GENERAL ELECTRIC
Monogram
JANUARY-FEBRUARY 197

Tomorrow's transmission lines

PLUS: 1979 Corporate strategy;
GE energy-saving lamps;
Overcoming winter's blahs

THE COMPANY

Corporate strategy

At 1979 Management Conference, GE leaders highlight the path for making this 'an innovative Company of the future.'

GENERAL ELECTRIC **Monogram**

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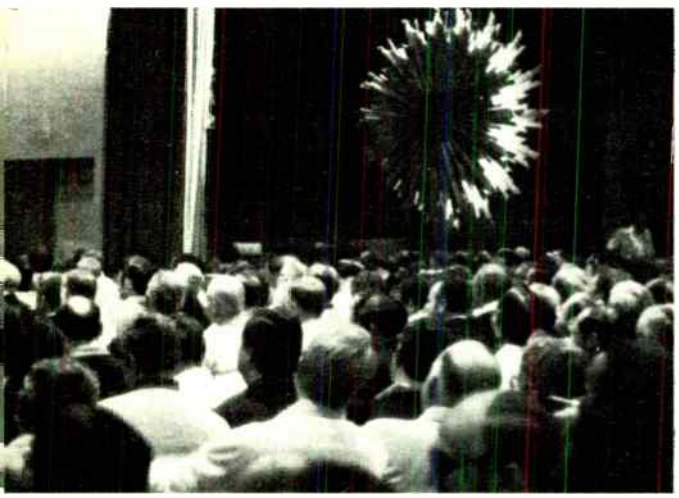
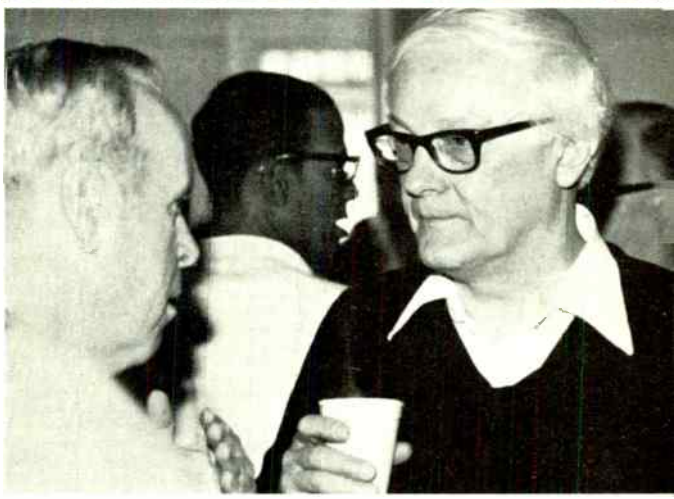




In the first week of January 1979, General Electric reached still another record high—the greatest number yet to attend its annual Management Conference. The total of 418 conferees overflowing the venerable facilities of the Belleview Biltmore in Belleair, Florida, included 61 newcomers attending their first conference, more than twice as many as in 1978.

The conference was only minutes old when GE Chairman Reginald H. Jones set the serious "all business" tone by highlighting some fundamentals: "our vision for this Company, our managerial objectives, and the main thrusts of our corporate strategy."

The image of GE as a traditional electrical manufacturer tied closely to the load growth curve of the electric utilities still persists, Reg Jones noted, even though "General Electric long ago spilled over the confines of electrical manufacturing and has become a worldwide, nearly $20-billion enterprise by expanding, decade after decade, into new products and services, new markets, and new industries suitable to our capabilities."

He repeated the summation of General Electric he had presented in December to the New York Society of Security Analysts: "If you were to ask where General Electric is going in its second century, I would say that we are trying to be a well-managed and socially responsible enterprise that systematically develops new sources of earnings by anticipating the needs of a changing world."

Thus, he added, "our vision is to be an innovative Company of the future—at the leading edge of technology, management and social change."

The question he presented to the conference: "How do we move from that broad vision to the specifics of strategy and planning?"

Three primary objectives of the Company were re-emphasized by the Chairman:

- "The first is to achieve sustained earnings growth at a rate exceeding the growth rate of the United States Gross National Product."
- The second objective: "to maintain a productive environment for our employees, who are the Company's most valuable asset."
- And the third: "Self-governance. We want to

(continued next page)

International competitors were given a hard look by Vice Chairman Jack S. Parker. Many overseas firms have grown their sales four- and five-fold over the past decade, he noted. Today, several factors intensify the challenge. Devaluation of the dollar, for example, has reduced the cost of investing in the U.S. relative to Europe and Japan, and has produced a "surge in U.S. manufacturing by foreign companies." One such company, Siemens of Germany, has said in its annual report: "We intend to be more active than ever in the largest single electrical market in the world, the U.S.A." To support GE domestic markets, Parker said, "we need to enhance our offshore activity and effectiveness." He called for GE operations to go further in rationalizing production on a worldwide basis and in building strength in a coordinated international way. "Worldwide strategies," he summed up, "require continuity, not opportunistic sallies."

Resource management was the theme of remarks by Vice Chairman W. David Dance. Time was, he said, when individual GE businesses *assumed* there would be resources available to allocate when they were needed. This outlook led to unpleasant surprises. As a result, the Company now has a matrix approach to resource planning that identifies and amplifies the "early warning" signals of changing resource needs, quantifies the resources to be applied, and helps avoid surprises. The challenge ahead: "planning and managing our resources in such a way that we will have the right 'mix' at the right time to support sales and income goals."

manage the business in a balanced and ethical manner, in order to maintain our franchise with the public, and thus minimize interference with our freedom of action."

All three objectives, he said, are necessary and interrelated. He also noted that in developing a corporate strategy to fulfill these objectives, management realizes that the challenges will differ for future time intervals.

"Near-term in 1979 and 1980, we are looking at a period of intense competition, inflation, a relatively mild recession, and a tentative recovery," the Chairman reported. "Then, in the years 1981 through 1983, we enter a period that could be very favorable for General Electric, with demographic and economic trends that spell opportunity for many of our businesses here and abroad."

The challenge, as he sees it, is "to sustain our earnings trajectory, with only minor fluctuations, through the unsettled conditions of the next two years, and still maintain our programs designed to take advantage of the opportunities and needs of the 1980s."

The 1979 Corporate Plan, Chairman Jones told the conferees, is structured around eight strategic thrusts. "Three of them we call growth strategies, three of them are resource strategies, and two are strategies related to the external environment."

Growth strategy number one, he said, is "to *enrich the profile* of Company business performance by differentiated resource allocation. We are going to allocate a high proportion of our investment funds to businesses that have exceptional growth prospects, based on their track records and the perceived opportunities of the 1980s."

He made clear that General Electric won't

Announced at Belleair: the new Corporate Technology Council

Jack C. Acton
Industrial Products and Components Sector

Don J. Harbour
International Sector

Thomas H. Lee
Power Systems Sector

Jerome J. Suran
Technical Systems and Materials Sector

John C. Truscott
Consumer Products and Services Sector

Cross-fertilization in General Electric technology, a major subject of the Corporate Technology Study, is to be improved through formation of the new Corporate Technology Council announced at the conference. Members include: Dr. Arthur M. Bueche, Senior VP—Corporate Technology, as Chairman; James F. Young, VP—Technical Resources, as Secretary; Roland W. Schmitt, VP—Corporate Research and Development; James T. Duane, Manager—Computer Management Operation; and the five newly-appointed Staff Executives—Sector Technology Operations, pictured.

ignore its highly profitable and competitively strong Strategic Business Units in maturing markets, or those businesses where competitive strengths and market positions are less strong. "But the reinvestment emphasis there will be on profitability improvement," he explained.

What about SBUs in weak industries or weak competitive positions? "We will be reducing the drag by means of tight reinvestment control and business restructuring plans."

Thus, over time, he said, "we'll continue to shift our center of gravity toward more profitable businesses with a steeper growth trajectory."

Business development, the Chairman said, is the Company's second growth strategy—"and it's closely related to enriching our profile." He looks to new ventures as one key way to extend the Company's scope and enhance its business mix so as to assure earnings growth.

"Growth strategy number three," he continued, "is our *global integration* strategy by which we will be able to pull together multiple-SBU approaches toward specific overseas opportunities, and improve both our export performance and the performance of our foreign affiliates."

Turning to the three strategic thrusts related to resource management, Chairman Jones called for "a substantial move forward in productivity improvement." He called this "probably the most urgent and difficult resource challenge in 1979."

Another resource challenge: "to step up our rate of *technological innovation* for product improvements and productivity increases." This challenge, he said, "involves committing more of our technology resources to innovation, with greater emphasis on gaining the initiative—and

(continued next page)

less on defensive reaction." Other objectives: to regain cost leadership in lines where it is in doubt, and to improve cross-fertilization in technology. To this end, the Chairman announced the new Corporate Technology Council (see page 5).

The third strategic thrust related to resource management: "a *human resource* strategy to make sure that we will have the skills in place to take advantage of the new technologies and the increasingly international character of our business."

Two strategic thrusts related to the external business environment were summarized by the Chairman.

The first: to provide a more effective GE voice in the debate over *public policy*. Reiterating that most of the really big problems facing the Company are external to the business, he noted: "This year we'll focus on three areas directly related to General Electric's business performance: anti-inflation policy, energy policy, and international trade policy."

A final thrust for 1979: a *risk containment* strategy. "Murphy's Law has not been repealed, even for General Electric," he observed. But management has identified the indicators that "will alert us to major risks which would affect the whole Company. With sufficient warning, our planning system should enable us to minimize the effects of such 'discontinuities.' "

To outline these main strategic thrusts, Reg Jones said, doesn't assure success—"only you and your associates can do that. But they do give us a sense of direction and a plan of action by which we can hope to sustain our earnings growth trajectory in the years ahead."

The parameters thus set by the Chairman, the 1979 Management Conference followed through with three days and 23 other speakers analyzing General Electric's status and prospects.

At the end, Reg Jones reviewed the main points and set forth the personal challenge to the assembled managers and their associates back home. "Management is not an easy occupation—yet it can be one of the most satisfying and fulfilling. We are entering a period full of uncertainties, doubts and, unquestionably, frustrations. Yet Jack Parker, Dave Dance and I, and our entire Board of Directors, have every confidence in you and your associates back home. We see a level of competence and sense a degree of sophistication that is unrivaled in our history. You *will* get the job done."

Microwave ovens – not just for cooking anymore

General Electric microwave owners have found dozens of new uses for their time-saving appliance—and they're writing in to let the Company know about them. Intrigued, the *Monogram* interviewed a number of GE microwave owners, some of whom are featured here.

Dee Campbell: dried flower bouquets. Pennsylvania's Dee Campbell teaches new microwave oven purchasers how to cook as part of her job, then pursues her hobby of drying flowers in her own microwave oven at home. A home economist with Boscov's Department Store in Reading, Pa., Dee has been drying flowers for the past three years. Having originally used silica gel as a drying agent, she recently began experimenting with other compounds, including a mixture of kitty litter and salt—which she says is "inexpensive, easy to work with, can be used again and again, and preserves reds and purples beautifully—though they're the hardest colors to dry."

Nathalie Dupree: quick-dried herbs for cooking. Nathalie Dupree uses her GE microwave oven to dry herbs for her cooking classes at Rich's Cooking School in Atlanta, Ga. "I use parsley, basil and thyme for everything from salads to main dishes," explains Nathalie, "and the microwave oven helps me to quickly prepare enough of them for many classes."

She adds: "The quick-drying of fragile herbs like tarragon has other advantages. Since I can dry a half-cup of almost any herb in two minutes, the leaves and flavor remain fresh."

Reneé Powers' bread-dough art. California's Reneé Powers has parlayed her hobby of making bread-dough objects in her microwave oven into a thriving business. She recently opened a small shop in Los Angeles which stocks an assortment of baskets, tissue-box covers, ornaments and

Dee Campbell prepares to "microwave" a flower for a dried-flower arrangement.

Nathalie Dupree demonstrates herb-drying.

Reneé Powers (r) shows bread-dough crafts.

plaques, all made from bread dough baked in her microwave oven and then painted or shellacked to make them washable. Also on sale is Reneé's 18-page booklet on bread-dough art, *Merry Menageries with Microwaves*.

"I don't know how I'd keep the store stocked without my microwave," observes Reneé, who hasn't used her conventional oven for 2½ years. "Where the microwave can bake one of my smaller pieces in four to eight minutes, a regular oven takes nearly two hours."

Mary Beth Stokes: dyed fabrics by microwave. An artistic English teacher, Mary Beth Stokes spent a year creating a 7′ x 5′ work of art made from pieces of fabric dyed in her GE microwave oven.

"At first I thought I could buy enough fabric to get all the colors I needed," says Mary Beth. "But then I found I needed nuances of color I could get only by custom-dyeing small pieces of cloth. I was able to use literally hundreds of shades because the microwave brought the dyes to a boil in minutes, then dried the dyed material just as quickly."

Hand-sewing pieces of fabric together as they were dried, Mary Beth completed "My Opus" in time to be part of The Atlanta Artists' Club Gallery show last fall.

Mary Beth Stokes displays fabric mural.

To help safeguard Mohawk River recreation, Schenectady GE operates six-acre wastewater treatment plant.

GE and

Want proof that the

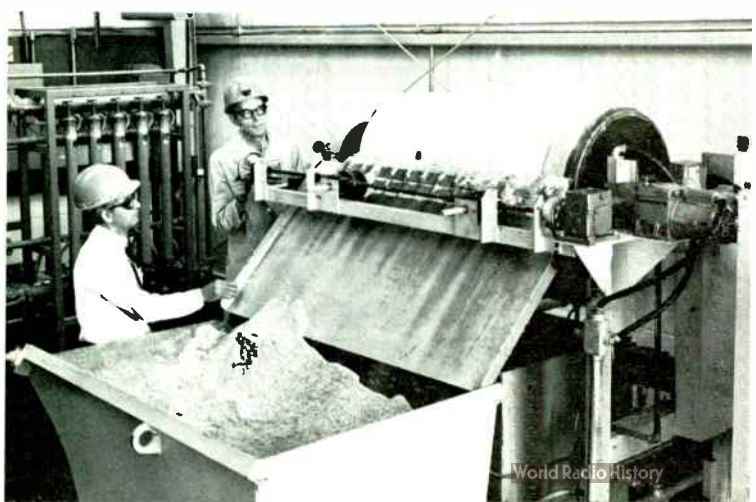
General Electric people wondering how well the Company is doing to avoid contamination of waterways adjacent to its factory facilities can find ready reassurance in recent awards granted to GE plants.

A "Clean Water Award" from the Izaak Walton League of America, Inc., a noted conservation group, was presented last July to Plastics Business Division's Mount Vernon, Ind., plant. The GE facility was nominated for the honor by the Indiana State Stream Pollution Control Board and the Environmental Protection Agency (EPA), Region 5.

Mount Vernon packs a unique one-two punch in cleaning its wastewater. The waste brine from one of the site's manufacturing operations goes through an electrolytic separation process to reclaim two distinct raw materials for reuse in the manufacture of Lexan® and Valox® resins and Lexan sheet plastics. At Mount Vernon's wastewater treatment plant, residues left in other waste streams are gobbled by micro-organisms, whose voracious appetites are stimulated in oxygen-rich sealed basins. Daily, the GE facility draws some five million gallons of water from the Ohio River for its production operations. To preserve the scenic surroundings of the plant, GE constructed an artificial brook to carry the treated effluent across a natural wooded landscape before it finally reenters the river.

Mount Vernon invested $33

Above: Mount Vernon, Ind.'s Nathaniel Spells, Sr. (l), and Gary Van Zandt review aeration procedure used in wastewater treatment. Below: Charleston, S.C.'s John Noe (l) and William Basily check wastewater-filtering machine used after production of turbine hoods.



clean waters

Company's water protection measures are effective? Recent awards supply it aplenty.

million in its brine recovery operation and wastewater treatment plant. Are they doing the job? Goldfish and pet turtles thriving in laboratory samples of the treated water silently vouch for the systems' success.

In Charleston, S.C., GE's Steam Turbine-Generator plant was the recipient of still another environmental protection award for clean-water efforts. Presented last December by *Power* magazine, the commendation recognized the use of an oil/water separator, manufactured by GE's Re-entry and Environmental Systems Division in Philadelphia, Pa., and other pollution-control equipment that treat 3000 gallons of process wastewater daily.

Originally designed by environmental protection personnel at GE's Pittsfield, Mass., plant, the GE oil/water separator removes free oil from the wastewater. A rotary vacuum filtration unit separates and removes oil and solids from the partially-treated waste. What's left is mostly diluted machine tool coolant, which goes into a 6000-gallon storage tank and then is pumped into an ultrafiltration system to separate the desirable coolant from surplus water. The concentrated coolant is held for recycling, and the surplus water is pumped to an oxidation pond for final biological treatment prior to discharge from the plant. And there's an energy-related bonus: the oil separated by the various processes is accumulated, sold and eventually burned as a heating fuel.

In Selmer, Tenn., GE's Distribution Assemblies Department earned a 1975 award from the Kentucky/Tennessee Water Pollution Control Association for exemplary clean-water performance. Selmer's wastewater treatment facility removes pollutants that are generated in the manufacture of busways—components used in switchgear and transformer products for high-voltage distribution. The plant treats 100,000 gallons of wastewater each day.

The list goes on. Not all GE plants are award-winners, but each is staffed with environmental specialists and equipped with the technological hardware "to make 'clean water' a carefully measured objective," notes Dr. Edward L. Simons, manager of GE's Corporate Environmental Protection Operation in Schenectady, N.Y.

The largest treatment operation is at Schenectady's main plant, where a virtual deluge of water—20 to 40 million gallons—is processed daily.

Erie, Pa., discharges up to 1.5 million gallons of treated wastewater daily into Lake Erie, meeting strict criteria set by the International Joint Commission Agreement between the U.S. and Canada. A hundred yards from where the effluent cascades off a cliff and into the lake, fishermen catch rock bass and walleyed pike.

Fort Wayne, Ind., recycles some of the water used in its factory operations. The remainder is treated before its discharge into municipal sewers. And at its Taylor Street plant, where giant coal and scrap metal piles loom behind the building, coal dust, oil and grease that travel with rainwater runoff are "caught" and removed by a special system, allowing only treated water to enter the nearby St. Mary's River.

What lies ahead? Says GE's Dr. Simons: "Clean water regulations have been changing since 1972, when Congress authorized a new national system of water pollution control. GE plants subject to this system have met the Federal Government's first objective by controlling their wastewater discharges through applications of what the law calls the 'best practicable control technology currently available.' Now, the Clean Water Act of 1977 has directed the EPA to require even tighter controls for many chemicals not specifically covered in the 1972 legislation. Individual states and cities also have their own special regulations that must be met.

"Water pollution control already has been a multi-million-dollar investment for GE," he concludes. "As the Company continues to grow, the new regulatory framework will require continued investment in improving present systems, designing and constructing new ones, and performing ongoing tests to make sure treatment facilities are doing everything they're supposed to do."

Do-it-yourself career

With GE's open promotion systems, employees take the

Dan Daylor plans success in a new civilian career

"I'm 38 years old and just starting a new career. In five years, I hope to be a part of engineering management at GE," declares 20-year Navy veteran Daniel P. Daylor, who joined Lynn's Medium Steam Turbine Department as a sweeper in December 1977, a month after his military discharge. As a result of job posting, he became an inspector in quality control by April 1978—and was notified of another promotion, to a nonexempt radio-

Keith Walter changed job paths to work with people

"For 21 years, I had worked in a variety of GE engineering areas. The assignments were challenging, but as time passed, I felt a personal desire to direct my energies toward working more closely with people on things that affect their jobs—and their futures," recalls Keith D. Walter of Binghamton's Aerospace Control Systems Department. In 1977, he sought a posted job and was hired as an employee relations programs and benefits specialist.

"Naturally, I pondered a bit about the wisdom of making such a drastic career switch at this point in my life, and I had to do a lot of homework to learn the job," he notes. "But because many people here also have technical backgrounds, there's no problem in establishing a quick rapport when we sit down to talk."

Rose Rogers now a two-time winner in job advancement

"Factories are okay. I worked in them at GE for 12 years. But I felt limited in my work—and I knew I could do more," says Fort Wayne's Rose M. Rogers. "So I gave job posting a try. And it worked—*twice*!" From her hourly-rated assembly job, she advanced in 1977 to an exempt customer-service position, then progressed again in 1978 to Specialty Transformer Business Department's marketing section, where she negotiates prices.

"Before joining GE, I was a licensed practical nurse. A nice job—but I was also a divorcée with an asthmatic son, and wanted regular hours with better pay and benefits," she notes. "Trading a starched, white uniform for factory safety glasses turned out to be one of the most important changes in my life!"

Helen Frank followed job opportunity to Florida

"It was a far cry from Pennsylvania, but if my GE career path led to Florida, I wanted to follow it! My husband agreed. He has his own business, and opened a branch when we relocated here," explains Helen C. Frank from her Daytona Beach office at Space Division's Ground Systems Department. "I was working at GE in Philadelphia, and had self-nominated for a position in nearby Valley Forge's Space Division. Surprisingly, that led to my being considered for a promotion in Florida—and I made the move!"

She was hired for the job in 1977, and last year accepted a new post there as manager—digital electronics design. Shown above with designer Joseph Cox, she adds: "Now, I'm on the other end of job posting, and use it often to hire qualified people."

moves?

initiative to find new jobs.

graphic technician, as this issue of the *Monogram* went to press.

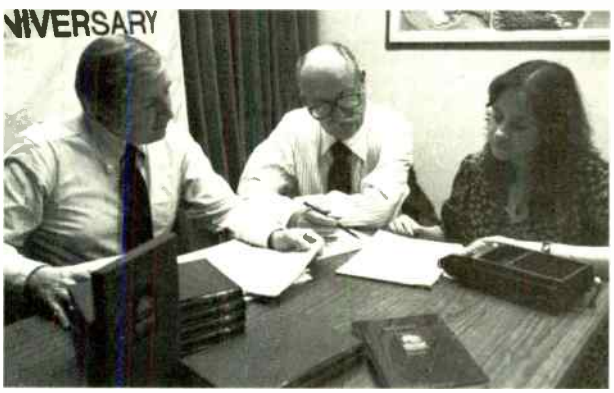
"I was a senior chief machinist's mate in the service," Daylor adds. "Years of Navy training, plus General Electric job advancement opportunities, should help me get ahead!"

Debbie McNeill switched from office to factory

"I got exactly what I wanted: a change in work hours, a factory environment and a job that's teaching me about manufacturing," says Debra McNeill. After working five years as a secretary in Lynn's Aircraft Engine Business Group, she used job posting last summer to obtain an hourly-rated job as a production follower. "I feel closer to the business when I'm in the factory," she notes. "And I thrive on the fast pace of the work!"

Above, McNeill is shown routing CF6 aircraft engine parts in her first factory job. In December, she again used job posting to advance to a position as a machine operator. "I like to be active," she concludes. "I'm busy on the job—and have time to be busy at home, too, now that my workday ends at 3 p.m."

Just off the presses: ***Science, Invention and Social Change***, a handsome 203-page book (top) reporting on GE's recent science symposium, is reviewed by Schenectady's Timothy Sauter (l) and Donald Calkins. Right, Cleveland's James Jensen, Neil Corrigan and William Rogers (l to r) with Lighting Business Group's 224-page ***A Century of Light***. Below, Elfun 80-page anniversary book, ***Reflections***, checked by (l to r) Edwin Hicks, Walter Brzoza and Mary Gatzemeyer.



Books celebrating the Company's history

Now in limited distribution are three attractive new GE books—inspired, respectively, by the Company's recent International Symposium on Science, Invention and Social Change; the 100th anniversary of Edison's first light bulb; and the Elfun Society's 50th anniversary.

Monographs

$40,000 scholarship fund. The largest scholarship grant ever made by a GE component to encourage minority engineering graduates has been awarded by Milwaukee's Medical Systems Business Division.

Ten area high-school students —chosen for their outstanding academic studies as well as their school activities—each received a $1000 Minority Engineering Scholarship, which is renewable every year for four years. The $40,000 scholarship fund—a large commitment for one location—came from the Engineering Department's operating budget.

At awards ceremony, GE's John C. Truscott (r) talks with future engineer Michael Mitchell, a Dartmouth College freshman (l), and his brother.

Aiding the disabled. Fremont, Ohio's Jean Verdier is legally blind. But thanks to Lighting Business Group's Gene R. Schaaf and a number of other LBG employees, she by no means is handicapped. Verdier, a counselor for the Ohio Bureau of Employment Services, uses special readers both at work and at home—which permit reading matter to be illuminated, filmed, enlarged and projected on a closed-circuit TV screen. Her ongoing problem: where to quickly get replacement lamps for her readers.

Enter Bellevue Lamp senior material specialist Gene Schaaf who, on learning of Verdier's dilemma, hurried to the phone and started calling. Figuring that "if a lamp was made, GE made it," Schaaf eventually discovered that Euclid Lamp indeed built the needed 1460X microscope illuminator lamp. What's more, a list of possible GE suppliers revealed that there was one in nearby Sandusky. Schaaf quickly obtained the GE lamps and installed them in Verdier's readers.

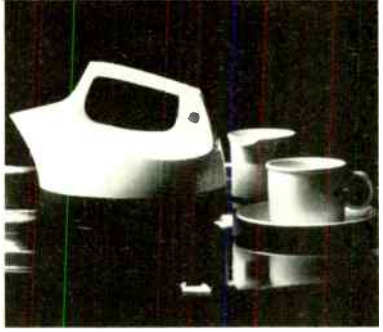
Observes Schaaf: "What is amazing about Jean Verdier is that, legally blind since birth, she holds a B.A. in social work and psychology from Ohio Northern College, and counsels dozens of economically-disadvantaged people who also have disabilities."

No weight problem. Erie's Nancy M. Veres is no ordinary weightlifter. In American Athletic Union deadlift competition, she holds the *world record* for women in the featherweight class. To set the record, she lifted a 290-pound barbell from the floor, held it steady for ten seconds, and then returned it to the floor gently.

"You've got to love this sport to work out 16 hours a week!" says this Transportation Equipment Products Department lathe operator. "My husband is a weightlifter. I took up the sport after getting tired of sitting upstairs while he was practicing downstairs. He was tickled to help me!"

How does Nancy get psyched before a lift? "I listen to the announcer mention my name. Then I look at the bar and say to myself, 'I gotta pull it up! I gotta pull it up!' I block everything else out mentally."

Honors. Dual honors have been awarded the Company's programs for share owners and financial analysts. On February 2, Chairman Reginald H. Jones will accept the award for Excellence in Corporate Reporting granted the Company by the Financial Analysts Federation. And *Institutional Investor* magazine selected the GE 1977 Annual Report as the best in the Electrical Equipment category, citing GE as one of the three companies that have received top ratings for the fourth consecutive year.



• Australian General Electric (Appliances) Pty. Ltd. has been awarded the 1978 Prince Philip Design Award—that nation's most sought-after consumer product design award—for its KE 12/20 series electric kettles. Prince Philip presented the prize via satellite from Buckingham Palace during a coast-to-coast TV special.

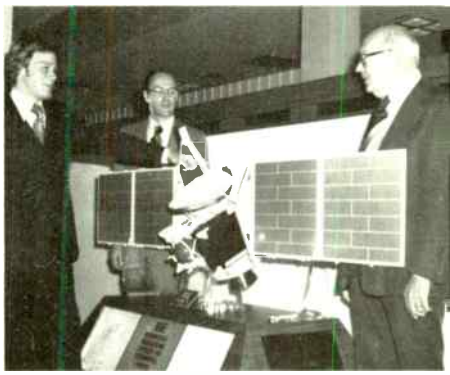
• Fairfield's Dr. Jerome J. Suran, staff executive—Technical Systems and Materials Technology Operation, has been elected president of the Institute of Electrical and Electronics Engineers (IEEE) for a one-year term.

• San Jose's Hugh D. Hexamer, manager—Communication and Nuclear Power Information for the Nuclear Energy Business Group, has received the Atomic Industrial Forum's Clyde A. Lilly, Jr., award medal for his nuclear industry contributions.

All in the (GE) family. Four generations ago, in 1891, great-grandfather Albert Babson joined Edison General Electric Company. In 1977, great-grandson Carl M. Bosch (l) joined GE's engineering training program at Valley Forge. In between: grandfather Carl E. Bosch (r), who married Babson's daughter Elizabeth, and who worked for GE from 1929 to 1962. And father John A. Bosch (c), who joined GE in 1953, and last year was named General Manager—Aerospace Electrical Systems Programs in Binghamton.

Why is the youngest Bosch family member working for GE? "I evaluated employers objectively when interviewing for jobs after college, but GE made the best offer. Naturally, from a lifetime of family discussion about the Company, I knew it was a good one!"

Incidentally, General Electric has more than one four-generation family. Great-grandfather Pasquale Petrucci joined the Company in 1900 and set the GE employment example for his son, the late Joseph I. Petrucci; grandson Joseph W., with Installation and Service Engineering Business Division in Dallas; and great-grandson John, with GE Credit Corporation in New Orleans.



Calling the shots. Friday night at Bridgeport, Conn.'s Sacred Heart University: William J. Donlin (left)—who just hours before had stepped off Conrail's Connecticut commuter train from New York—now sports a black-and-white striped shirt and a whistle.

"This is my 24th season serving as a professional college-basketball referee," says the Export Sales and Services Division communications manager. "My Friday and Saturday evenings between November and March are almost solidly booked!"

He notes: "My performance as a 'ref' is stiffly rated by coaches, athletic directors, fellow officials, and of course, the Eastern College Athletic Conference. But I love the job! It takes me to some of New England's top sports departments, and gives me some great physical and mental conditioning."

Donlin became an accredited referee shortly after his graduation from King's College in Pennsylvania—"where I was a 'hooper' [basketball player]. I stand only five-nine. When our team used to walk into the gymnasium, people would mistakenly hand me the towels!"

More for less

With cheap, abundant energy a thing of the past, GE's lighting thrust is toward energy-saving lamps— more light for the dollar.

In 1973, finding themselves with few energy-saving alternatives to the Arab oil embargo, Americans began a "turn-off-the-bulbs" campaign. General Electric's lighting business was hit hard. Now, six years later, thanks to Company innovations in high-efficiency lighting that conserve energy and reduce energy costs, GE lighting sales are breaking all previous records.

"Users are increasingly demanding more energy-efficient lighting systems," observes General Electric VP James A. Baker, group executive of Lighting Business Group: "Much of today's installed lighting is inefficient, dirty and carelessly operated. Huge amounts of energy could be saved with the right light sources, ballasts and fixtures."

This year, Nela Park will lead the Company in celebrating "The Century of Light." GE's lighting business has come a long way since Edison's first practical incandescent light bulb began glowing so brightly on Oct. 19, 1879. Today's GE lighting catalogs list several thousand different lamps—from the minuscule bulbs used in complicated surgery up to the 10,000-watt lamps used in filming live shows at Nashville's Grand Ole Opry House (see page 17).

Notes VP Baker: "As a nation, we *need* adequate illumination in offices and factories to maintain high productivity and quality of working life. GE researchers are constantly designing more efficient incandescent, high intensity discharge and fluorescent lamps. Lower-wattage units are handling bigger and bigger lighting jobs."

Energy-saving innovations in GE lamps recently caught the attention of management at Houston's Astrodome—home park for professional baseball, football and soccer, and other events ranging from religious conventions to tractor pulls. An evaluation of the incandescent

VP Jim Baker: "The Maxi-Miser® fluorescent lamp/ballast system is the most efficient 40-watt fluorescent system now commercially available in volume production."

lighting system showed that GE lighting could reduce electricity costs more than $80,000 per year, cut bulb replacement expenses $43,000 per year, significantly reduce maintenance costs—and *double* the floor's illumination. The new Astrodome lighting system employs 600 GE 1500-watt Multi-Vapor® lamps mounted in GE Powr-Spot® luminaires.

Other customers are responding to the nationwide call for energy conservation. The Lubbock, Tex., city council recently mandated the use of high-pressure sodium (HPS) lamps in its street lighting. Instead of using 1000-watt mercury-vapor lamps, Lubbock's thoroughfares now are lighted with GE 400-watt Lucalox® lamps mounted in Powr-Door® luminaires. Lighting operating costs have been cut 40%—while the city maintains as much illumination as before.

In the Pacific Northwest, a Kennewick, Wash., elementary school recently installed GE 40-watt Watt-Miser® II fluorescent lamps and Maxi-Miser® ballasts in its classrooms—as part of a national education group's "Saving Schoolhouse Energy" project. This new four-foot fluorescent lighting system is expected to produce 4% more light then a conventional 40-watt system, but averages 16% less wattage with a 23% gain in system efficiency. Maxi-Miser ballasts for use both with eight-foot Watt-Miser II Slimline and with high output lamps are scheduled to be on the market soon.

Overseas GE successes in lighting, as well, are attributable to the Company's efficient products. In Paris, such prominent landmarks as the Arc de Triomphe, Place de la Concorde and the Madeleine Church are lit exclusively by GE lamps. The Arc de Triomphe (see page 17) is lit with 500-watt Quartzline® tungsten halogen lamps and 300- and 500-watt PAR 56 incandescent

(continued on page 16)

A 63% cut in lighting costs for this Redmond, Wash., home (above) was realized with a GE system that relies almost exclusively on Soft White home fluorescent tubes instead of incandescent household light bulbs. Built for *Family Circle* magazine, the house employs 53 fluorescent tubes, several in custom-designed fixtures. The new 33-watt, Gro 'n' Sho Bright Stik® portable fluorescent (left) is a self-ballasted, plug-in unit that needs no extra fixture or wiring. It provides as much light as a 50-watt bulb and lasts five times as long.

lamps. General Electric Technical Services Company obtained this order—because GE was the only supplier that could provide the Quartzline superior lighting source. Quartzline lamps offer twice the life and higher light output than conventional lamps.

For Switzerland's federal highway program, the International Lighting Department is supplying, through Novelectric AG, more than 36,000 GE fluorescent and HPS lamps to light two road tunnels on a new primary route connecting West Germany and Italy. When completed later this year, the 10-mile St. Gotthard tunnel will be the world's longest road tunnel. GE lamps were specified for the St. Gotthard and Seelisberg tunnels because of their longer life, energy savings and ease of maintenance.

To be sure, General Electric's latest lamp technology has found its way into a plethora of other lighting innovations—multi-flashbulb products which provide better light for photography, and new sealed-beam halogen headlamps for automobiles. Halogen headlamps can extend a car's high-beam distance with no increase in wattage. GE plans a regional roll-out of these headlamps early this year, with national distribution by year end.

A new generation of General Electric programmable lighting controls for offices and factories—computer-based for greater precision—represents another powerful tool for reducing lighting energy waste. Providence's Wiring Device Business Department will market them in August. Tests show that the new controls can pay for themselves in less than two years, by providing the right amount of light when and where it's needed.

What's ahead for lighting? "Our R&D efforts are concentrated on providing innovative light sources that give more light for the lighting dollar," observes General Electric's Baker. "We expect to see increased use of fluorescent lighting, including units that can be installed in screw-in incandescent sockets. We've made great progress since Edison's first carbon-filament bulb, and each new breakthrough saves energy dollars for our customers."

Northern Arizona University achieved an $11,000 annual energy savings in its new stadium by using GE 1000-watt Lucalox® HPS lamps.

Each Alpha Beta food-chain store in California saves about $1500 a year in energy costs by using Watt-Miser™ fluorescent lamps.

A city street in Denver, Colo., is lit with 400-watt Lucalox® lamps, which give six to eight times more light than the lamps they replaced.

In Switzerland's Alps, thousands of GE lamps will soon help European motorists traverse the world's longest tunnel.

Country music stars shine under Quartzline® lamps at Nashville's Grand Ole Opry House (top). John Travolta and Karen Gorney (right) of "Saturday Night Fever" dance at Odyssey : 2001 disco in Brooklyn. GE lighting system was designed by Lite Lab Corp.

As "The City of Light," Paris includes such landmarks as the Arc de Triomphe, lit by GE lamps (above). New halogen headlamps (right) can double a car's present allowable high-beam candlepower.

FlipFlash® II bulbs (above) provide more evenly lighted photos than those of the original FlipFlash units. In Georgia, Amoco Fabrics Co. (right) saves nearly $1 million a year in lighting costs by using Lucalox® lamps and Duraglow® fixtures in its three plants, including Hazlehurst Mill shown here.

High-wire artists? No, technicians, making electrical connections to capacitors and rectifiers at GE's newest Project Ultra High Voltage test facility in Lenox, Mass. High-voltage d-c is being tested for its electrical efficiencies and environmental effects.

TECHNOLOGY

Tomorrow's transmission

Giant electrical sphere exemplifies GE's ongoing research in high-voltage transmission. GE continues to explore the best way to send UHV a-c and d-c through long-distance transmission lines.

D-C power lines operating at 1½ million volts? It's the objective of work at GE's newest ultra-high-voltage facility.

In the early days of the electrical industry, the differences between a-c and d-c technology led to a bitter "war of the currents," with a-c emerging as the victor. Today, d-c transmission has reentered the electric transmission scene, not as a militant warrior, but as a highly useful option to power-line planners.

GE champions of d-c already claim that d-c transmission costs less for many applications,

has many environmental advantages and is more efficient, compared with a-c technology. On the basis of the promise it sees for d-c power, General Electric recently energized at Lenox, Mass., a new multimillion-dollar HVDC (high-voltage d-c) test facility. It will enable GE scientists and engineers to study how UHV (ultra-high-voltage) d-c can be sent efficiently through transmission lines for long distances.

This 1½-million-volt Project UHV facility is reportedly the largest such d-c test unit in the world. Moreover, it's a unique example of public and private sector cooperation. The program's research is being funded by the U.S. Department of Energy and the Electric Power Research Institute (EPRI), a private utility organization.

Remarks GE's Luciano Zaffanella, manager of Project UHV: "The Project's future d-c work is being widely hailed as a critical link in developing better transmission systems and, in effect, supplying the energy necessary to keep our nation running at its accustomed level." Observes GE's John G. Anderson, manager of the High Voltage Laboratory: "More history is

lines

being written. With this program, we turn to magnitudes of d-c voltages that Edison never dreamed possible when he built his first d-c lines!"

Why so much voltage, one may reasonably ask? A capability of 1½ million volts of d-c is far beyond what the U.S. has presently.

When GE started Project EHV (extra-high-voltage) in 1958—the 750,000-volt predecessor of the current Project UHV—the highest U.S. voltage was 345,000 volts. Many people argued that was all the nation would ever need. But by 1966, for example, Canada already was using 735,000-volt transmission lines.

That same year, with an Edison Electric Institute contract, General Electric enlarged its test facility to 1½ million volts of a-c and renamed it Project UHV. EPRI took over the funding of Project UHV in 1973. The facility since has become a mecca for power engineers from around the world.

"Two factors are leading us inexorably toward greater use of d-c transmission," declares EPRI's John J. Dougherty, energy systems director. "One is that we're required to transmit increasingly larger blocks of power over long distances—either because generating plants must be built further from load centers, or because it's necessary to tie large electrical systems together for reliability. The wisdom of the latter was plainly evident during last winter's Midwest coal strike."

He continues: "The second reason for increased use of d-c is that, through research, the relative cost is steadily decreasing. As energy blocks become larger, it's more economical and less wasteful to use higher voltages." Dougherty suggests that by the early 1980s—because of Project UHV's findings, and complementary work at several U.S. and foreign laboratories—transmission-line designers will have most, if not all, the data they need for designing d-c lines of more than one million volts.

Environmental effects of high-voltage lines have been studied by General Electric and the electric power industry for many years. A major Government interest in Project UHV involves research in electric-field effects from such lines.

States the Department of Energy's Robert W. Flugum, power delivery program manager: "Recognizing the importance of overhead transmission in transferring power, it's essential that we design UHV d-c lines so that no hazard to human, plant or animal life exists under or near them."

Perhaps the most important aspect of the research done at Lenox has been to measure many environmental effects attributed to UHV transmission lines. Scientists have investigated the extent of audible noise, radio interference, TV interference and ozone production from energized lines in all types of weather. Data also are being used by biologists to design their own experiments.

"HVDC presents many opportunities, economically and technologically, and it appears to offer environmental advantages as well," sums up Flugum. "This project effort will, we hope, provide the Government with the information needed to specify environmentally-acceptable HVDC lines."

Concludes General Electric's Zaffanella: "While d-c transmission is still in its infancy, its use to date has demonstrated extraordinary benefits. Because of Project UHV, when the time comes to build and operate UHV lines, we will have a solid base of information on which to rely."

Lakeville Journal Photo by James Kevlin

PEOPLE

Overcoming winter's

You think downhill racing is tough? Meet Earl Stetson

With icicles and frost clinging to his face, Pittsfield's Earl W. Stetson manages a victory smile after winning the over-50 age group division of a cross-country race, held a year ago in Salisbury, Conn. Remarks the Power Transformer Department engineer: "I'm 'hooked' on cross-country racing. I derive tremendous satisfaction from setting a goal for myself, and then using my physical conditioning, skiing technique and mental determination to achieve it."

Stetson began X-C five years ago, and entered X-C marathon racing three years ago. In 1977, he was selected as a member of the Eastern Ski Association Citizen Racing Team. In past years, he has been an alpine skier and member of the National Ski Patrol.

"Cross-country marathons are harder than regular ones," says Stetson, who, as a jogger, has run in Dartmouth College's marathon. "With cross-country races, distances are longer—around 38 miles—and greater staying power is required because of cold weather."

Bill Tate, Frank Bachmaier: X-C teacher and student

Erie's William K. Tate, Jr. (l), manager—propulsion manufacturing for Transportation Equipment Products Department, was a 1977 bronze medalist in Quebec's 2800-participant Canadian Marathon, for covering 60 miles of the 100-mile cross-country course. This February, he's traveling to western New York to take part in the first cross-country Overland Ski Race.

But there's more to Tate's X-C pursuits than trophy competitions. He finds some of his greatest rewards in teaching the sport to others. One of his students: Frank K. Bachmaier (r), a GE-Erie lathe operator, who is beginning his second season of X-C skiing. Bachmaier lost both his legs in a car accident when he was a junior in high school. Artificial limbs, determination and Tate's encouragement support him on outings in a local ski area.

In addition to teaching his GE co-worker, Tate has provided X-C lessons to a woman who is blind, and to a group of novices from age seven to seventy in a National Audubon Society clinic. "Personally, I enjoy getting outdoors," says the veteran skier, who has downhill and X-C skied for 27 years. "Each summer, I hike, backpack and play tennis. And I ski all winter long."

Bob Turner: combining ski pleasure with GE business

Last winter, when Burlington's Armament Systems Department asked Robert G. Turner to lend a technical assist to a major Norwegian GE parts supplier, the project engineer set two objectives for his Scandinavian trip: business and skiing.

His stay in Norway coincided with a 250-entrant annual downhill/cross-country ski race—the F-16 Invitational—named for the defense project in which several companies participate. He took part in both the serious and "novelty" X-C race portions of the meet. And in slalom, he placed tenth in individual competition, and shared first place in the team contest with a representative for the supplier that Turner was visiting.

"I've skied since high school," the Vermont native continues. "Most of my skiing now is cross-country. My family and I are spending much of our spare time clearing a mountain path for a local Billy Koch [former Olympic skier] Cross-Country League, organized for children 13 years old and younger."

blahs

Exercising in 'snow-belt' country poses no problem for GE's avid cross-country (X-C) skiers.

Denese Deeds used X-C in 'Blizzard of '76'

"After moving from Miami, Fla., to Buffalo, N.Y., in 1971, I spent four winters sitting at home and doing nothing," recalls Denese A. Deeds. "Then, I found a remedy for the white-season blahs: cross-country skiing." The *next* year, when 70-mph winds ferociously whipped 100 inches of snow into mountainous drifts that crippled Buffalo during the infamous "Blizzard of '76," she was glad that she had practiced a useful winter pastime. "The snow hit on a Friday afternoon, and I was trapped at work with about 3000 other people until Saturday night," she remembers. "By Sunday, I was cross-country skiing. Looking back, it was one of the most sensible forms of transportation in the city."

Deeds joined GE last year as an industrial hygiene and safety specialist for the Capacitor Products Department in Hudson Falls, N.Y. "The area is a good one for cross-country skiing," she observes, "and so is Pittsfield, Mass., which is where my boyfriend lives."

Dodds and Merriam—exploring Ontario's countryside

"I was desperate for exercise—so for want of anything better to do in winter, I was forced into cross-country skiing!" laughs Kenneth M. Dodds, a product planner with Canadian General Electric's Housewares and Home Entertainment Department in Barrie, Ontario. "Let's face it—cross-country is a cold sport. At first, I was unenthusiastic about putting on all the needed layers of lightweight clothes. In the past, to escape the cold and get some exercise, my wife and I have flown to Jamaica, Barbados or Florida."

Dodds (left)—shown on a recent X-C outing with his wife Jean—took up the sport six years ago. Now, with CGE employee William H. "Bill" Merriam (right) and Bill's wife Marie, the Dodds spend many winter weekends traipsing through an Ontario countryside which receives some 12 feet of snow annually.

Observes Merriam, a Housewares purchasing agent: "I was raised in this area, so I felt it my duty to show Ken the winter flora and fauna. I'm an avid outdoorsman and love cold, wintry afternoons." Adds Dodds: "With this sport, I get some of the purest air in North America!"

VP Bill Anders: 'when in Oslo, do as the Osloans . . .'

In Norway, everyone skis—from five-year-olds to 75-year-old King Olav V. Unfortunately, when then Nuclear Regulatory Commission Chairman William A. Anders was appointed U.S. ambassador to Norway in 1976, he'd never been on cross-country skis in his life. "There I was, attending diplomatic receptions where 95% of the talk was about the kind of ski wax you were using!" he remarks. "I felt I had a duty to get with it!"

After only three months of practice, this Apollo 8 astronaut, now a GE vice president and general manager of San Jose's Nuclear Energy Products Division, entered Norway's toughest cross-country ski race, the Birkebiner. Notes Anders (shown with wife Valerie): "I had three objectives: not fall down, finish, and beat at least one Norwegian. I accomplished the first two, but the only person I was able to beat was an American named Smith."

In Oslo, Anders also was a guide in the Ski For Light program for the blind, and in February will work with the program's U.S. offshoot in Squaw Valley.

(continued next page)

Zurich's Reto Caprez—scoring 'private victories'

Having grown up in a Swiss mountain resort, Reto Caprez of Zurich, Switzerland, started skiing early. During World War II, by necessity, he took up X-C skiing when serving in the Swiss army. He later returned to the downhill sport, and continued it until 1973.

"My wife coaxed me back into cross-country," remarks Caprez, a vice president with GE Technical Services Company, Inc. and an International BWR Projects Department consulting engineer. "She took up cross-country to enjoy the serenity of the out-of-doors, and the camaraderie which accompanies the sport."

From 1973 through 1977, Reto Caprez participated in St. Moritz' Engadine Ski Marathon, and in 1978, completed the Tiroler Koasalauf course in Austria's Kitzbühl mountains. "You can't just buy a pair of cross-country skis and join a ski marathon. But if you've been doing a fair amount of skiing, it's satisfying to see how much you can accomplish."

Randy Putnam: a sundown skier of wooded trails

When darkness empties the forests of daytime cross-country skiers, Randall F. Putnam dons a headlamp and hits the trails. "There's a pleasant eeriness about cross-country skiing at night," he observes. "On a moonless evening in the deep woods, the only visible path is a 1500-foot white ribbon of snow, illuminated by my lamp."

Putnam is a marketing communications specialist for the Silicone Products Business Department in Waterford, N.Y.—"where winter means enjoying the outdoors or suffering cabin fever at home," he explains.

Are there risks in nighttime X-C? "Some, if you overextend yourself. Of course, the unexpected can happen, too. Last year, as I was crossing a street between trails, a snowplow driver steered off the road when he saw my headlamp. He thought I was an oncoming snowmobile!"

Organization Changes

CONSUMER PRODUCTS AND SERVICES SECTOR

Leonard Vickers, Staff Executive—Consumer Products and Services Marketing Operation

Thomas J. Albani, General Manager—Housewares Marketing Department

Philip M. Gross, General Manager—Miniature Lamp Department (Engineering and Manufacturing)

James F. Sarver, General Manager—Refractory Metals Products Department

INDUSTRIAL PRODUCTS AND COMPONENTS SECTOR

W. Scott McIntosh, Managing Director and Chief Operating Officer—Allen West Holding Company Limited

James M. McDonald elected a Vice President

G. Ronald MacArthur, General Manager—Northeast Sales and Distribution Department, GESCO

Andrew J. Walsh, General Manager—GESCO Marketing Programs Department

INTERNATIONAL SECTOR

Ottorino Beltrami, Chairman of the Board and Chief Executive Officer—Compagnia Generale di Elettricità, S.p.A.

Agustin de Leon, President and General Manager—General Electric de Mexico, S.A.

Arthur V. Puccini, General Manager—International Trading Support Operations

POWER SYSTEMS SECTOR

George H. Schofield elected a Vice President

TECHNICAL SYSTEMS AND MATERIALS SECTOR

Glen H. Hiner, General Manager—Plastics Business Division

Robert L. Stocking, General Manager—Medical Systems Sales and Service Operations

Kenneth R. Anderson, General Manager—Data Communication Products Business Department

Bobby J. Bowen, General Manager—Medical Systems Engineering Department

James G. Del Mauro, General Manager—Medical Systems Sales Department

Michael P. Moakley, General Manager—Medical Systems Service Department

Jude Marie Brown and father

The Lamusta family

Lynwood Metts (r) and father

Susan De Souza

Angela Wittemore (l) with student

Curbing education costs

Included in GE's employee programs is one which offers interest-free loans to borrowers during the in-school period.

On Nov. 1, President Carter signed legislation which makes all Federally-subsidized student loans *interest-free* to students during their in-school period, regardless of family income levels. The student to whom a loan is made is responsible for its repayment after the schooling, at a 7% interest rate.

As a result, under General Electric's Guaranteed Educational Loan Program (GELP) begun in 1970, employees and their children who qualify for loans now may obtain them interest-free during their schooling.

"We anticipate increased employee interest in this program because of the new law," says William A. Orme, manager—Corporate Support Operation for Corporate Public Relations Operation. "For 1979, the Company has increased its deposits to guarantee up to $1 million in new loans."

GELP provides for guarantees of loans made to students by participating banks. These loans, up to $2500 per year for undergraduate study and up to $5000 per year for graduate school (banks may have limits below those maximums), are guaranteed by United Student Aid Funds, Inc., based on GE deposits in USAF's "special reserve."

For more information on this Company program, please contact employee relations offices at GE plant locations.

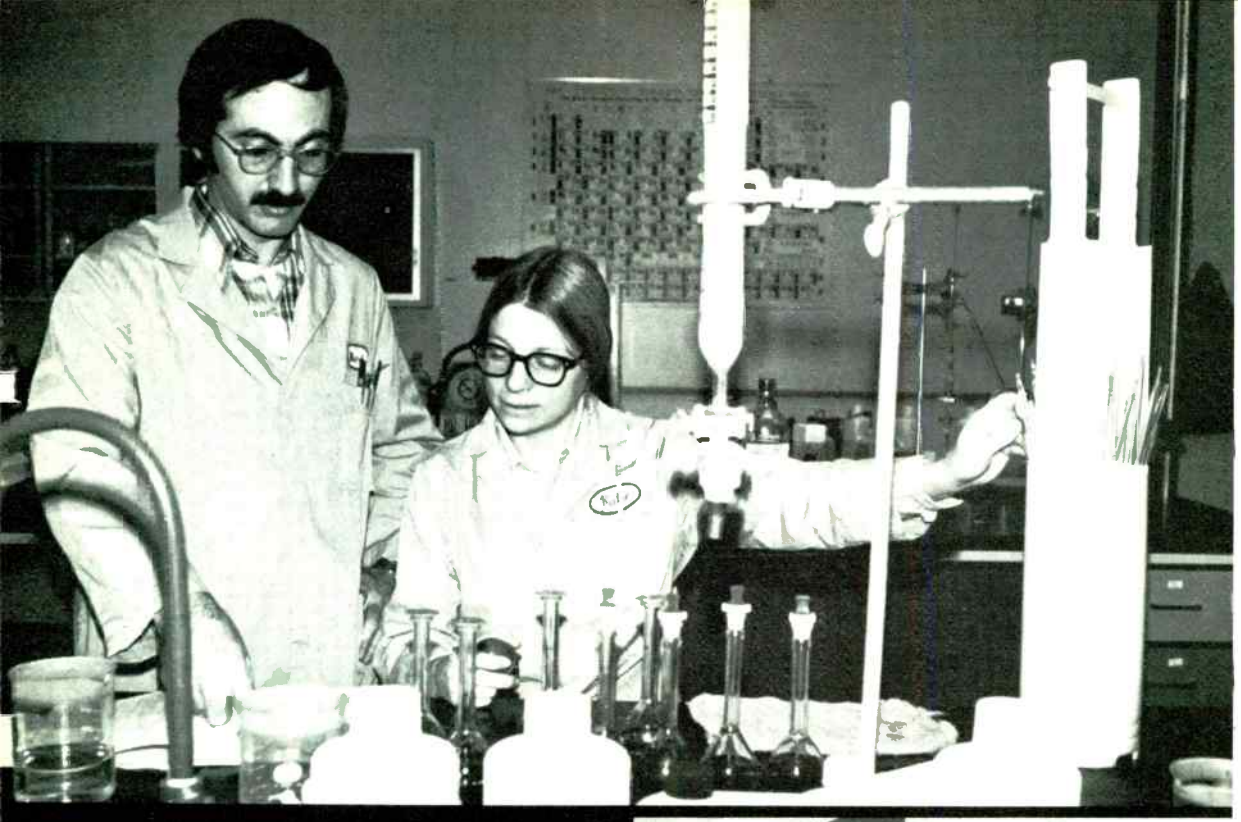
• Using GELP to help her earn a Ph.D. in experimental social psychology at Ottawa's Carlton University, **Jude Marie Brown** is studying the mental strategies that people use to deal with short-term stress situations. Her father is New York's David M. Brown, International Projects Department.

• The three sons of Lynn's Richard **Lamusta** (right), Business Aircraft Engine Department—(l to r) **Stephen, Richard,** and **Mark**—know GELP's benefits very well. Using GELP, son Richard graduated from Northeastern University with a B.S. in law enforcement; Mark is a Northeastern junior, also majoring in law enforcement; and Stephen is a University of Montana junior, majoring in forestry.

• A senior at The Citadel, a South Carolina liberal arts military college, **Lynwood Metts** will receive his B.S. in biology in June, and then enter the Air Force. Shown with his father, Charleston's Jedious Metts, Large Steam Turbine Department, Lynwood has used GELP to help finance his education—as did his brother, who has graduated, and as does his sister, a college freshman.

• **Susan De Souza's** affinity for foreign languages recently qualified her to spend a semester near Rio de Janeiro, Brazil, studying at the Catholic University of Petropolis. A junior at the University of Massachusetts, she is one of three college-age daughters of Lynn's Manuel J. De Souza, Medium Steam Turbine Department—all of whom are using GELP to complete their educations.

• Pursuing a master's degree in counselor education at the University of Southern California in Los Angeles, **Angela Wittemore** now is using GELP a *second* time. The first? Obtaining her B.S. in psychology from Northern Kentucky University. Her father is Evendale's Hubert Wittemore, Aircraft Engine Business Group.



NATURAL RESOURCES

Utah's technology

GE natural resources affiliate uses advanced techniques to bring new mines 'on stream.'

As members of a technology-oriented enterprise, GE people are familiar with the varied technical programs aimed at advancing electrical and allied technologies. But what about the technology of the Company's natural resources affiliate, Utah International Inc.?

A recent *Monogram* visit to the people and facilities of Utah's Mining Technical Services operation found a distinctive, three-phase technology utilizing such sophisticated techniques as satellites, computers and atomic analyzers.

"The big thing to keep in mind today is that the high-grade, easy-to-mine ores are gone," observes Robert N. Hickman, manager—Mining Technical Services. "Today's low-grade deposits require large capital investment and must be fully and efficiently developed. Utah's engineers and laboratory scientists—in close cooperation with Utah's exploration, marketing and environmental quality departments—must develop an entire infrastructure for today's complicated mining operations."

After new mineral deposits or possible acquisitions are identified, a flood of questions arises. What is the ore's assay quality? How many tons per day could a mine produce? What chemical preparation facilities would be needed? How many draglines and shovels would be required? It is at this point that detailed assessments and feasibility studies to back up "Go" or "No Go" business decisions must be made.

◀ **In Sunnyvale, Calif., chemical analyses of mineral samples are performed by Minerals Laboratory employees Mark Craven and Katie Haswell (left). Below left: employees Si DoFoo and Kathy Dibble in front of Lab's 24,000-sq.-ft. building.**

How is a new mine brought "on stream"? Mining projects and modifications to operating mines begin with Utah's mining engineers. They're the "advance team" which develops conceptual layouts and cost estimates.

On their heels come Utah's Minerals Laboratory staff—metallurgists and chemists who are the "data team," supplying ore analyses, bench-scale and pilot plant tests, and, eventually, highly-individualized process flowsheets for each mine.

Next comes the "operations team," Utah civil, mechanical and electrical engineers who supervise preparation of final construction drawings. They serve as contract managers in overseeing the mine's construction, start-up and initial operation.

Satellite computer data are among the tools which aid Utah mining engineers in assessing a mine's potential value. At the new Trapper surface steam coal mine near Craig, Colo., Utah engineers are studying the feasibility of an *underground* coal mine some 1000 feet below present mining operations. Helping them in their evaluation are data retrieved from Skylab, Gemini, high-altitude aircraft and NASA's Landsat 2—the latter a General Electric-built satellite.

"Satellite photos cover much larger areas than airplane photos, and can detect more geological features," remarks Milton W. Hood, manager—Mining Engineering. "We can discover fault lines, differences in temperatures between land masses, and how mountain ranges tie together. The more data we collect, the more we minimize underground mining's capital risks, safety and environmental problems, and other structural concerns."

In passing, Hood notes that Utah's minerals exploration team uses GE's Interactive Multispectral Analyzer (IMAGE-100) computer aboard Landsat to seek clues to locations of mineral deposits.

"Computers are an important tool in determining whether a mine should be opened, and how it should operate," continues Hood. "For example, we use them to estimate reserves, plot maps and produce the mining schedules needed to determine the size of mining operations and the type of mining methods needed. We also do specific engineering studies—on mine ventilation and equipment selection, for example."

Ore samples obtained by Utah mining engineers at prospective mine sites are rushed to Utah's Minerals Laboratory in Sunnyvale, Calif., where Phase 2 of Mining Technical Services activity begins.

One of the Lab's main duties: to supply chemical, petrographic (rock) and environmental analyses of various ores. Precise answers as to the metallurgical values of various ore samples must be ascertained quickly.

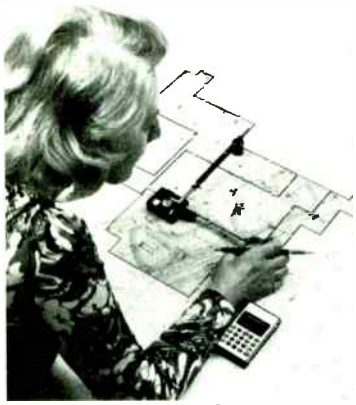
To accomplish this, the Lab's crushers and pulverizers produce different "meshes" of each mineral. Gravity, magnetic or liquid separators separate the minerals from the "gangue," or waste matter. Then assays are run—by fus-

(continued next page)

Extensive lab work is required to determine the feasibility of producing tungsten concentrates. Metallurgist Steve Dixon (above) conducts process flowsheet work. Metallurgist Kimi Jomoto (below) separates tungsten from waste matter.

To produce tungsten concentrates, various chemical reagents and flotation processes must be tested. Below, technician Emilio Cruz sets up a pilot plant leaching apparatus.

"Full technical support services for Utah mining operations are our objective," states Mining Technical Services Manager Robert Hickman (left), shown in discussion with Manager Milton Hood.



Conceptual layouts for a prospective mine are drawn up by drafter Joyce Chambers (above). Technician Nick Labao (below) uses a by-product from one of Utah's mines, ammonium perrhenate, to make perrhenic acid—a commercial product offered by the Minerals Lab.

ing ores down into glass beads which, when x-rayed, emit distinctive amounts of radiation.

Atomic spectrophotometers and d-c argone plasma spectrophotometers are among the advanced instruments used by the Lab staff to determine an ore's characteristics. These rock analyzers use radioactive trace elements which identify each mineral by its distinctive wavelength.

"Atomic analyzers are so precise that they can determine a rock's mineral composition in 'parts per billion'," explains Arthur W. Lankenau, manager—Process Development. "Using gamma and betagamma detectors, we can learn the amount of uranium in ores in a few hours—work that used to take several days!"

To be sure, the Minerals Laboratory's work is not confined to analyses of various ores, or to relatively simple "sink-float" coal tests that judge the quality of coal samples (good coal is lighter and floats). The Lab staff also determines if ore processing plants are needed for various ores, and researches the optimum operations mode for each facility through bench-scale and pilot plant testing.

"Right now, we're concluding an extensive pilot plant program on a Nevada tungsten mine in a joint effort with General Electric's Refractory Metals Products Department in Cleveland," notes Lankenau. "We started process flowsheet work about 18 months ago, and have tested various chemical reagents and flotation processes. We've finally reached the stage where we can determine the feasibility and optimum conditions for producing tungsten concentrates."

Utah's Island Copper mine at Port Hardy, British Columbia, is an outstanding example of how laboratory efforts pay off. In 1967, a feasibility study was begun, and a large pilot plant program eventually was organized. When laboratory results turned up positive, Phase 3 of Mining Technical Services' work began. Utah engineers directed the entire engineering effort—including logging of the mine site, mine and ore concentrator construction, shiploading and town development. The mine opened in 1971, and Mining Technical Services engineers assisted with start-up and initial operation.

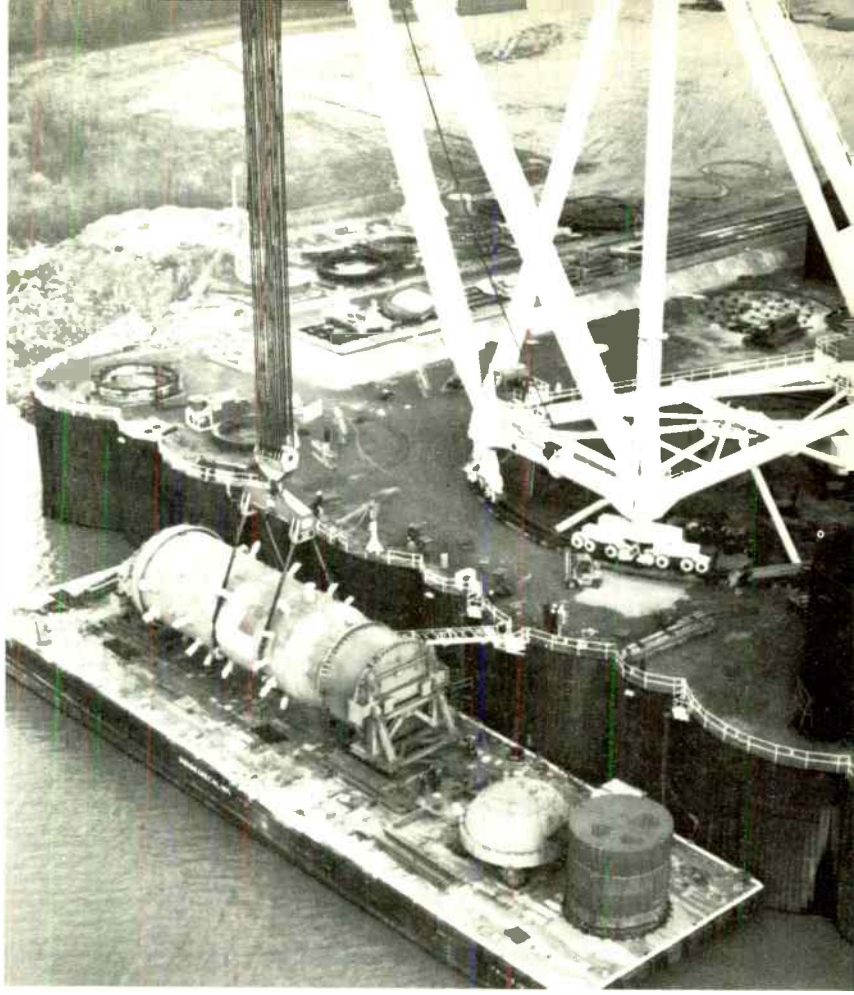
"Sophisticated equipment selection, major repair work, warranty negotiations and start-up activities of new mines are routine fare for our construction engineers," declares James R. Miller, manager—Engineering and Construction Services. "We cooperate closely with mine site personnel to get Utah's mines 'on stream' and keep them operating."

The Samarco iron ore mine near Belo Horizonte, Brazil, illustrates the wide breadth of Utah engineers' activities. In 1976, when Utah acquired its 49% interest in the Samarco project, Mining Technical Services became the engineering contract manager, supplying drawing approvals, engineering directions and construction supervision. In 1977, the mine, ore concentrator, pelletizing plant, 250-mile slurry pipeline and port facility all became operational.

Concludes Manager Bob Hickman about his operation's achievements: "We're proud of our record in helping Utah obtain the most advanced mining, processing and construction resources available to any mining company."

Moving the big stuff

Neither jungles nor tunnels nor inadequate port facilities stay GE transportation people from their appointed rounds.



Heaviest nuclear pressure-vessel shipment ever made was GE's 7000-mile barge trip from Tennessee to Washington State via Panama Canal.

First, some incredible weights. The steel pressure vessel for a General Electric BWR/6 nuclear reactor weighs a whopping 800 tons. A GE steam turbine-generator stator can weigh nearly 500 tons. A GE frame-7 gas turbine weighs 150 tons.

Transporting such leviathan-sized equipment to GE customers economically—often in miserable weather and to nearly inaccessible corners of the globe—is both a colossal undertaking and a delicate art. As the world's largest manufacturer of electrical equipment, GE asks its transportation people to perform such logistical "miracles" on a routine basis.

"*All* of the advertising and marketing, *all* of the design and engineering effort, *all* of the manufacturing expertise are useless if we can't get the product to the customer safely and economically," observes San Jose's Russell M. Palazzolo, manager—Transportation and Materials Distribution for Nuclear Energy Business Group.

In 1976, Palazzolo helped establish a Power Systems Sector transportation advisory group, to "watchdog" domestic Sector shipments. Power Systems produces the lion's share of the Company's mammoth equipment, and the advisory group last year helped the Sector save $178,000 in transportation expenses. "The Sector's domestic freight bill last year totaled $65 million," Palazzolo notes.

To curb transportation expenses wherever possible, and to ensure successful deliveries, transportation planning for GE's behemoth units begins many months in advance. Loads are "consolidated"—strategically packed together aboard one train or barge—to save money, fuel, time and environmental impact. To avoid "going around Kelsey's barn"—transportation lingo for costly detours—railroad trestles are strengthened, overhanging rock projections removed and new roads and barge slips built.

Remarks Palazzolo: "As transportation employees, we're 'can-do' people. It's our job to move the big stuff, and with considerable pride we can say we've never failed yet!"

Overcoming delivery obstacles requires knowledge, ingenuity and stick-to-itiveness. Case in point: two GE shipments, in 1976 and 1978, from Houston to northeast Mexico's Laguna Verde nuclear power plant.

(*continued next page*)

Each load consisted of a 32-foot-high by 20-foot-wide pressure-vessel shroud and shroud head, along with a 50-ton diesel generator. The equipment was for twin 650-megawatt GE reactors which are now under construction.

The first shipment left Houston by flat-deck barge in January 1976 and, in the Gulf of Mexico, encountered 26-foot seas and high winds. The tugboat captain valiantly brought the barge to safety at the Mexican port of Tampico. When finally delivered to the Veracruz port, the matériel was off-loaded by a barge-mounted crane onto special heavy-duty trailers—equipment which had been brought in by GE prior to the barge's arrival.

Next, the load began a 70-mile overland trip through jungles, across mountains and down back roads. It took an entire day to maneuver around one highway toll booth. Wooden "wire raisers" had to be installed atop the tall shroud and shroud head to pass beneath "live" utility power lines. The guard rails on a harrowingly-tight concrete bridge had to be chopped off, and then replaced. Mango and banyan trees had to be removed or trimmed back.

At one point, there was no road whatever. GE-supervised road crews built 17 miles of dirt road in one week—the heavy earthmoving equipment operating just ahead of the shipping load. Finally, after two months of arduous travel, with GE transportation personnel sleeping in mosquito-netted hammocks and routinely coping with steep road grades, the shipment safely reached the Laguna Verde plant site.

In January 1978, a second GE shroud, shroud head and diesel generator made a similar trip.

"Actually, the Laguna Verde transportation jobs were rather short hauls," remarks Russ Palazzolo. "Our January 1976 shipment of a nuclear pressure vessel with its internal mechanical parts, from Tennessee to Washington State, was more spectacular."

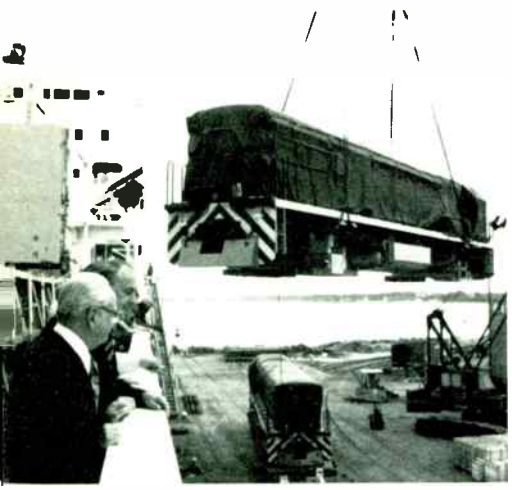
This latter load—at 1421 short tons the heaviest nuclear pressure-vessel shipment ever made—involved a 7000-mile barge trip down the Mississippi River, across the Gulf, through the Panama Canal, north along the West Coast and up the Columbia River. The 1½-month journey began in Memphis, where General Electric and Chicago Bridge and Iron jointly produce pressure vessels.

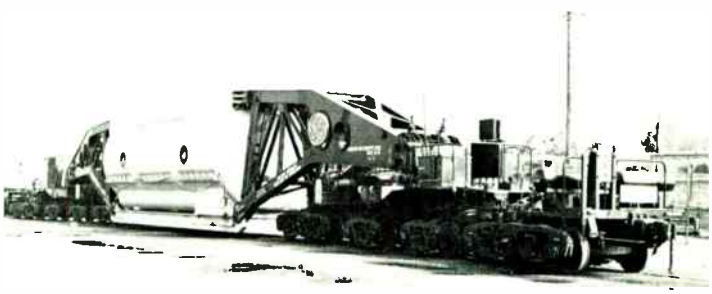
"This move marked the first time that a vessel's internal components were shipped already installed," notes San Jose's Fred A. MacLean, project manager for the 1100-megawatt Hanford 2 nuclear power plant where this equipment was delivered. "By installing the 'internals' in Memphis instead of at the plant site, we helped our customer save up to $1 million and five months of field installation time!"

Gigantic GE railroad cars that carry a million pounds are another tool used by the Company's transportation people to move such items as Schenectady's steam turbine-generator stators and Pittsfield's phase-shifter transformers. Among GE's 39 railroad-transport cars are two heavy-duty cars, each of which has 20 axles. One is a depressed-center flatcar and the other a Schnabel (suspended load) car, both designed for lower clearance.

Last December, Large Steam Turbine-Generator Division (LSTG) delivered by rail the largest piece of equipment it has ever manufactured. A stator weighing more than 900,000 pounds was sent from Schenectady to a 1270-megawatt Palo Verde nuclear power unit near Arlington, Ariz.

Accompanying the GE load on its long journey were two





Bound for Kenya, GE diesel-electric locomotives (left) are loaded aboard steamship on Lake Erie. Above, hydraulically-maneuverable Schnabel car enables a stator to be shipped through low clearances.

GE transportation people in a special GE yellow caboose, which contains an observation port from which to watch the load.

"With rail shipments, our single largest problem is clearances," states Russell E. Swanker, manager—LSTG Transportation. "The 'swing-out' of cars can cause calamity. A 20-degree curve can produce a swing-out of up to 40 inches!"

In May 1975, LSTG shipped through the port of New York to Japan the largest single piece of equipment ever moved through there up to that time—a Schenectady turbine-generator weighing 410 tons. Prior to the move, GE paid the Erie Lackawanna Railroad $9200 for widening several rock cuts between Binghamton, N.Y., and the port. Had these obstacles not been removed, GE would have incurred a large transportation charge by having to travel from Schenectady to Ashtabula, Ohio, then south to Youngstown, and finally east to the port.

"Tunnels represent a particularly tough clearance problem," continues Swanker. "Sometimes, product design modifications are required. Before we shipped two stators in 1976 across the Continental Divide to Craig, Colo., we built a mock-up and sent it through the route's 17 tunnels. We found that we had to design the stators for shipment upside down, thereby reducing their width at the top of the load."

Schenectady Utilities Operation assists LSTG with its difficult shipping needs, notes the Operation's Malcolm N. Ross, manager—Transportation and Distribution—"by making contacts with railroads, acquiring special railroad equipment, obtaining clearance information, and providing personnel to ride with special trains when necessary."

Factory-to-front-door transportation is a major responsibility in the power generation business. "While 'front-door' deliveries enjoy some popularity in the U.S., they're often a necessity overseas, in order to deliver large GE apparatus to developing countries," declares New York's John P. Scally, manager—Export Transportation for Export Sales and Services Division (ESSD). Listed among Scally's gargantuan freight: GE stators, transformers, diesel-electric locomotives, gas turbines and generators.

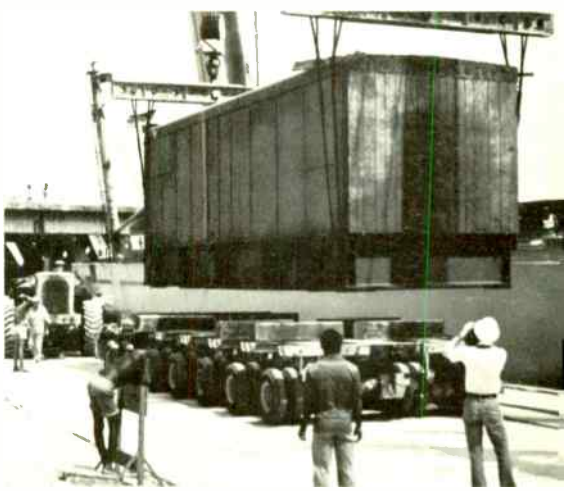
"Developing countries need large amounts of electric power quickly, so ESSD works with Gas Turbine Division and International Projects Department to deliver new GE gas turbine orders as fast as possible," continues Scally. "These countries often lack a transportation infrastructure, so GE first must import the transportation, then import the equipment, transport it inland over rough terrain, and also erect the plant."

Establishing transportation networks overseas is no simple task. In Nigeria, for example, General Electric already has delivered 51 diesel-electric locomotives—to help transport cargo from congested port facilities. Still, much congestion remains.

"Last year, in order to deliver three frame-5 gas turbines to Nigeria's Ijora power station, we chartered a shallow-draft, 'roll-on, roll-off' ship with heavy-lift cranes," remarks Scally. "Then, en route to Lagos, we stopped in Spain to pick up special heavy-duty trailers."

He continues: "With an 80-day ship back-up in port, we could not unload at the commercial docks, so we obtained authority to use a private dock. We had exactly 48 hours to unload. In this move, we had to furnish everything—the dock, trucks, crane and the chartered vessel."

Specially-designed barges (below) containing GE gas turbines are placed aboard a vessel bound for Southeast Asia. Right, a gas turbine for Nigeria's Ijora power station is transported to site by special heavy-duty trailer.



Career Education

GE's educational communications are helping young people decide on vocations—and are winning high marks for the Company.

Young people trying to decide which careers they will pursue are, increasingly, applying to General Electric for guidance.

The rise in the numbers of their letters directed to GE is no accident. The young people are responding, in most instances, to GE advertisements they have seen in scholastic magazines throughout the school term.

The GE ads show teenagers doing things that they are good at or interested in. A girl may be solving an intricate puzzle. A boy may be settling an argument between friends. The ads take these real-life situations and relate the teenagers' interests, hobbies and personal strengths to possible career paths. The ads encourage students to pursue their interests and expand them with related academic subjects.

At the end of each advertisement, students are invited to write to General Electric for more ideas concerning their future careers. In response to the young people's requests and questions, GE sends them booklets that describe selected career fields and the education needed to obtain desired jobs. Available information pertaining to the students' individual interests is also sent along. Teachers' queries are answered with the career booklets as well as poster blow-ups of the ads.

Why is General Electric so interested in offering career education? Corporate Educational Communications Manager E. James Clark cites several reasons.

"We're providing a needed service," he says. "Choosing a career is, for many young people, a very confusing business, full of doubts and uncertainties. We can help by suggesting where

one's aptitudes and interests can lead, and how to get there."

A second reason is that General Electric benefits from providing this service. "Our series wins goodwill for the Company from both students and their teachers," Clark explains. "Provision of services such as this over the past thirty years has been a key factor in the good reputation GE enjoys in the academic community."

Also, the career guidance materials help to break stereotypes in young people's minds. "Girls and minority youth still tend to regard engineering, for example, as a profession that's not for them," says Clark. "Our ads are part of our ongoing campaign to make these young people know that they, too, can plan to enter technical fields, if their interests and abilities lead them in this direction."

As a result of the GE educational campaign, Educational Communications receives approximately 60 letters a day from students during the academic year. Even a quick scan of these letters bears out Jim Clark's point about the benefits to General Electric. "Thank you for your booklets on helping people find jobs," a typical letter says. "I am so glad that I know people who can tell me what to start off with when I graduate . . ."

Or this one: "Thank you for caring how young people choose their life careers. You must be a wonderful company . . ."

LETTERS to LINDA

The stacks of letters received daily from students responding to General Electric's educational ads are directed to Linda Vaughan, Coordinator, Secondary School Programs.

Although most of the letters are serious requests pertaining to career development, every now and then one comes in that makes Linda break up. Here are samples:

". . . I would like information on a career of being a doctor. I have the guts of a doctor . . ."

". . . What's it like to be an engineer? How much do you make a month? Do you have long lunch hours? What time do you get out of work? . . ."

". . . I am 11 and I want to know about careers because my parents are stingy with my allowance. I really need help! . . ."

". . . I would like to know if you could send me free information about a career I would like to be when I get older:
(1) Baseball player (infield)
(2) Football player (quarterback)
(3) Fireman
(4) Police
(5) President of the U.S. . . ."

". . . Please send your book to me because I am interested in the business world. I intend to be very rich and I would like to know how much trouble I am going to have . . ."

". . . I think that maybe I would like to be a writer, but I keep thinking I'll end up half-starved in a garrett . . ."

". . . I'm Catholic and I want to be a nun. And I want to go to college, marry, and have eight children. I need help, please send me some advice . . ."

". . . I don't mean to be conceited, but first I am very good looking. I have a good personality. I have a good voice and good acting too. Lots of people tell me I look like Donny Osmond.

"I am very well-known for my looks, personality, and my girlfriends. Since you are in a higher position than I am, I thought you could give me publicity . . ."

GENERAL ELECTRIC
General Electric Company
Fairfield, Connecticut 06431

FIRST INDONESIAN LNG. The need for new sources of energy worldwide has placed a premium on the development of liquefied natural gas (LNG), and General Electric products are playing a key role in bringing LNG plants on line. Located on Indonesia's remote Kalimantan Island near the equator, the new Badak LNG plant is Indonesia's first LNG project, and uses GE condensing steam turbines to drive refrigeration compressors (right) which chill the gas. The entire Badak project, from the discovery of the Badak natural gas field until the first LNG cargo was loaded, required less than 5½ years—an industry record.

Six GE steam turbines from Fitchburg's Mechanical Drive Turbine Department drive the facility's six large centrifugal compressors. Even in tropic heat, ice forms on these compressors during their operation. The plant's LNG emerges at −260 degrees F. and is stored in cryogenic tanks until it is loaded into LNG tankers.

In its first year of operation, the Badak plant produced and sold as much or more LNG than has been produced by any LNG project over a similar period of initial operation. The plant is owned by Pertamina, the Indonesian state oil and gas enterprise.