nuclear Energy Division, helped develop the new exhibit's nuclear section.

"In designing the energy exhibit, we purposely avoided static objects and long written texts," notes Barber. "The exhibit stresses interactive learning through use of 24 'test your knowledge' games—many engineered for computer inquiry and response."

Located high in the Berkeley hills with a panoramic sweep of the Bay Area, Lawrence Hall was established as a public science center and UC research unit, and honors Berkeley Nobel Laureate Ernest O. Lawrence, developer of the cyclotron. The energy exhibit's impact is being further expanded by offering at cost to other institutions a specially produced multimedia energy program and a 56-page brochure on energy issues. Questions regarding the materials, as well as the displays themselves, can be sent to: Robert F. Content, Assistant Director, Lawrence Hall of Science, University of California-Berkeley 94720.

Incidentally, the exhibit's general admission fee has been waived through next March for those GE employees and their families planning trips to the Bay Area. The Hall is open daily from 10 a.m. to 4:30 p.m.





Crotonville's traditional setting takes on a new appearance in California . . . just one of seven U.S. regional training sites where GE's management education courses are now offered.

## "Crotonville West"

Mention the "Crotonville experience" to anyone who has attended GE's Management Development Institute near Ossining, N.Y., and immediately one hears of the Hudson River Valley's woodsy green hills and the Washington Irving country near Tarrytown.

But mention the "Crotonville experience" to Western Region GEers and one may hear of something quite different—California's John Steinbeck country, sand dunes, boiling surf and windy beaches that yield Pismo clams and driftwood.

It will come as no surprise to many employees who have recently taken Crotonville's Management Practices Course, Motivation Workshop, Kepner-Tregoe Program or Foreman Supervisory Program that these courses are now being offered on a regional basis. In fact, Crotonville has seven Regional Development Centers strategically located around the country, plus one in Mexico City. Management education courses also have been offered in Canada, Brazil, Singapore, Australia, the Philippines and Ireland.


**The Western Region Development Center,** nicknamed "Crotonville West," has been operational since 1970, and holds its training sessions at various locations in Northern California's Monterey Bay area. "High-quality training facilities are an absolute must for us," says the center's director, Carl G. Coleman, Jr., Manager-Communication and Training. "We recreate the Crotonville experience locally, and without permanent facilities must rent quarters that guarantee smooth functioning on a tight schedule."

This is not to say that Crotonville West is an

exact carbon copy of its Eastern parent. At Monterey, Carmel, Pajaro Dunes and Santa Cruz—Western Region training sites—geographic diversity abounds. Notes Coleman: "Where else can one look up from a textbook on human resources management and see Jeffrey pine, fog-shrouded coastline and fishermen landing flounder and sea perch? We purposely choose our sites for maximum privacy and idea-starting."

**An interesting aspect to Crotonville West** is its active recruitment of outside managers for the Management Practices Course. Begun last year, the Crotonville MPC program seeks to enrich the exchange of ideas by including five non-GE managers in each 20-member training class.

"Actually, we have several reasons for encouraging outside participation," states W. E. "Ned" Herrmann, manager of Crotonville's Management Education Operation. "Meeting other companies' managers exposes our own managers to alternative business practices; provides a benchmark by which we can judge our own performance; and allows GE to demonstrate to outsiders the calibre of its own management team."

Herrmann and Coleman are men enthusiastic about the expanded Crotonville regional program, and about Crotonville West's active involvement specifically. As regional director Coleman concludes: "We've greatly lessened the cost and time of sending people back East for training. Courses in resource management, information gathering, employee motivation and problem-solving can be taught locally and with less impact on normal work-cycles." 

# After hours: For GEers, creativity extends to hobbies too

With General Electric people putting such great emphasis on creativity on the job, it's not surprising that they carry this innovative spirit over to their after-hours hobbies and avocations. Here are four examples.

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## To Russia With Love

“Welcome to Moskva!” said the Aeroflot stewardess as Albany’s Audrey Green stepped off the plane in Moscow for her fourth trip to the U.S.S.R. in five years. Green, a secretary in Advertising & Sales Promotion Operations’ Energy Systems Operation, is an ardent Rusophile—interested in Russia’s history, music, culture and people—and has purposely set out to teach both Dr. Kissinger and Mr. Gromyko a lesson in international détente.

It all started in 1971 when Green was working at Pennsylvania’s Muhlenberg College and decided to take a night course in Russian lit. “I got hooked. When a college group left for Russia that summer, I was on the plane.” But she came back dissatisfied: “One has to know the Cyrillic alphabet—beat the language barrier—to appreciate the people.” After a year of tutoring and a crash course in Russian, Green took her second and third trips to Russia with added confidence. On her third trip she worked at the Gas Turbine Division exhibit at the Nefta-Gas Show. Notes Green: “I’m going back again this month because I want to experience one of those fabled Russian winters.” This time, she hopes to meet a Soviet interpreter, Milana Ryabskaya, whom she met in Schenectady last fall during Gas Turbine’s 12-week training program for 14 Soviet technicians.

Asked about a possible GE assignment in Mother Russia, Green laments: “A&SPO-type work is out. Since the government controls the economy, there is no advertising. All prices of similar goods are the same.”





## Humor in a Graveyard

New England's old gravestone epitaphs presumably would be the last place to find an advertisement, right? Not so, chuckles GE's Stephen D. Budrow, a coil winder with Pittsfield's Distribution Transformer Department, who is a cemetery history buff in his spare time. He recalls the marblecutter who erected his wife's stone "as a tribute to her memory and as a specimen of his work. Monuments of the same style 350 dollars."

Budrow numbers himself among a growing group of aficionados seeking to preserve the history, humor and art of old gravestones through "stone rubbing." Since 1970, Budrow has made rubbings in the U.S. and 16 other countries, including rubbings of an ancient Mexican temple. He has written a 36-page self-guide tour booklet of Pittsfield's cemetery; completed an archeology course at England's Cambridge University; placed a rubbing in the Smithsonian Institution; and now hosts a local educational TV show called "Relearning Our Heritage".

"Stone rubbing is basically very simple," Budrow explains. "You place rice parchment or pellow fabric against the gravestone and then rub it with graphite to pick up even the slightest cuttings. An average reproduction takes about two or three hours and leaves your arm bones tired."

Stone rubbings are not new. The ancient Chinese employed a discipline known as T'a-pen or "ink-squeezing," and were the first society to use this preservative process. Adds Budrow: "All stone-rubbing enthusiasts are seeking to preserve a history and art which time and weather are rapidly eroding."

Budrow thoroughly enjoys his hobby. Here's one of his favorite "finds":

*"Sacred to the memory of Mr. James Bates who died August the 6th 1800. His widow aged 24 who mourns as one who can be comforted lives at 7 Elm Street this village and possesses every qualification for a good wife."*

(continued next page)

## The 'small world' of Wayne Lasch

Outside, Wayne Lasch's home looks like any other house in Cleveland's Shaker Heights. Inside, though, there's a complete early American general store with merchandise on the shelves and barrels of nails and flour bags on the floor. There's also a bakery shop, an ice cream parlor, a garage sale and two Shaker Society rooms in place—and a Shaker meetinghouse rapidly going up.

If you haven't noticed the accompanying photo, they're all miniatures—authentic replicas constructed to the scale of one inch per foot.

Lasch, a research chemist for Lamp Business Division's Lighting Research & Technical Services Operation, shares his hobby with his wife, Sally. "You'd be surprised what items are available," he notes. "You can find or design anything from a modern fire extinguisher to an old-fashioned cash register—all in the proper scale."

Since starting in 1970, the Laschs' most ambitious project has been reproducing three rooms at nearby Rainbow Babies' and Children's Hospital. With the Cleveland Miniaturia Society, they miniaturized hundreds of items including flashlights, stethoscopes, clocks, oxygen tanks and gauges, and medication bottles with scaled-down labels.

Explains Lasch: "Hospital officials requested miniature replicas of three specific rooms—the operating, recovery and patients' rooms—to show young patients the course of their upcoming treatment. It's supposedly the first time such detailed replicas have been made available at any hospital."

Lasch is now spending ten hours a week in his basement workshop building a Gay 90s bar. "It's the most ambitious thing I've done so far. I don't know where I'm going to put it!"

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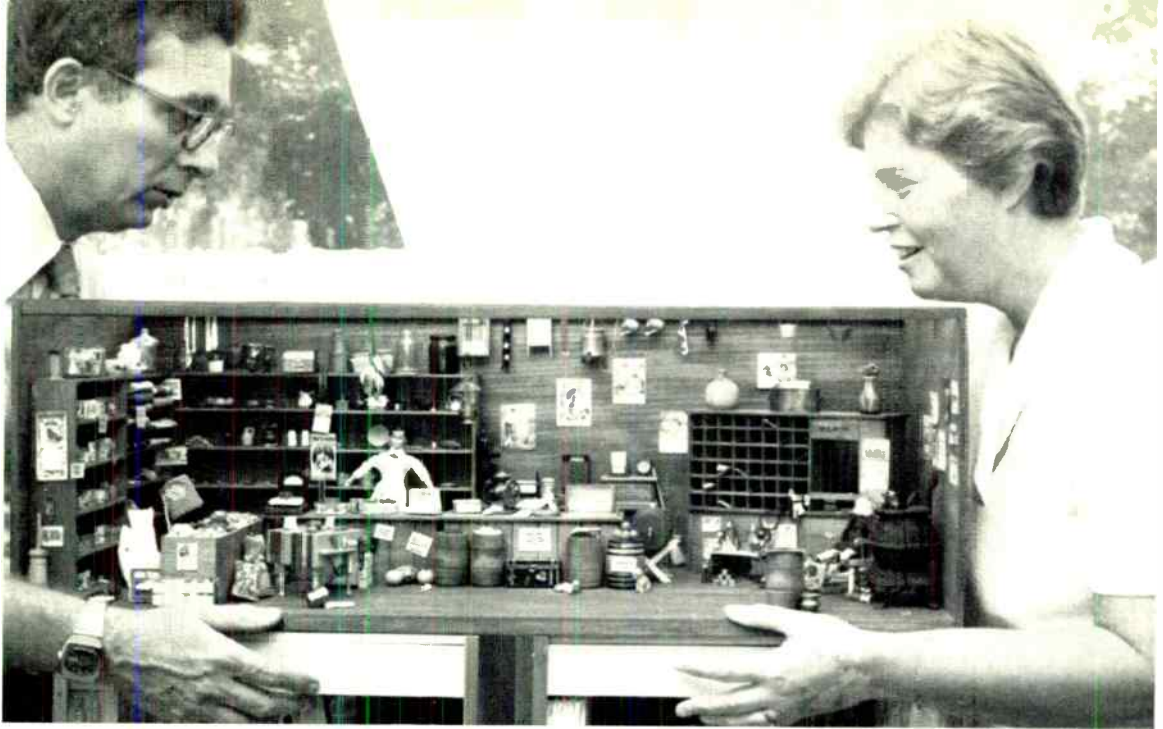
## P. T. Barnum's Disciple

Schenectady's Gordy Turner did not run away to join the circus as a kid, but he's been chasing the Big Top ever since. Turner, a technical illustrator in GE's Advertising & Sales Promotion Operations, is a "circus nut" and proud of it. "When Ringling Brothers-Barnum and Bailey was under canvas, I used to travel with the circus several weeks a year on vacation. I once led a herd of elephants for a four-hour, ten-mile walk to a railroad yard."

Turner's tours with the Big Top have made him an expert. It shows. Since 1949, he's designed and assembled an entire lilliputian circus—complete with wagons, tents, railroad cars, circus performers, animals and sideshows. "I've even got circus route books dating back to 1936," observes Turner, "which give day-to-day accounts of who was in the show, who got hurt, what animals gave birth, and how the box office did." He also has other circus memorabilia and numerous reels of home movies and recordings.

An Albany native, Turner is the fourth generation to work at the Schenectady Plant. His great-grandfather was a cabinetmaker there during the Edison-Steinmetz era (1890-1924), his grandfather was a machinist from 1902-1944, and his dad was a steamfitter for several years after World War II.





## Organization Changes

### CORPORATE

**Phillips S. Peter**, VP—Washington  
Corporate Office

**Arthur J. Demaris**, Manager—Corporate  
Public Information

**John F. Flowers**, Manager—Corporate  
Credit and Collection

### AIRCRAFT ENGINE BUSINESS GROUP

**Brian H. Rowe**, VP and General Manager—  
newly established Group Product Engineer-  
ing Division

**Edward Woll**, VP and General Manager—  
newly established Group Advanced  
Engineering Division

**James E. Worsham**, VP and General Man-  
ager—Airline Programs Division

**Ralph Medros**, General Manager—Group  
Product Quality Operations

**Louis V. Tomasetti**, General Manager—  
Military Engine Projects Division

**Paul C. Setze**, General Manager—Marketing  
Department, Military Engine Projects  
Division

### COMPONENTS AND MATERIALS GROUP

**Philip R. Pluta**, General Manager—newly  
established Plastics Engineering Department

### CONSUMER PRODUCTS GROUP

**Paul W. Van Orden**, General Manager—  
Housewares and Audio Business Division

### INDUSTRIAL AND POWER DELIVERY GROUP

**W. Henry Bryan**, General Manager—Eastern  
Apparatus Service Department

**John E. Williams**, Region Manager—South  
Central Region, Apparatus Distribution  
Sales Division

### SPECIAL SYSTEMS AND PRODUCTS GROUP

**Robert R. Hench**, General Manager—Infor-  
mation Services Marketing Department

**Paul R. Leadley**, General Manager—Infor-  
mation Services International Department

**Raymond W. Marshall**, General Manager—  
Information Services Systems and  
Technology Department

# Technology: leverage to



*Dr. Thomas A. Vanderslice, VP and Group Executive for the Special Systems and Products Group, delivered the talk excerpted here to the Executives Club of Chicago. Into it he poured some heartfelt responses to the “malnutrition” of U.S. research and engineering and the need to reassert technology as a key problem-solver. His interest in the problem is personal, as the executive responsible for GE businesses which depend on continued technological leadership—from the electric wheel to computer service networks. Tom Vanderslice also brought to this assignment credentials that include six years with GE’s Research and Development Center. The result is a very trenchant statement of the case for re-invigorating U.S. technology.*

Today we are properly concerned about oil supplies. But back in 1900, much of the world’s agriculture was as dependent upon a single South American country for nitrate fertilizers as we are now dependent on Arab oil—and the natural sources were running out. Then a German scientist named Haber learned how to “fix” nitrogen from the air and fixed the problems of scarcity and the monopoly of nitrates at the same time.

Likewise, at the beginning of WW-II, Japan took over Southeast Asia and the rest of the world’s sources of natural rubber were cut off. At first the idea of conservation got most of the attention. Some of you may remember the scrap rubber drives during the war. But in spite of all the patriotism and all the efforts, the results were far from meeting essential wartime needs.

Fortunately, an accelerated program to develop synthetic rubber for tires was also being mounted—from a technological viewpoint perhaps the most successful “Project Independence” this nation has ever carried out. In 1940, not a single pound of general purpose synthetic rubber was produced in the U.S. By 1944, an annual production of over 670,000 tons was achieved, and the product was so superior for most purposes that we never went back to dependence on natural rubber again.

There is a moral to these stories and it concerns the relative esteem in which technology is held in our society right now.

Are we becoming so self conscious about technology, “the problem-creator,” that we tend to forget the long role of technology as the problem-solver? Let’s look at the record.

Our predecessors were very strong on a technologically-based infrastructure. They built a transcontinental system of roads, railroads and canals, of basic industries and abundant energy resources, and of the most productive agriculture the world has ever known—all of which has served this nation well for more than a hundred years.

Now, it appears, essential parts of that infra-

# solve the problems facing the U.S.

structure are badly in need of upgrading and modernization, and one aspect of this infrastructure is of particular concern to me, to General Electric, and to the scientific and technical community: the state of U.S. research and engineering and its implications for the future of our society.

There is a more specific moral to the stories about nitrate fertilizers and synthetic rubber. The events would not have taken place, or at least not at the same rate, if the technological infrastructure had not already been in place, with a reservoir of scientific and engineering talent to apply to the problem, and a chemical industry with the managerial talent and productive know-how to perfect and mass produce the products in very short order. Another lesson to be learned is that it is sometimes easier to provide a technological “fix” than to get people to make a major change in their lifestyles.

I hope we are all as concerned today about being as fortunate with regard to our present and future resource problems.

The 25 years following WW-II saw some of the most dramatic commercial innovations in history—stemming at least in part from the R&D of the 1940s: television; computers; the transistor and integrated circuits; gas turbines and nuclear reactors; jet air transport; Xerox copiers; synthetic diamonds (which relieved yet another monopoly); structural “engineered” plastics; radar; and communication, weather and navigational satellites.

For most of this period the U.S. had a comparative advantage in new and improved products and processes, an advantage that has continued to the present in agricultural and so-called high-technology products.

With this rich heritage of technical competence resident in our labor and managerial forces, it may seem strange to say that U.S. technology is in trouble today. Yet I believe there are trends that, unless corrected could lead to a rapidly maturing crisis, such as the United Kingdom is now undergoing in translating her

technology into economic growth. This is a road we dare not go down.

In recent years, R&D in the U.S. has been suffering from malnutrition—and it may be suffering not just from a lack of federal and corporate calories, but also from an imbalanced diet.

Basic research—in high-energy physics, materials, plasma physics, nuclear chemistry—provides much of the fundamental knowledge upon which modern scientifically-based industry is built. This research also includes a safer, more attractive environment; effective treatment, or better still, prevention of such diseases as cancer and mental illness; the development of new energy sources and more energy-economical homes, transportation, and industry; and new sources of raw materials and a more effective agriculture.

But much of what we expect science and technology to provide in the future will, in the opinion of many in the scientific community, be slower in coming unless present trends away from basic research are reversed.

The free and exuberant atmosphere of technical innovation that sustained research and engineering in the '50s and '60s has disappeared as we seem to be heading towards a nation in which the number of those able to point with concern to the problems exceeds those equipped to tackle and solve them. The number of scientists and engineers engaged in R&D per 10,000 population has declined from the late '60s to the present.

The basic anachronism in these trends is that the polls tell us that most Americans still believe that the best way to achieve the complicated and sometimes competing goals we now seek remains the same: through economic growth.

And the economists tell us that the best route to economic growth is through technical innovation.

Simon Kuznets goes so far as to state that the major capital stock for an industrially advanced nation is not its physical equipment; it is the body of knowledge amassed from tested findings

*(continued next page)*

of empirical science and the capacity and training of its population to use this knowledge effectively.

A good example of Kuznets' thesis was the rapid recovery of German industry after WW-II, when its capital equipment lay in ruins. It is conventionally held that capital from the U.S. under the Marshall Plan played a leading part in this, and it did, but it was above all the technical competence and knowledge that resided in the German people that enabled them to rebound so quickly.

As we listened to the election campaign in the last few weeks and months, both parties and all candidates seemed to agree that solving the un-

employment problem, solving the economic problem, has to take priority in the nation's goals.

Yet expenditures for R&D, the "seed corn" of our technology, have been declining for nine straight years, and are continuing to decline relative to our GNP. Even if we take the space program totally out of the picture, there is still more than a 20% decline in R&D expenditures as a per cent of GNP over the last ten years. This gradual decline in the ratio of R&D expenditures to the gross national product is expected to continue through 1986.

In the face of a great need for economic growth and the solution of social problems, we have to ask ourselves: is this the right balance, and the right track for America?

By 1986 we will need to have created 18 million new jobs in this country or more than 2 million new jobs a year between now and then. This is not an estimate, but is based on the number of people already born and growing up in America who will need jobs if we are to attain only a 5% unemployment rate.

I was reminded of this by reading in the *New York Times* of the problems in Great Britain. According to the article, "Successive British Governments took much of the money that might have gone into industry to build an ambitious welfare State to the point where borrowed money now supports it."

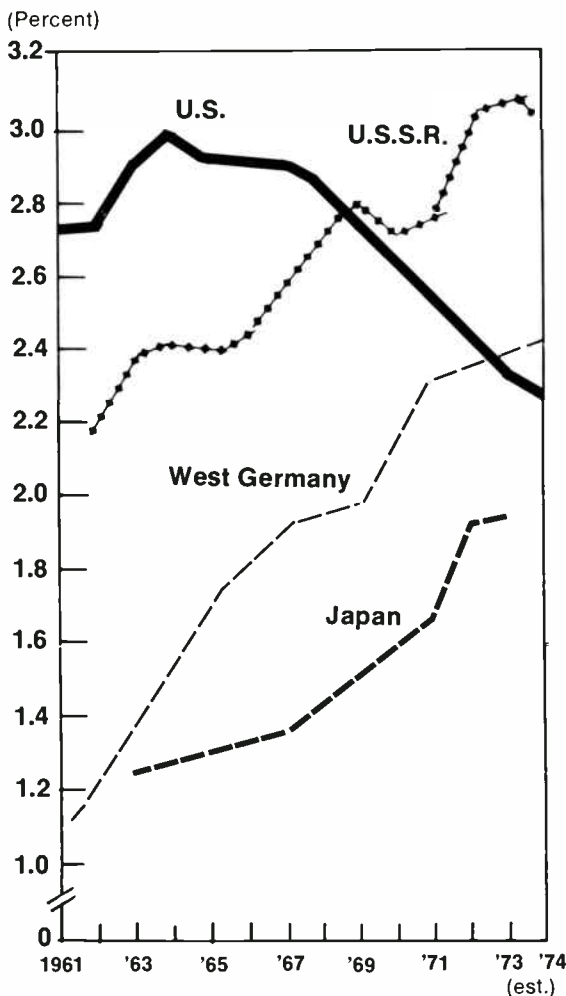
Meanwhile, other countries, including West Germany and Japan, copied with notable success the original American model of innovation and technological development, built up their economies and now support their welfare services from taxes on the profits of their expanded industries and the wages of their highly-paid workers.

We must protect the "seed corn" of scientific and technological competence that resides in our universities, industry, government and privately funded research organizations—our vital technological infrastructure.

In the long run, I can think of nothing that can give us more leverage on all of the problems that confront us now and in the future.

Restoring technology to its problem-solving place is a key way to begin to get back to the fundamentals that built this country. And it would create "new" jobs, not only for the scientists and engineers, who again in the larger sense create their own jobs, but also for hundreds and thousands of others. □

### R & D Expenditures as Percent of GNP



Vanderslice: Time to reverse the striking decline represented here ?

**More on 'Living Links'.**

Having read with interest the September-October *Monogram* article on John A. McManus, the 95-year-old pensioner from Salem, Mass., who had a close association with the late great Elihu Thompson, I thought you might be interested in one of our Schenectady GE pensioners, William VanDyck, who celebrated his 101st birthday recently. He's the third oldest pensioner in our Company, which is quite a distinction when you consider that there are some 60,000 of them.

In fact, VanDyck was born 17 years before the General Electric Company was founded in Schenectady in 1892. He started his career in 1906 and ended it in 1946 with his retirement. He served as first president of GE's Brazilian affiliate and, during his last nine years of service, he was assistant to the president of International General Electric.

He also knew his share of GE greats. He vividly recalls the Company's first president, Charles A. Coffin, and his successors E. Willard Rice, Gerard Swope and Charles "Electric Charlie" Wilson.

The electrical genius Thomas Edison was a personal friend of VanDyck's father, Francis. Edison frequently consulted with the elder VanDyck, who was a noted professor of physics at Rutgers University for almost fifty years.

"Although he came to our home often, I was just a kid to him," recalls VanDyck. "In later years, when I was working for GE in Brazil, Edison did send me a large personally autographed photo of himself, which I still have."



**VanDyck at 101:**  
Another living link to GE's history

He also recalls Edison's 75th birthday party in Hoboken, N.J. "One of the highlights of the evening was when Edison was told by the toastmaster that a man in Denver wanted to communicate with him via the telegraph," explained VanDyck. "Edison, who was one of the fastest telegraphers of the day, readily agreed to use the old machine which was conveniently sitting on one of the tables. It wasn't but a few minutes when he stopped and looked up with a smile. 'The gentleman in Denver can't keep up with me,' he said."

VanDyck's scrapbooks contain photos, letters, news clips, citations and a host of other memorabilia from notable personages not only in General Electric but from all over the world.

Still hale, hearty and active, VanDyck has a fantastic memory and a sense of humor. He goes to "the club" every day, and holds his own when it comes to cards and backgammon. As far as his health is concerned, he says he doesn't worry about it. "I eat what I

want and I haven't been ill or to see a doctor in years."

KAREN KENNEDY  
Schenectady, N.Y.

Three quarters of a century ago today, on July 20, 1901, I became a General Electric employee in Schenectady at the age of fourteen, as a messenger boy at three dollars a week.

Fifty years later, in 1951, when I retired, I had been, respectively, credit manager, assistant treasurer, and treasurer of International General Electric Company; also, assistant treasurer, or treasurer, or director of several of its foreign selling companies; also, treasurer and director of Electrical Export Corporation, a GE-Westinghouse combination.

I made many foreign trips in the interests of those organizations.

It is possible that I am the sole survivor of the group which formed the IGE in New York City in 1919, fifty-seven years ago.

It seems doubtful that there are many, if any, GE pensioners now living who were GE employees seventy-five years ago.

I was born on December 28, 1886 in Vergennes, Addison County, Vermont and am now in my 90th year.

GEORGE MCKENZIE ROBERTS  
San Francisco, California

*Editor's note: The September-October Monogram article on John A. McManus, which drew several interested responses from the Monogram audience, ends on a sad note. John A. McManus died on October 29, 1976 at the age of 96.*



**CATCHING FISH  
WITH GE FLASHBULBS**

Lighting the world's mysterious ocean depths to photograph a golden longnose butterfly fish on Australia's Great Barrier Reef poses no problem for professional marine photographer Douglas Faulkner. He uses General Electric clear flashbulbs exclusively. Faulkner's latest book on world marine life, Dwellers in the Sea, has just been published by The Reader's Digest Press and features dozens of exotic underwater shots using GE flashbulbs. Incidentally, in the Company's ranks is another avid sea life photographer: Mark Morton, Vice President and Group Executive for the Aerospace Business Group. Morton also has done underwater photography on the Great Barrier Reef and in major oceans of the world.

