



GENERAL ELECTRIC
Monogram
JANUARY - FEBRUARY 1980

**Little chips
make
big waves**

PLUS:

**Management Conference;
GE-Utah joint ventures; radar resurgence**

GENERAL  ELECTRIC
Monogram

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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. Hervie Haufler, Manager, Corporate Editorial Programs. Request permission to reprint articles from the Monogram Editor, Fairfield, Connecticut 06431. Copyright 1980, General Electric Company.

THE COMPANY

New management team plans 'the decade ahead'

At 1980 Management Conference, GE leaders outline steps to make the '80s the 'greatest growth decade' in Company's history.

“One of the main purposes of this 1980 Management Conference is to let you see and hear your new management team. The program is structured around that purpose. And let me say, without waxing oratorical about it, that I think you are going to be impressed. This is a team of chargers, believe me. They're winners, every one.”

So stated GE Chairman Reginald H. Jones after calling to order General Electric's annual Management Conference, held the second week of January in Belleair, Florida. He noted that since the 1979 Belleair meeting was too crowded, “two 2-day conferences are being held this year, each identical as to program and level of attendance, with top management addressing both.”

This year's attendance at the twin meetings reached still another record high—a total of about 520 conferees. Some 109 newcomers were present, another record.

Jones quickly got to the serious business at hand, noting that the Company's entry into the



Scenes at Belleair meeting: reports by GE Chairman Jones and other speakers were supplemented by question-and-answer sessions and informal discussions during coffee breaks.

1980s was underway with a broadly experienced management team: "As far as the economic climate is concerned, we're taking off in stormy weather. The world is in turmoil, and here in the U.S. we're grappling with simultaneous inflation and recession. But I hope we can look beyond the cycles and build a common vision of the spectacular opportunities that face this Company in the 1980s. If we play our cards right, we can turn the troubled '80s into *the greatest growth decade* that General Electric has ever known."

The Chairman's appraisal of GE's preparations for the '80s included these salient points:

- "We've developed and put in place an experienced team of Vice Chairmen, Sector Executives and Corporate staff officers, and they're backed up by a depth of management talent that cannot be matched in any other company.
- "We've got an organization structure that can accommodate growth and change without

strain.

- "We've got a strategic planning system that works, and which has become a genuine competitive advantage.
- "We have diversified our earnings base through a selective resource allocation—so the GE that moves into the 1980s is decidedly different from the Company that entered the 1970s.
- "We have internationalized the Company, and are today the biggest U.S. industrial exporter.
- "We have revitalized our research and development capabilities, increased R&D expenditures and embarked upon major new expansion efforts.
- "We've initiated special training and recruiting programs, especially in the new electronics technologies.
- "We've launched an across-the-Company productivity drive to take full advantage of the most advanced manufacturing technologies.
- "We've improved relationships with our key constituencies.

(continued on page 5)

At Belleair: viewpoints of Company's new Vice Chairmen



The world marketplace should provide GE with "another decade of opportunity for the fleet of foot and the ingenious of intellect," according to Vice Chairman John F. Burlingame, who surveyed the GE international and Utah International Inc. operations.

Noting that, "with all its trouble and turmoil, the '70s were a decade of opportunity for GE and Utah," Burlingame told attendees that GE international product sales in the preceding decade more than quadrupled, and that Utah increased its net income seven-fold. "The world market will be one of the key opportunities in the coming decade and it's going to take *aggressive, initiative action* to make the most of that opportunity."

He continued: "There is no place in a high-inflation environment for the macho 'I can do it alone' approach when there are resources available which can reduce the risks and improve the payout. So let's use our national executives and country managers; let's joint venture inside and outside the Company; let's use every contributing asset we have to get the best payback for GE we can."



Power and technical systems businesses were the subject of remarks by Vice Chairman Edward E. Hood, Jr., who observed to the group that "the successful large companies of the future will be 'federations of entrepreneurs'—not giant bureaucracies."

Hood stated that, "looked at technically, there's hardly a scientific discipline or engineering skill that GE's power systems and technical systems and materials operations don't need and *have*. And there's corresponding strength through every function. The excitement and challenges of working with these businesses come from the opportunities they represent for meshing—and multiplying—GE strengths for the future.

"The challenge for us is how to promote entrepreneurship—and all that it means in terms of fast-moving, flexible response—and yet draw on the formidable strengths of General Electric. By now, I hope you are asking yourself whether you and your team really are taking advantage of all the Company strengths. To the extent that your answer is 'not well enough,' that's your—make that *our*—challenge."



Our consumer mission, said Vice Chairman John F. Welch, Jr., is "to meet the aspirations of a more affluent society by evolving our brand to the upper end and reinvesting in two massive services—home communications and credit. The role of GE industrial businesses is to assure that consumers *are* affluent and *can* fulfill their aspirations, by addressing the two most urgent U.S. challenges: productivity and energy."

He also stated: "Many still think of innovation as something for the inventor and not for them. So *obsolescence* may be a more vivid way to involve the entire Company in the innovation issue. As leaders, you have to encourage innovation. But you *cannot* accept obsolescence—not in your factories, your processes or your people. Obsolescence in factories may be a function of age. With people it's not; it's a state of mind. Some are obsolete in their 20s; others never see or feel it.

"We have thousands of loyal, well-trained people, and we need them to be current. The programs are available. Your challenge is to be sure our people can participate in them."

- “We’ve refined our marketing capabilities, both domestically and internationally.
- “And we’ve built up the financial resources to take full advantage of our opportunities.”

Jones reminded listeners that “General Electric is no longer exclusively or even primarily tied to the load-growth curve of the electric utilities, though they are still important customers. Through the commitment of funds to a series of well-planned business ventures and acquisitions, we are expanding and diversifying our earnings base.”

He said: “Even to those of us who have lived with it, the degree of GE change has been startling. In 1968, our traditional electrical equipment businesses provided 80% of our earnings; last year they provided only 47%! That is still a substantial amount of money, and these businesses include some very consistent money-makers. But the really spectacular earnings growth has come from man-made materials and natural resources, aided by the Utah International acquisition. The materials businesses provided only 6% of GE earnings in 1968, but they produced 27% in 1979. The fast-growing services businesses have moved up from 10% to 16% of Company earnings. And transportation, mostly aircraft engines and locomotives, has moved up from 4% to 10% of earnings.”

He added, “Where international activities provided only 16% of our net income in 1968, the figure in 1979 was 40%. Our export sales alone have grown dramatically from \$400 million in 1968 to about \$2.8 billion in 1979.”

Jones explained the thinking that must go into the Company’s Corporate strategy for the 1980s: “This may be a troubled decade for the world and the U.S., but that’s nothing new. Trouble is the human condition. The task of management is to anticipate and work through the troubles and, if possible, turn them into opportunities. That’s what we’re going to do at General Electric!”

The challenge thus set by the Chairman, the conference continued with 16 other speakers examining GE’s present status and prospects.

Commenting on the world economic outlook for the next decade, Walter K. Joelson, staff executive—Economic Research and Forecasting Staff, said, “The 1980s will be a decade of excess demand,” which bodes well for business. “Thus, if economists and politicians speculate about future growth rates, they had better recognize that growth will be a function of the *supply side* of the economy.”

The GE economist cautioned against overconfidence, though: “After years of absorbing large numbers of women and youngsters, the gains in the labor force will start to decline in the ’80s. So, if economic growth is what we want, then productivity improvement is the only game in town—the only way to marshal sufficient resources to satisfy the explosive demand of the coming decade.”

Joelson concluded: “Our vision of the 1980s thus yields a highly complex decade. The energy syndrome, inflation, sluggish growth of the labor force, intense worldwide competition—these are the forces that will influence Washington lawmakers as *demand* takes second seat to *supply*. For General Electric, these forces can spell major opportunities in the 1980s. Clearly, we are at the threshold of an era that will reward the *raison d’être* of business: risk-taking and entrepreneurial competence.”

Daniel J. Fink, Senior VP—Corporate Planning and Development, also took up the new “supply-oriented” national focus, as he addressed conferees on strategic issues of the 1980s: “The expected activity on the supply side of the U.S. energy problem, as one example, has got to be a growth opportunity worth our attention. To top it off, you can multiply the U.S. effort by two-and-a-half to take care of the rest of the world.”

Fink continued: “If we are to remain a world technological leader, we have to organize and focus our creative efforts on these new needs. Our challenge is to avoid a steady-state General Electric and come down on the side of opportunity. That’s the intent of the Company’s four Planning Challenges for 1980: *unprecedented business development...through international growth...through technology development... with productivity improvement.*”

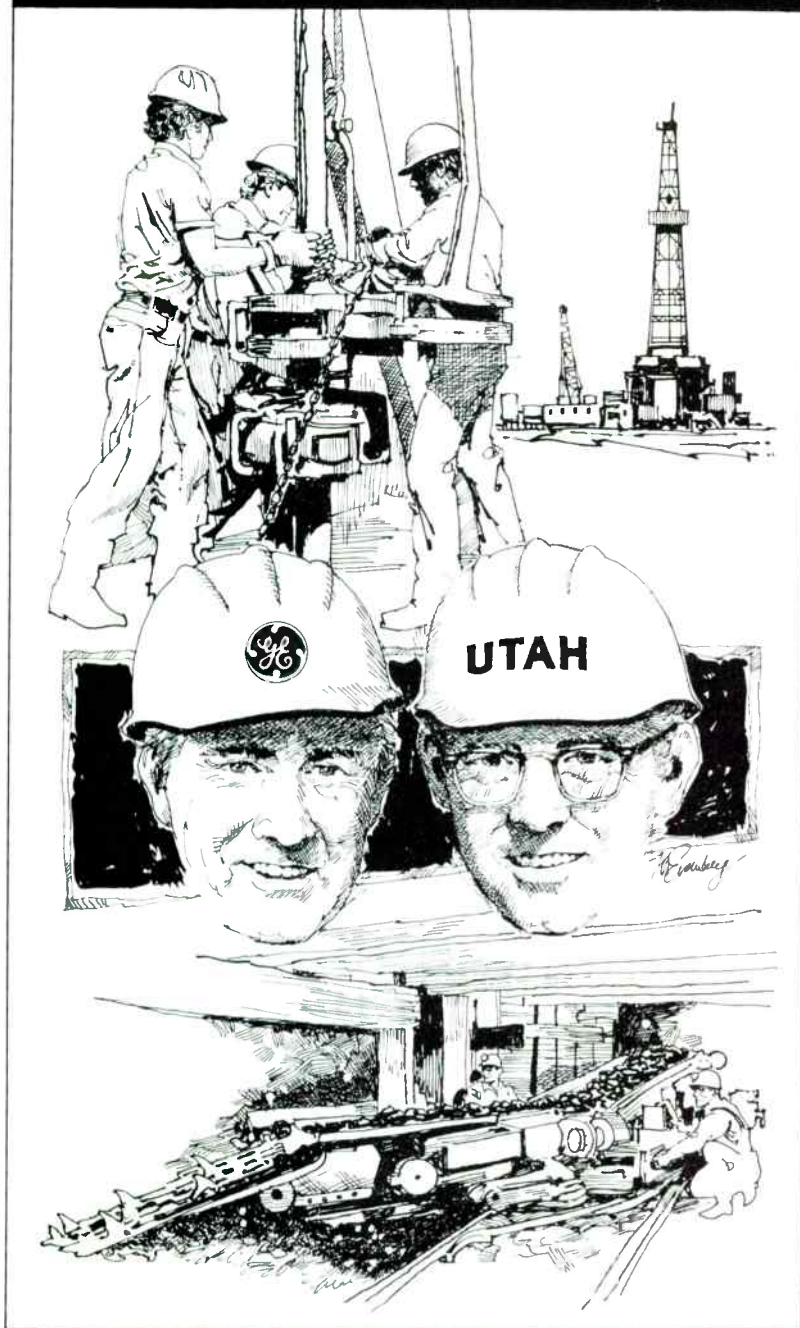
At the meeting’s end, Reg Jones called for a “stretch effort” by General Electric leaders and their associates back home to make the 1980s “the best decade ever” for the Company. He noted the prominence on the conference agenda of GE long-term considerations, saying, “Every manager faces a paradoxical challenge to try to help build an enterprise unlike anything seen in this world—a company at once both *adventurous* and *solid*.”

He concluded: “Whether or not we turn our aspirations into realities depends upon our people, and especially the people in this room. In my view, our success in this stretch effort depends on each manager seeing it as a *personal* responsibility.”



GE and Utah's joint ventures

Can conventional GE businesses and the natural resources affiliate help each other? Two examples show it's happening.



Venture 1. Canadian General Electric wanted to diversify into Canada's resource sector. Ladd Petroleum Corporation, a Utah International subsidiary, was seeking new funds for capital spending. Ladd and CGE have formed a 50/50 venture that lets them spread oil and gas exploration risks.

Venture 2. GE's Lighting Business Group wished to assure a supply of tungsten used in manufacturing lamp filaments and other fabricated components. Utah was exploring ways to expand its domestic mining operations. The Group's Refractory Metals Products Department and Utah's Mining Division have formed an 80/20 venture to develop and operate an underground tungsten mine.

"Highly successful thus far"—that's how Ladd Petroleum's Denver-based president, John H. Moore, describes the Ladd-CGE exploration venture.

"Established in 1978 to explore for oil and gas in Canada's Alberta, British Columbia and Saskatchewan provinces, the three-year, joint agreement combines CGE financing and Ladd know-how—allowing Ladd to 'leverage' its expertise and spread the risks of exploration," Moore notes. "To date, 11 of the 18 exploratory wells drilled in the venture appear successful. Estimated reserves for the 10 gas wells and one oil well amount to a potential of 4.2 million net equivalent barrels of oil."

Observes CGE's V. Gerold Staff, VP and comptroller, in Toronto: "A change in Canadian tax laws in 1976 stimulated our interest in natural-resource investments. Canada, in effect, encouraged corporations such as CGE to diversify into the resource sector, by

giving us an opportunity to gain a tax advantage similar to other oil industry members. Ladd provided us with a logical way to diversify, and to do so with an experienced partner within the GE family.”

The \$22-million venture calls for expenditures over a five-year period. Exploration projects are to extend over a minimum three-year period, with associated development costs continuing until the fifth year.

Moore points out that Ladd’s 61% success rate these past two years on Canadian exploratory wells was unusually high for this activity, adding with a chuckle, “We hope our CGE friends don’t expect this rate of return to continue.”

“The Ladd-CGE joint venture is a fine example of business synergism,” comments Staffl. “Of the 10,000 U.S. independent oil and gas operators, Ladd Petroleum is well positioned within the large-independent category. Last year, counting its U.S. operations, the firm achieved a 39% success ratio on exploratory wells, compared to an industry average of 25%.”

CGE and Ladd jointly own interests in more than 53,000 acres in Western Canada. Under the joint agreement, Ladd is responsible for all exploration and production. Calgary’s Wally R. Lozanski, Canadian division manager, is in charge of operations.

Moore concludes: “In 1980, we hope to drill an additional 18 exploratory wells—the same number as in our combined first two years of joint-venture activity. We believe vast supplies of oil and gas remain to be found in North America if the economics are right.”

Springer tungsten mine near Winnemucca, Nev., represents a second joint-venture

activity for GE and Utah. Construction activities at this previously abandoned mine began last September. Plans are to have the mine operating by early 1982. It is expected to produce 1.6 million pounds of tungsten per year—a significant portion of GE’s tungsten requirements.

“Tungsten is a strategic material for the nation and many businesses—and as one example, this metal can be found in every type of GE lamp,” states Cleveland’s James F. Sarver, general manager of Refractory Metals Products Department. “During the last decade, demand for tungsten has often exceeded supply. Prices have been volatile, and most producers are in politically unstable world regions.”

That’s why, in 1971, Cleveland’s lamp people actively began probing the idea of “backward integration” as a way to assure a supply of tungsten and lower acquisition costs. Notes Sarver: “Several of my predecessors at Refractory Metals—in particular, the late Vice Chairman Herman L. Weiss and retired General Manager Robert F. Johnson—had investigated the feasibility of operating a tungsten mine.”

He continues: “In 1972, GE leased the inactive Springer tungsten mine property, and three years later, began preliminary development. On its own, the Department set out to determine the ore reserves.”

The GE-Utah merger in late 1976 proved timely for the Refractory Metals task force charged with developing the Springer property. Recalls Sarver: “Early in 1977, after the merger went through, we signed a joint-venture agreement with Utah International, whereby its Mining Division took charge of the facility’s


development and operation. Utah’s years of experience in all facets of mining were a boon to us in quickly completing the preliminary work.”

San Francisco’s Charles K. McArthur, senior VP and manager of Utah’s Mining Division, observes: “We are interested in mining any material that is profitable to extract and market. This venture lets us expand our U.S. mining activities into another natural resource, tungsten, as well as increase our experience in underground mining. Both GE and Utah see the venture as a ‘strategic fit.’”

Discovered in 1914 by an itinerant prospector, Springer mine was first operated in 1917. Low tungsten prices and lack of demand caused the mine to be closed periodically until it was permanently shut down in 1958. Having leased the mine site in 1972, GE last year acquired the mine, including all mineral and water rights.

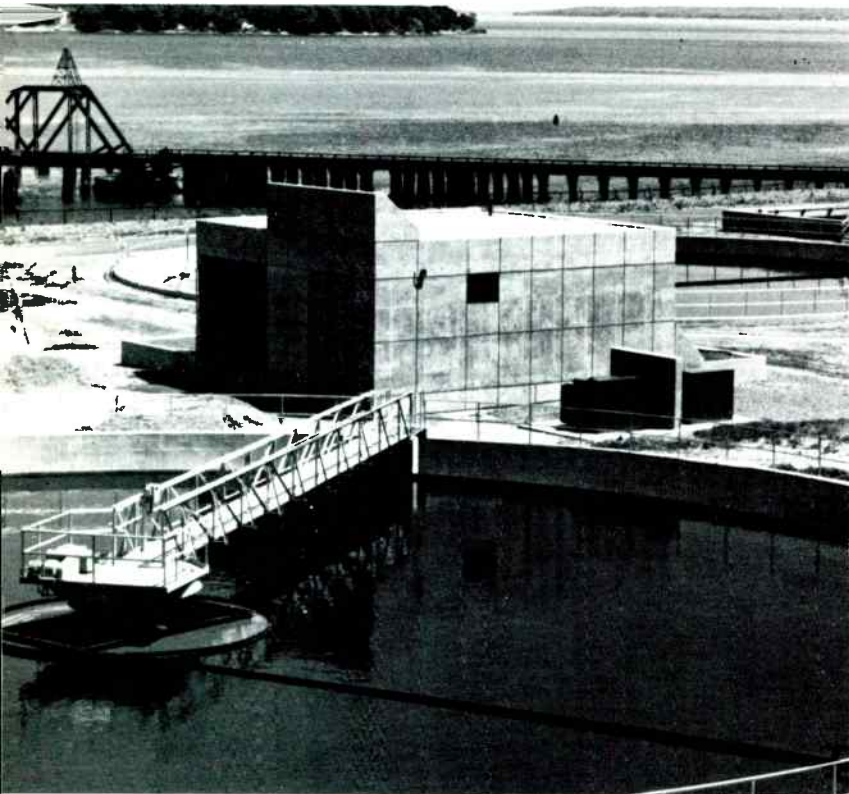
Utah VP Boyd C. Paulson and Refractory Metals’ John W. Guyon have lead responsibilities in this venture.

“An in-house source of tungsten not only will afford Refractory Metals with a sizable portion of the key material used in manufacturing GE lamp filaments, but also will offer us other profit opportunities both inside and outside the Company,” Sarver states.

He emphasizes, though, that the venture with Utah is not intended to furnish all of his Department’s tungsten needs. “Springer mine is our hedge against prices and demand on the world tungsten market. Since tungsten prices do fluctuate widely, we don’t want to be caught sitting atop a huge tungsten operation if prices dip. Through this venture, we’re keeping our options open.” 

As Maine goes?

Making an aggressive use of clean-waters technology, the state says it's



After final treatment in one of three circular clarifiers, Portland's wastewater is disinfected and discharged into Casco Bay.

From the top of a hill near the entrance to Back Cove, Portland, Maine's Casco Bay sparkles clean and blue in the sunshine. And thanks to the new GE-equipped Portland Wastewater Treatment Plant on the hillside, Back Cove and Casco Bay will soon *be* as clean as they *look*.

Before the new facility, completed in 1979, went into operation, wastewater from both homes and industries in Portland—Maine's largest city—was discharged through about 50 outfalls into the Fore River, the Presumpscot Estuary, and Back Cove. The water quality

had deteriorated to the point where shellfish flats and beaches were closed. But with most of the wastewater pollutants now being removed before the water is discharged to Casco Bay, the next few years will see a dramatic reversal of that deterioration.

Maine claims to lead the nation in wastewater control, which has been mandated by Congress and is being implemented by the Environmental Protection Agency.

In Portland, the water-cleanup program began in 1968, when the Portland Water District, which has tradition-

ally provided water from Sebago Lake for the city and nine surrounding communities, offered to provide wastewater treatment services, too.

With state legislature approval a year later, a regional plan for wastewater facilities was developed, and the Boston engineering firm of Camp Dresser and McKee designed the plant. Construction got underway in 1976.

Able to process 15.2 million gallons of wastewater per day, the Portland plant is Maine's newest and largest municipal treatment facility... a multi-level maze of pipes, filters, sedimentation tanks, heat exchangers, aeration basins, and control panels... with a wide variety of General Electric equipment installed throughout the complex. There are Power-Vac® interrupters from Switchgear Business Department in Burlington, Iowa; transformers from Rome, Ga.; AKD low-voltage switchgear from Distribution Equipment Division's Salisbury, N.C., plant; motor control centers from General Purpose Control Department in Mebane, N.C.; and panels and disconnects supplied by Distribution Equipment Division in Plainville, Conn.

With three pumping stations in operation and three more under construction, the facility will be ready to handle the needs of a 1995 Portland population estimated at 87,000.


According to the Environmental Protection Agency, thousands of communities in the United States have "dragged their feet on cleaning up sewage discharges" into

pointing the way for others.



GE motor control centers regulate water treatment operations.

rivers, lakes and bays. Maine's cities—including Portland—are proud that they are not included in that number.

Robert A. Miles, Apparatus Distribution Sales Division systems engineer in Wellesley, Mass., who worked with consultants to coordinate the ordering and installation of General Electric equipment at the Portland Wastewater Treatment Plant, commented: "The water and wastewater industry presents an opportunity for service to the community by GE as well as an opportunity for a large volume of GE business nationwide." 



Beautiful Casco Bay, site of Maine's Portland Light, is being environmentally protected with the help of General Electric technology at work in Portland's new wastewater treatment facility.





At work on computer project, Lynn Marquard says program has given her "a valuable perspective on manufacturing needs."

'New faces' in GE computer rooms

New Software Engineering Program is helping GE meet the need for computer professionals.



Program enrollees Kathleen Lambert and Michael Maloney prepare classroom software assignments in computer library.



Students (l to r) Albert Zwiesler, Maria Phillips and Glenn Merrill attend seminar designed to increase their technical communication skills.

Receiving computer-room training from program coordinator Joan Carter, seated, are Michael Warren, Susan Wallace and Vladimir Winkler.

Boom times have hit the computer technology field. Across the U.S., companies are vying with each other on college campuses and in paid advertisements for properly trained computer personnel. In General Electric this year, an additional 1,300 persons with computer-related disciplines are needed to keep pace with the Company's burgeoning computer applications.

Computer technology's "brushfire" growth—from its role as a financial and data processing tool to runaway applications in engineering, manufacturing and marketing—has created new challenges for GE employees charged with developing the Company's professional technical workforce. New Corporate dimensions are being added to furnish GE businesses with enough computer professionals, and to provide follow-on career development programs.

The new Software Engineering Program (SEP), started last June by Bridgeport's Computer Management Operation, is one important response to this electronically astute era of minicomputers and very-large-scale integrated circuitry (see pages 16-18).

James T. Duane, manager of CMO, states: "Many GE operating businesses report needs for high-caliber, computer-oriented graduates trained in the special skills needed for industrial computer applications. SEP is designed to attract such graduates. It provides a concentrated six-month curriculum for employees schooled in computer science, math and engineering. In Bridgeport classroom and lab facilities, enrollees learn the industrial approach and get 'hands-on' computer experience by being assigned real projects

which they finish by working in teams with software experts."

"The men and women selected for the Software Engineering Program represent an important investment in General Electric's future computer-related thrusts," observes Joan C. Carter, the program coordinator. "Our pilot class of 13 people, which graduated just before Christmas, was specially chosen for their potential to assume leadership roles in developing General Electric computer software."

Recruited from universities throughout the U.S. and Canada, the first graduates of the program are now working in nine different Company components, which sponsored their class work. While it is intended that most enrollees be entry-level people, some may be concurrently enrolled in other GE training programs such as the Edison Engineering Program.

Notes Carter: "To the best of our knowledge, SEP is the only program of its kind in existence. We begin the course work with General Electric orientation, communication-skills development and an introduction to current software engineering techniques. Then the students are assigned to team projects, directed by seasoned GE professionals."

Formal courses on all important aspects of software are conducted by the CMO staff. Bridgeport's Computer and Production Professional Relations Operation (C&PPRO) supports CMO in its educational effort through a "computer learning center" facility which offers both classroom space and audio-visual equipment for the training staff. Additional lectures are pre-


sent by outside technical speakers, and by such computer vendors as Hewlett-Packard and Digital Equipment Corporation—to acquaint enrollees with the equipment they will eventually use.

New enrollees in the Software Engineering Program are presently beginning their course work. Comments from several members of the first graduating class follow:

• *Michael V. Warren, B.S./Computer Science, California State University.* Now at Binghamton's Aerospace Control Systems Department, Warren rode his motorcycle from California to Connecticut to report for work.

"Before joining the Software Engineering Program, I visited Bridgeport for meetings with GE computer people and product department representatives. I heard about the program—and learning about that, as well as the exciting aircraft systems work at Binghamton—convinced me to join GE.

Aerospace eventually offered to sponsor me on this program, and the subsequent training was useful in helping me tackle software problems and evolve good documentation."

• *Susan G. Wallace, B.S./Math, Rochester Institute of Technology.* Also working in Binghamton, she comments: "This program has no equivalent on the college level. It prepares you to apply what you've learned in college to real-world applications. At GE, a team concept is used—which builds communication skills and promotes give-and-take. The program's classes and labs build confidence. You actually analyze systems and apply various software engineering techniques to arrive at a sound design solution." 

Monographs

Tea for one? Lady Sarah Churchill, grandniece of the late Winston Churchill, has tea poured for her by Re-entry Systems Division's Diver Equivalent Manipulator System on the movie set of "Raise the Titanic." In the upcoming adventure film, the DEMS device will pretend to work 12,500 feet underwater, repairing the hull of the *S.S. Titanic*, which sank in 1912 after hitting an iceberg.

The film, set in the present, depicts the amazing efforts of a U.S. special agent to recover vital material from the famous steamship. Since the ship is down too deep for divers, the only solution is to raise it!

DEMS—which is in actual use worldwide on offshore rigs to help explore for gas and oil—was a "natural" for its part, since it extends man's "sense of feel" movements into the deep-sea environment.



Pop quiz on Edison. Did you know that the first incandescent lights west of the Mississippi were demonstrated at the University of Missouri? Did you know that Thomas A. Edison himself made possible this 1883 "light show"?

The dynamo Edison donated was recently the focus of a

rededication on the Columbia, Mo., campus. This early generator—refurbished last year by GE employees at Erie's Aerospace Instruments and Electrical Systems and DC Motor and Generator Departments—was returned to the school, along with a similarly renovated smaller generator of the same period.

The GE people received help from the Smithsonian Institution and GE's Lighting Business Group.

Edison's connection with the university goes back to 1863. Then age 16, he was visiting New York City's Gold Exchange one day and helped avert a panic among brokers

by repairing an electric quotation indicator that had broken down. Dr. Samuel S. Laws, then vice president of the Exchange and later president of the University of Missouri, offered him a well-paying job.

In 1882, Edison returned the favor. He gave the university, through Laws, a dynamo and incandescent lamps. The school later set up the equipment and put on its demonstration.

Shown at ceremonies (l to r): U.S. Rep. Richard H. Ichord (D-Mo.); the university chancellor, Dr. Barbara S. Uehling; Senior VP Ralph D. Ketchum, group executive of Lighting Business Group; and engineering dean Dr. William R. Kimel.

Snowy saves. Ohio Ski Patrolman Thomas Stadnik holds the top rank in the Patrol—National Appointee—which only some 4,000 members have attained in Europe and the U.S. since the rank was created in 1936. One would assume that, with 12 years of rescue work under his belt, Stadnik began skiing at an early age. "Not so," says 43-year-old Stadnik. "I never strapped on a pair of skis until I was over 30."

An assembler with Cleveland's Lighting Business Group, he works with the



Patrol after-hours without pay, averaging about 300 hours a year. Stadnik, who has received extensive emergency medical, avalanche and mountaineering training, notes that Patrol members must be strong and resourceful: "When you're lowering an injured person down a slope on a toboggan, you're wrestling with a combined equipment and body weight of at least 200 pounds, and that's not easy on skis."

Study with a master. On Friday and Saturday nights, Milwaukee's Irving D. Crabbe (right) doesn't bowl, go to movies or pursue the typical leisure activities others may enjoy. Rather, he pursues a hobby that has fascinated him all his life—cooking.

Nine years ago, he learned that one of the world's master chefs, Werner Buchel (left), was in the Milwaukee area. Until Buchel came to the U.S. in 1948, he was chef for the Royal House of Liechtenstein in central Europe.

Crabbe, a vendor perform-



ance specialist with Medical Systems Business Division, asked Buchel if he could apprentice under him at his Alpine Village restaurant. Buchel said yes—and today

Crabbe is completing his eighth year as one of Buchel's banquet chefs, in charge of his own kitchen, serving large meals for weddings and other gatherings.

"We sometimes serve 350 people at one dinner," observes Crabbe. "Werner has taught us to demand absolute quiet in the kitchen because it takes great concentration to get everything just right. The entrees—from stuffed Cornish hen to breast of capon on curried rice, sirloin of beef and whitefish—require utmost care to be prepared correctly."

Foils airline attack. On board a recent American Airlines flight bound from Chicago to San Francisco with a full load of passengers was Syracuse's Richard S. Hill, Solid State Applications Operation.

After the jumbo jet had been aloft a short time, one of the passengers became noisy and started causing a commotion. Hill stepped into the aisle to see if he could help quiet the man. "The guy came up the aisle and bumped into me," Hill explains. "I started talking to him, and eventually we sat down together. Everything was fine until he asked me about his old school in Chicago—we both grew up there.

I didn't answer the way he thought I should. The guy got violent, pulled out a knife and stuck it in front of my face."

The flight got even more dramatic when the passenger walked over to a young woman and tried to run the knife down her arm. Hill grabbed him from behind. "Another passenger got in front of him, but got stabbed in the face and chest."

An off-duty pilot on board the plane was able to tie the man's hands with a belt to keep him subdued until the aircraft could make an emergency landing in Denver.

Why did Hill get involved in such a dangerous situation?



"Nobody else seemed about to do anything." Then he adds jokingly, "I had just finished reading my magazine and was getting kind of bored."

\$50-million addition. Determined to keep pace with the fast-moving electronics revolution, General Electric's Research and Development Center is expanding. Now in the design stage, the 1980-83 building program will increase floor space at the Schenectady facilities by 30%.

More than half of the building effort will be devoted to construction of one of U.S. industry's most modern electronics laboratories.

States Dr. Roland W. Schmitt, VP for Corporate Research and Development: "This expansion program highlights GE's determination to be a major factor in the 'new electronics' now sweeping energy, manufacturing, transportation, communications, appliances and other consumer products, medicine, defense and numerous other fields."

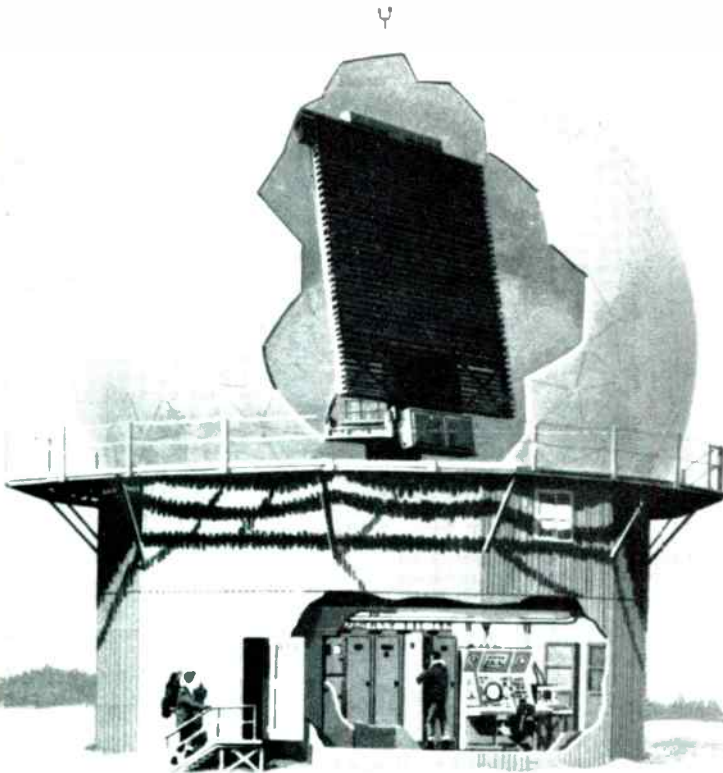
The expansion represents the largest addition to R&D Center facilities in the last 25 years.

Honors. Lynchburg's Mobile Communications Business Division has received the Corporate Award of the International Association for Hybrid Microelectronics for "achievement of a high level of excellence in mobile communications technology."

• VP Gerhard Neumann was recently awarded the prestigious 1979 Daniel Guggenheim Medal "for development of highly efficient aircraft engines for commercial and military purposes."

Radar resurgence

Computers and the 'new electronics' are bringing intriguing new challenges to GE defense specialists.



An early warning air-defense radar for detecting security threats via Alaska's air approaches, the U.S. Air Force's new "Seek Igloo" radar under development by GE represents prospective new Company business.

Radar, the World War II technology that has had its business ups and downs since the war's end, is in the midst of an orders resurgence. The reason: new electronic technologies are making old systems obsolete. It's a renaissance in which General Electric is participating in a big way.

The supersonic speeds and ranges of today's aircraft and the hundreds of potential targets make it essential that radar be able to detect and track automatically—despite enemy signal jamming and weather interference. In 1972, Syracuse's Electronic Systems Division began developing for the U.S. Marine Corps the first air-defense radar to utilize solid-state electronics exclusively, combined with computer management of the system. The Marines' AN/TPS-59 tactical radar was to become the progenitor of the Company's new GE-592 product line.

Last September, the first of

the GE-592 family of radars was delivered to the Belgian Air Force installation near Ghent as part of the NATO air defense network.

Based on its successes with these first completely automatic air-defense radars, the Company recently won a \$19 million contract from the U.S. Air Force for yet another GE-592 radar system.

Code-named 'Seek Igloo' by the Air Force, it is so tagged for its rugged arctic task of watching Alaskan air approaches to this continent across hundreds of miles of sparsely inhabited tundra.

Observes VP Thomas I. Paganelli, Electronic Systems Division's general manager: "The Seek Igloo three-dimensional system is designed to replace the Alaskan Air Command's 20-year-old radars, thus enhancing North American air defenses. Seek Igloo will give range, position, and

height of aircraft, covering a 200-nautical-mile distance and an altitude of up to 100,000 feet."

General Electric is now developing two of these radars for testing. One will be installed near the Alaskan coastal town of King Salmon, while the second will remain in Syracuse. VP Paganelli continues: "Operational tests should be completed by 1982. Besides the two test radars, the Seek Igloo contract contains prices for 12 additional radars that the Air Force plans to purchase later."

"With Seek Igloo, a minimally skilled technician can maintain the radar using built-in equipment that automatically identifies faulty components," says Lt. Col. Lewis F. Sitterly, program director. "More than 550 Air Force and contractor personnel presently maintain and operate the Alaskan systems. When the radars are installed, that figure will be about 90—with an

estimated annual savings of more than \$30 million.”

Over-the-horizon radar—so named because it utilizes radar beams reflected off the ionosphere to detect targets beyond the line-of-sight horizon—is another innovation in air surveillance, and General Electric is a major contributor to this ongoing defense research. In 1975, the Air Force selected GE to develop an over-the-horizon radar to determine its feasibility as part of the U.S. early warning air-defense system.

The first such CONUS OTH-B Experimental Radar System is now being installed in Maine by GE. It’s hoped that over-the-horizon radars will become a key part of the U.S. defense system, and that additional radars will be installed.

“As a leading pioneer in the field of radar electronics, the Electronic Systems Division can be proud of its continuing leadership as one of the nation’s major suppliers of defense electronics equipment,” remarks Paganelli. He quickly ticks off a few of the Division’s other radar successes:

- In 1955, in less than nine

months time, GE built and installed in Turkey the world’s most powerful radar of that time, the FPS-17, part of the Air Force’s Spacetrack global surveillance network.

- In 1972, for the U.S. Army’s Safeguard ballistic missile defense system, GE designed and produced the Perimeter Acquisition Radar (PAR). Currently the world’s largest, most powerful phased-array radar, PAR is now used in the Air Force’s spacetrack network.

- In 1976, the Systems Technology Radar (STR) was delivered to the U.S. Army’s Kwajalein Missile Range for use in ongoing research and development in ballistic missile defense. STR is one of the most sophisticated radars ever designed.

- Also in 1976, GE unveiled the TPS-59, designed to become the backbone of the Marine Corps’ tactical air-defense system. Paganelli comments: “GE is currently negotiating with the Marines to supply up to 11 more of these lightweight, transportable radars.”

The largest current market for military ground-based air surveillance radar is for three-

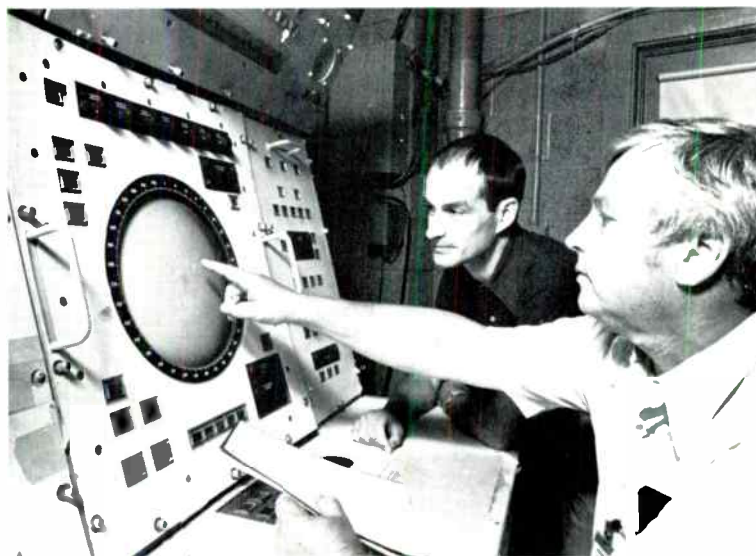
dimensional systems, both in North America and abroad, observes General Manager Paul J. Teich of Syracuse’s Surface-based Electronics Programs Division. “GE is poised to capture much of this business, because of such computer-aided ‘3D’ radars as the TPS-59 and GE-592.”

Teich notes: “The GE-592 we produced for the Belgian Air Force is a valuable stepping-stone towards our supplying additional computer-aided radars. Similar systems could be applied to opportunities in the 1980s. Canada, for example, is considering replacement of its Pine Tree Line, and other countries are expected to purchase ‘3D’ radars over the next several years.”

Concludes Paganelli: “Electronic Systems Division made significant investments in the TPS-59 and GE-592 development, and with our new orders, we’re confident that we’ve made a sound investment. Winning the Seek Igloo contract was a major victory, representing a milestone towards building an exemplary GE line of computer-managed solid-state radars.”



Incorporating latest GE radar technology, a GE-592 system was delivered to Belgian Air Force in 1979 as part of a NATO modernization program. Right: Belgian AF Capt. Gerard Loriaux (l) with GE’s Howard L. Johndrow.



MICROELECTRONICS



“**M**icroelectronics is to General Electric what oil is to the United States.”

That’s how Herbert J. Kindl, general manager of the Aerospace Electronic Systems Department (AESD) at Utica, N.Y., describes the pervasiveness and strategic importance of microelectronics throughout the Company.

The subject was equally pervasive at the 1980 Management Conference at Belleair, Fla. VP Donald S. Beilman, head of the Aerospace Technology Development Operation, told the attendees that “almost two-thirds of GE’s 1983 sales billed will be impacted by the electronics position of many of our product lines.”

To assure General Electric’s future market leadership through products and systems incorporating microelectronics, Beilman outlined several steps being taken by GE to assure its technological currency.

“A major new microelec-

Silicon-on-sapphire wafer with dozens of integrated circuit chips—held here by engineer Douglas Kaputa—symbolizes ‘technical renaissance’ in GE businesses.



3: A tiny technology makes big waves

tronics program has been established involving a highly focused use of existing resources, coupled with an entirely new advanced microelectronics development and production operation," he announced. "This new program will supply internal users with custom integrated circuits (ICs) in order to provide unique GE product systems and features for the future."

A new microelectronics center is a major element of this program. To be established later this year, it will transfer new Corporate Research and Development process technology as well as acquired process technology into manufacturing status in the IC production lines in the new center. Beilman also reports that a major training program will be developed to educate management and train engineering and manufacturing personnel in the application of ICs.

A \$50-million addition to the Research and Development Center announced recently will also enhance the Company's ability to conduct integrated circuit research (see page 13).

Dr. Roland W. Schmitt, VP of Corporate Research and Development, explains that the microelectronics revolution will have an impact on society comparable to that of the industrial revolution, something not yet widely understood. "Few persons realize that today a single fingernail-sized chip can hold as much computing power as a roomful of equipment back in the '50s," he says. "Over 100,000 circuit elements can be crowded onto a silicon chip. That number has been doubling each year for a decade."

"An important factor in explaining the increased use of these devices is the dramatic decline in price per unit," comments Frederic K. Rosen, business development manager for

Technical Systems and Materials Sector. "In the early 1960s, for example, the cost per electronic function was ten dollars. Today, it's less than a cent."

ICs also provide other valuable benefits. For example, since their interconnections are created simultaneously with circuit elements, this eliminates many of the previously hand-wired and less-reliable soldered joints. Thus, ICs provide overall savings and easier maintenance. Chips also consume less power than the components they replace.

Microcircuit development at GE has been an ongoing effort involving AESD in Utica, the R&D Center in Schenectady, and the Electronics Laboratory and the Solid State Applications Operation (SSAO) in Syracuse, the latter a part of CR&D formed in 1967 as the Integrated Circuits Center or IC². Since then, SSAO has designed hundreds of custom

(continued next page)



Gold wire is used to connect an integrated circuit chip (left) to its carrier in final fabrication step. Above: AESD's R. Robert Rowe shows how evolution of chips reduces product size.



Photo mask of integrated circuit is checked by AESD engineer William Wagner and lab assistant Eloise Stergas (left). Above: a standard avionic module using several integrated circuit chips.

integrated circuits for use in the products and systems of over 40 GE departments.

The great leverage provided by such IC chips is seen in the growing list of General Electric products in which they're used. The new GE Spacemaker[®] microwave oven, for example, offers programmable touch controls, thanks to its built-in chip, and The Great Awakening[®] programmable digital clock radio's microprocessor allows an array of new features to attract consumers.

Other microelectronics applications cut across GE's numerous product lines: instrumentation and monitoring of turbines, "smart" thermostats, electric vehicle controls, VIR-equipped TV receivers, medical systems, time-of-day residential meters, plus various manufacturing and quality control applications.

"Microelectronics has been a key to reliability, repairability and the reduced size of personal communications equipment," reports Thomas A. McKee, manager of engineering at the U.S. Mobile Radio Department, Lynchburg, Va. The department has been



New GE AM/FM programmable digital clock radio uses microcircuits to provide such new features as different wake-up times, different stations for slumber and wake-up, and a memory to allow recall of six pre-selected stations (see page 26).

involved with microelectronics since 1964, and has designed chips since 1970.

A multimillion dollar investment in its future has been made by AESD, by installing its own microcircuit design and manufacturing facility—a step critical to its ability to win new avionics orders in a competitive, technology-driven market, says Kindl. But he stresses that his business isn't in selling chips, but in using them for such systems as airborne radar and space electronics.

"While we do build small lots of custom chips," he adds, "this is done to give us leverage essential to our ability to furnish a modern product that is cost-competitive and does what customers demand."

Kindl has established training courses for employees both in how to engineer systems to make optimum use of microelectronics, plus how to apply computer-aided design (CAD) methods to develop new devices.

To produce advanced systems will require a new generation of custom ICs, and the Company therefore is launching a major research effort to develop Very Large Scale Integrated Circuits (VLSI) containing some 100,000 transistors. This compares with small-scale ICs with only ten transistors, and the present microprocessor chips made via Large Scale Integration (LSI) with their 10,000 to 20,000 transistors.

One measurement of the IC state-of-the-art is the width of lines interconnecting circuit elements. Present LSI chips are from five to seven microns. (A *Monogram* page is about 50 microns thick, while a spider's silk is one to two microns.)

"The VLSI program is designed to ultimately achieve sub-micron capability,"

explains Robert C. Kroeger, program general manager of GE's VLSI program. "But having that process capability is only half the answer. You must support it with software and the CAD tools to design chips optimally," he adds.

To provide such software, the Electronics Laboratory is developing the logic, testing programs and CAD capability for chips of 10,000 elements or more, reports Dr. Albert P. Belle Isle, manager of Information and Circuit Technologies.

"The R&D Center challenge is to develop the advanced processes to fabricate VLSI circuits with feature sizes that will ultimately be smaller than the wavelength of visible light," explains Dr. Marvin Garfinkel, manager of VLSI programs at the Research and Development Center.

"The driving force is that shrinking dimensions permit increased electronic capability and reduced cost per function," he says. "This will require considerable research into the physical properties of IC materials such as silicon, advances in basic device structures and their electrical characteristics, and the development of processes capable of producing the extremely fine patterns required with high yield."

Dr. Dale Brown, manager of the Silicon Processing Operation at the R&D Center, who is heavily involved in the VLSI program, reports that optical lithography will be used to make chips with lines at the one micron level. The next step for producing even finer lines will be in applying electron beam lithography. "This is a fast-moving business," he says, "and you have to take risks now and then. But the rewards can be enormous." ▲

JA 'parents'

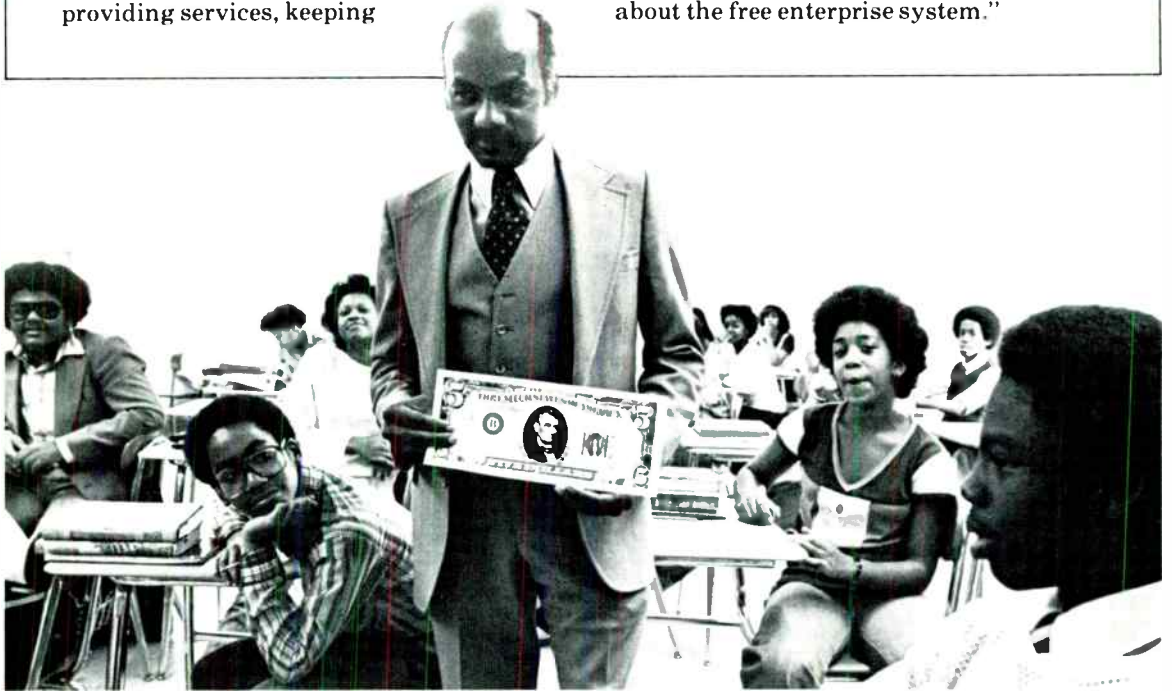
Helping build public understanding of business, GE people are contributing their time and talents to Junior Achievement projects.

The national Junior Achievement organization was founded in 1919 and, since JA started to keep records in 1942, General Electric employees have served as directors, advisors, in-classroom consultants and fundraisers for some 2,000 student-run JA companies. In the 1978/79 school year, GE involvement with JA ran to 84 operations.

In a JA project, high school students organize and operate their own company with the help of senior advisors. Business procedures include selling stock, manufacturing and marketing products, providing services, keeping

books and paying salaries. As a national average, about 80% of JA companies make a profit and distribute it as dividends to their stockholders at the end of the operating year.

"General Electric and Junior Achievement have been partners in progress for business for nearly 40 years," states Richard Maxwell, JA president and chief executive officer. "During these years, thousands of GE personnel have given unsparingly of their time, expertise and financial resources to help JA educate some 3.5 million young men and women about the free enterprise system."



Kenneth Combs lectures on career options

Project Business is a national in-school JA economic education program for eighth and ninth graders—and in Cleveland, Kenneth Combs addresses students on such subjects as the U.S. economy, money, banking and consumerism. Class field trips also are taken, and GE and other business sponsors pay for the study materials.

Notes Combs, a packaging design

engineer with Incandescent Lamp Department: "The first question I ask my classes is, 'What do you think of business?' One kid last semester said, 'Crooks'—and other kids echoed him. I took that as a challenge, and when classes ended, most were excited about business, and saw it as socially beneficial and a way to gain self-respect."

Combs, who teaches predomi-

nantly minority classes, serves as something of a role model for his listeners. "The youngsters ask me what I do at GE, how I got there, and if I'm happy with my work. This gets us talking about careers. My message to them is, 'Don't choose a career merely by title. For example, if you're interested in math, you can be an accountant, bookkeeper, bank teller or engineer.'"

(continued next page)

JAers tackle Christmas market in Columbia, Md.

Finding eager yuletide buyers for their puzzles and games, a JA company in Columbia, Md., takes advantage of the holiday buying spree to increase profits. Counseled by Major Appliance Business Group employees, Melanie Teal (left) and John "Chip" Galloway, Jr. (center), the student business, Techniques Unlimited, includes lesser-privileged minority youngsters from the Baltimore area.

"In a JA company, you get immediate feedback," notes Galloway, unit manager—Microwave Range Assembly. "If customers don't like a product because it's got poorly

mitred joints, they don't buy. If you don't come to work on time, you get fired. A JA company is not a social club."

Observes Teal, a material control specialist: "Every JA company has at least one Cinderella story. Ours involved an introverted girl with a domineering mother. The girl's sales were low and she didn't fit in. We gave her a one-year Dale Carnegie scholarship. Two years later, she was elected company president. She had developed real charisma, the kids loved working for her, and we finished the year as one of the region's top companies!"



Award-winning JA company advised by Rome, Ga., team

For five consecutive years, Rome, Ga.'s Jageco (Junior Achievement General Electric Company) has been the region's JA "Company of the Year." As a student business which manufactures throw pillows and book racks, the firm is advised by three employees of Medium Transformer Department. States Carlton H. Keith (center), a cost analysis and support specialist, who was a 1978 Philippe Award nominee for his JA work: "I immensely enjoy working with kids. The most valuable lesson they learn is that nothing's free. Even the *free* enter-

prise system works only as long as everyone does his or her share."

Donald D. West (left), an advanced manufacturing engineer, comments: "JA stimulates teamwork. No matter how good one person is, he or she can't equal the efficiency of a smoothly operating group of people. Conversely, one person who doesn't do proper work can drastically affect all the others."

Adds Bobby M. Potts, Sr., controls specialist: "By the end of a JA year, I've never seen a shy student. When everyone has to shoulder responsibility, reserve vanishes."

William Efner: active in JA for 17 years

"Each year, I've noticed the kids in JA get younger. Many ninth graders are participating in our current company, TIP A 6 (Teams in Productive Activity). For many of them, JA represents the first chance they've had to be measured on tangible achievements—in dollars, points and awards."

The speaker is Schenectady's William B. Efner, a documentation specialist with Gas Turbine Division. A JA "dad" for 17 years, Efner now advises a company that produces jumper cables, ice scrapers and stretch cords with hooks. "We have a hot rivalry going with another Schenectady JA business, advised by the R&D Center's Robert A. Roy. Our kids relish this. Competition teaches them to work

together, shoulder their share of the burden, and meet the world a little more."

Efner counsels his kids about how JA can prepare them for jobs. "One young fellow, our company's former

manufacturing VP, landed a good part-time job in manufacturing because of his JA record. Another young man, a fantastic salesman, is now putting himself through college on sales commissions!"



Susan Thompson: keeping a college promise

Immediately upon joining GE in 1978, Waynesboro, Va.'s Susan Thompson became a JA "mom" by helping advise Apex, a company that produced lapel buttons. "None of my high school counselors had talked with me about business, and in college, I promised myself I'd become a JA counselor."

Apex had been started in 1977 by Marjorie Grimes, GE employee and community relations manager. Thompson's successor company, Transfer Enterprises, produces T-shirt transfers and other related products using a TermiNet® 200 teleprinter—produced by Data

Communication Products Business Department—and a minicomputer. A department communications specialist, she observes: "Our JA company is now the largest in the area."

Thompson's college psychology work has assisted her in JA counseling. "One girl in my company has a daughter born out of wedlock. She returned to school after the baby's birth and joined JA. She's only 16, but she's a capable JAer, is carrying a full work load while caring for her baby, and plans to go to college to become an accountant." Shown with Thompson: JAers David Thompson (l) and Zo Tipton.



Organization changes

CORPORATE

John F. Burlingame elected a Director
Edward E. Hood, Jr. elected a Director
John F. Welch, Jr. elected a Director

CONSUMER PRODUCTS AND SERVICES SECTOR

John C. Truscott elected a Vice President
Richard T. Gralton, VP and General Manager—Major Appliance Marketing Operations
Wayman O. Leftwich, Jr., VP—Special Studies, Major Appliance Business Group
James F. West, General Manager—Major Appliance Marketing Division

INDUSTRIAL PRODUCTS AND COMPONENTS SECTOR

James P. Curley, Senior VP and Group Executive—Contractor Equipment Business Group
Donald K. Grierson, Senior VP and Group Executive—Industrial Electronics Business Group
Van W. Williams, Senior VP and Group Executive—Motor Business Group
George B. Farnsworth, VP and General Manager—Component Motor Division
Eugene J. Kovarik, VP and General Manager—Industrial Motor Division
William Longstreet, VP and General Manager—Distribution Equipment Division
James R. Olin, General Manager—Industrial Electronics Systems Division

INTERNATIONAL SECTOR

Edward C. Bavaria, General Manager—Middle East/Africa Business Development Division
Allan L. Rayfield, Chairman of the Board and Chief Executive Officer—General Electric do Brasil S.A.

POWER SYSTEMS SECTOR

George B. Cox, Senior VP and Group Executive—Turbine Business Group
Richard W. Kinnard, VP and General Manager—Large Steam Turbine-Generator Division
Nicholas Boraski, General Manager—Large Transformer Business Division

TECHNICAL SYSTEMS AND MATERIALS SECTOR

Donald S. Bates, Senior VP and Group Executive—Information and Communication Systems Group
William A. Anders, VP and General Manager—Aircraft Equipment Division
Otto Klima, VP—Special Projects, Aerospace Business Group
Thomas H. Fitzgerald, General Manager—Silicone Products Business Division
Donald J. Meyers, General Manager—Mobile Communications Business Division
Ladislav W. Warzecha, General Manager—Re-entry Systems Division

That championship

Do you love to dream the heroic sports dream? Breaking away for a Super Bowl touchdown? Or bringing home the Olympic gold? For a handful of General Electric people, caught up in the everyday business of running this Company, there was that time in the sun when the roar of the crowd was for them. There was that championship season.

First, there's Cliff Battles. It's now Dec. 12, 1937. Wrigley Field, Chicago. First quarter of the National Football League championship game. The hometown Bears, 9-1-1, the Monsters of the Midway, are preparing to devour the Washington Redskins on a field frozen as hard as iron. Pinned deep in their own territory, the Redskins line up in punt formation. As Sammy Baugh takes the snap, Battles sneaks through the line, turns and snares a surprise pass. He cuts and weaves and high-steps his way 42 yards. A few plays later, Battles bolts 10 yards for a touchdown. He leads all rushers that day, as he did all that championship season, and Washington wins, 28-21.

From 1932-37, Battles, who served GE as manager of civic relations in Washington, was one of the premier backs of the NFL. He was big, fast and durable, and could dance through a line with the best runners in the history of the

game. Twice he led the League in rushing and was the first player to gain 200 yards in one game. In 1968, he was inducted into the NFL Hall of Fame.

Today, a back with those credentials would be a millionaire. But Cliff Battles, who made \$2,700 in 1937, plus a \$225 championship bonus, reflected recently on his career and said: "I had a good time and it was a lot of fun."

Next: Ray Campbell. It's July 1961. The place is Fort Niagara, which has been guarding the entrance to the Niagara River since the French and Indian War. On the firing range is a captain, an international sharpshooter, who has just become the first person to nail 499 bull's-eyes out of a possible 500 in the Northeast Regional Hi-Power Rifle Tournament. With 20 targets to go, 600 yards out, is Sgt. Ray Campbell, a Purple Heart veteran of two wars. Campbell hasn't missed all day.

"The captain was as snug as a bug in a rug," recalls Campbell, now a stock keeper at Nuclear Products Division's Wilmington, N.C., plant.

With his right cheek swollen and sore from the continual pounding of his rifle's recoil, an M1, Campbell proceeds to put down the last 20 targets. A perfect 500. The first ever. "It was a job I knew I had to do," says Campbell, who shot for the

All-Army Trophy Team in the late '50s and '60s and helped the U.S. in 1968 to win the Conseil International du Sport Militaire in Fontainebleau, France.

1968. The Olympics. Mexico City. Baseball is being offered for the first time. Some 60,000 fans cram the stadium to see the USA face Puerto Rico. Starting at left field is Bob Jones, an all-America from Amherst College. The Puerto Rican lead-off batter laces a hit into the corner. Jones cuts the ball off, spins and fires a strike to second base. The batter is out. Although the USA loses, 1-0, it goes on to win the gold medal. Jones hits .312 and smacks a pair of doubles.

"It was my greatest moment in sports," notes the technical writer for Schenectady's Large Steam Turbine-Generator Division. "The first time you see USA across your chest it does something to you."

Jones' baseball career didn't stop with the Olympics. In 1971, he was the top pick in the free agent draft and was signed by the Pittsburgh Pirates. But, says Jones, "the honors I won as an amateur are more meaningful to me."

Moving to Waco, Tex., 1969. The track and field championships of the Southwest Conference. The grueling 440-yard intermediate hurdles. Southern Methodist University

season

A number of GE people have had big moments in sports. Here are examples.

sophomore Larry Eubanks, the youngest runner, sets his feet against the starting block. A pistol cracks. Eubanks springs into the race, legs churning. Ten hurdles. An all-out sprint. Neck-and-neck coming into the last turn. Then it's just Eubanks and a Texas A&M runner. The last hurdle looms up "like a mountain." Both men clear it; Eubanks ahead. He takes the last leg, wins and sets a conference record of 51.6 seconds, the 12th fastest time on the world list.

"I was doggone tired and sore with cramps," says Eubanks, manager—Product Service Finance for Major Appliance's Dallas region. "But the exhilaration of winning was great."

Let's step off the field for a moment. Spring 1956. The New York studio of the Perry Como Show. A solitary basketball hoop is on stage. Behind the curtain are 10 nervous, young men—members of *Look* magazine's all-America team. Perry Como introduces them one at a time, and they dribble onto the stage and toss up a shot before a live television audience. Joe Holup of George Washington University makes his basket and takes a seat next to the entertainer.

"The pressure to hit that shot wasn't so bad," recalls Holup, a purchasing manager at Schenectady's Turbine Business Group. "I had been in a

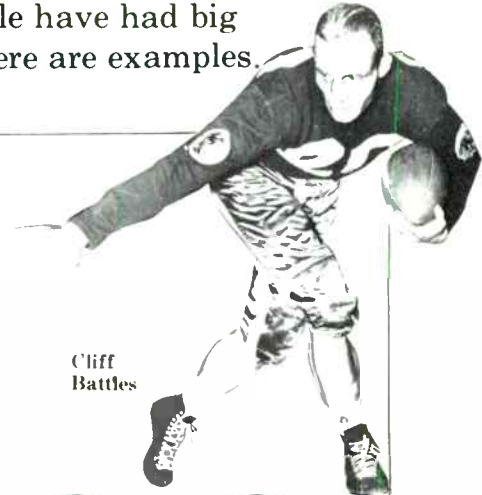
lot of close games."

And indeed he had. Holder of 18 records at GWU and the leading rebounder in the nation that year, Holup was picked in the first round of the NBA draft in 1956 by the old Syracuse Nationals. One of his biggest thrills, besides the Perry Como Show, was beating Michigan State for the title of the first Maryland University Invitational Tournament and getting the nod as the most valuable player.

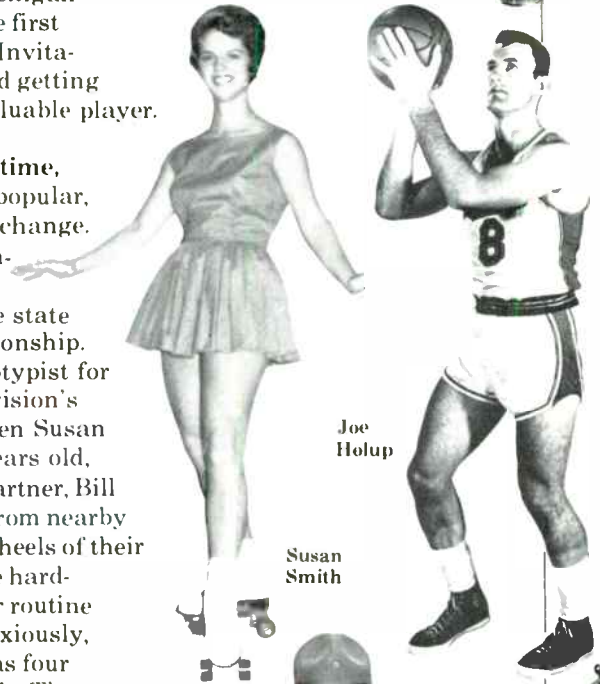
In our trek through time, we've touched many popular, big-time sports. Let's change.

June 1965. The Sunset Park Roller Rink, Wilmington, N.C. The state roller-skating championship. Susan Smith, a stenotypist for Nuclear Products Division's Wilmington plant, then Susan Pickler and just 19 years old, is twirling with her partner, Bill Matthews, a Marine from nearby Camp Lejeune. The wheels of their skates hum across the hardwood rink. When their routine is over, they watch anxiously, eyes wide with hope, as four judges flash scorecards. The points are high. The title is won.

Like many GE people once involved in sports, it was their time in the sun, their championship season. A year later, Matthews was gone like most soldiers, transferred to another camp in another part of the country, and Miss Pickler had become Mrs. Smith. **AW**



Cliff Battles



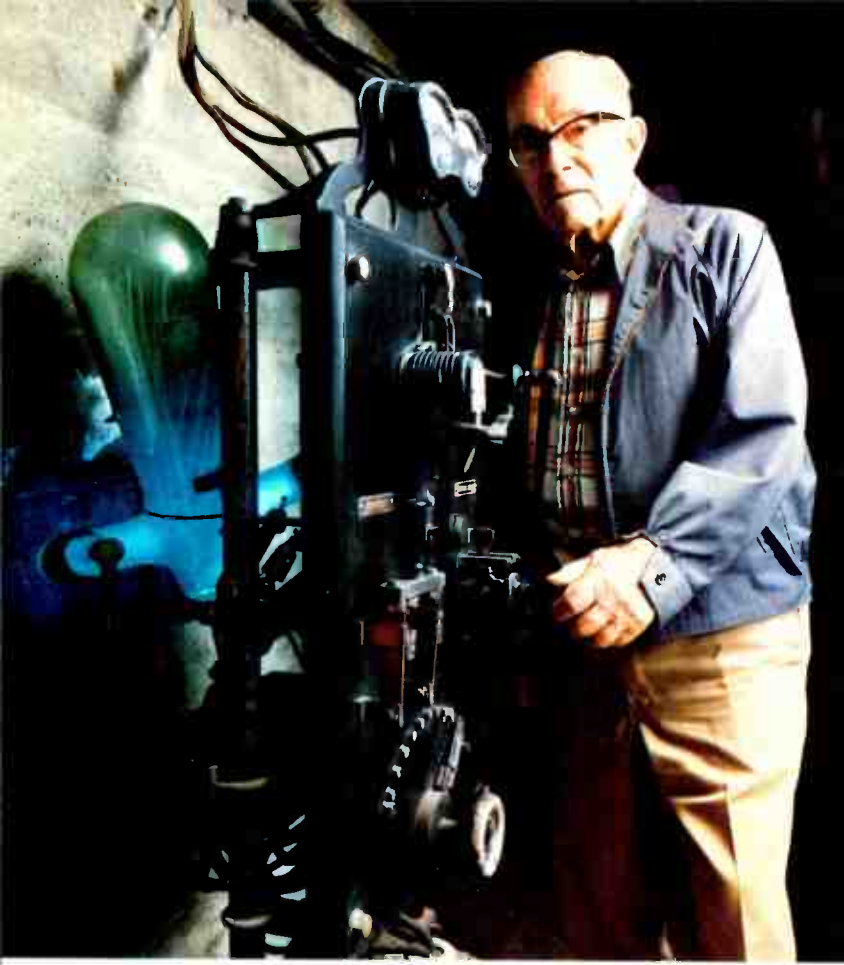
Joe Holup

Susan Smith

Ray Campbell



The



Master boat builder/restorer Joe Smith starts up the water-powered GE battery charger (top left) which gives life to his 80-year-old electric boat, *Barbara*, seen (bottom left) on New York's Lake George. The battery charger and boat are equipped with GE circuit breakers, voltmeters and ammeters (top right) and the craft runs on 12 eight-volt batteries (bottom right).



Wizard of Bolton Landing

Joe Smith's antique craft reminds us that if electric cars are coming back, why not electric boats?

Neither one is an ordinary octogenarian. Certainly not master boat builder and repairer James D. "Joe" Smith of Bolton Landing, N.Y., and emphatically not his turn-of-the-century electric vessel, the *Barbara*.

The craft, rescued by Smith twice—once from water and then from fire—is a sprightly 80-year-old ship which came out of a 20-year drydock last year, and this spring will begin service as a party boat, taking groups of up to 14 people out on Lake George.

Manufactured about 1900 by the Electric Launch Company of Bayonne, N.J., the *Barbara* runs on 12 eight-volt batteries—each weighing 160 pounds—and is kept going with the help of two antiquated GE 200-volt battery chargers, one powered by a water wheel. GE equipment on the boat and chargers includes voltmeters, ammeters, circuit breakers and a rare mercury-pool cathode rectifier, which converts AC current to DC.

Barbara came into Smith's life in the early 1920s. Smith, owner of F.R. Smith and Sons, a boat livery firm, was a commercial supplier of boats for hotels and estates in the Adirondacks. He had heard that the 30-foot *Barbara* had sunk to the bottom of Lake George, so he went to see her owners about buying her and bringing her up. Before he could make an offer, the owners offered him \$100 to salvage the boat and haul away its battery charger. Delighted, he accepted, and set to work restoring the boat in his boathouse.

"So quiet the fish never know we're coming," is how Joe Smith proudly describes this electric boat. He recalls that, two years after rescuing his *Lady of the Lake*, his cedar, oak and mahogany beauty was ready to join the three other electric boats he owned. "We used the electric boats for fishing parties because they were quiet, very maneuverable and easy to set on any of five speeds."

Smith notes that his boats could run for two-

to-three days without a charge, with the batteries being used for ballast. "The only trouble I've ever had with the batteries," he says, "is not being able to get them during World War II."

In 1956, because of her quiet motor and ability to go from less than one to up to 10 miles an hour, the *Barbara* was chosen to accompany U.S. marathon swimmer Stella Taylor on a journey down the lake. For hours on end, the boat stayed alongside the swimmer, beyond the actual endurance time for its powerful batteries.


As the swimmer passed Bolton Landing, a second electric boat joined the *Barbara* for the last 10 miles of Taylor's effort, but the *Barbara* made the trip to the end of the lake, with enough juice left to tow the other boat back to Bolton Landing!

Smith's silent boats plied Lake George until an October night in 1957, when a calamitous fire destroyed the boatyard—but not before Smith had rushed in to untie the *Barbara* and

send her out to the middle of the lake where she would be safe.

Smith rebuilt his business, but when the work was completed in 1959, there wasn't much call for electric boats, and the *Barbara* was put into storage for 20 years. Only recently did she emerge with a facelift, including new carpeting and captain's chairs.

Tourists passing Joe Smith's docks at dusk can now see the boat hooked up to its charger, its lightbulb-shaped rectifier glowing bright blue and a green "bug" dancing on a pool of liquid inside it. When they stop to ask "What's that?" Smith enjoys explaining to them that his boat is recharging—the "bug" is a hot cathode spot in the pool of mercury which conducts the electrical charge.

It's also a signal that Joe Smith and *Barbara* have once again returned to their port, and are gathering strength for another day. 



Hot ideas



Low-cost countertop cooking

Offering second-oven capabilities at a lower price than either countertop convection or microwave ovens, General Electric's new Versatron[®] electronic countertop oven provides family-sized meal capacity and a full range of oven functions. It features solid-state controls, uses less energy than a standard-size oven for similar cooking jobs, and preheats faster.



Low-energy refrigerators

Designed specifically for low-cost operation, this 17.15-cubic-foot top-freezer GE refrigerator is one of several models which are highly energy-efficient. Employing urethane foam insulation and a vertical evaporator that increases the refrigerator's efficiency by 50%, it requires at least 16% less electricity than standard GE models of the same capacity. It is available in The New Naturals[™] colors, and is equipped for installation of an optional automatic icemaker.



Microprocessor-based radio

The Great Awakening[™] clock radio is the first AM/FM clock radio with a programmable keyboard instead of a tuning knob, and its many wake-up and radio functions are made possible through low-cost microprocessors and breakthroughs in innovative test methods.



Electronic 'guard dog'

GE has introduced a portable, battery-operated, low-cost burglar alarm. The Zonar[®] intrusion alarm uses ultrasonics—an echoing system—which sends out an invisible beam that detects intruders, and sounds an alarm when the beam is broken.



More versatile TV viewing

All 1980 GE 19-inch television sets include a solid-state "Energy Conscious" chassis which uses only about 100 watts of electricity, compared with 143 watts for previous 19-inch models. Many units also include a backup color averaging control system, an all-channel Quartz electronic tuning system, and a microprocessor-based programmable remote control system. The power-regulated chassis is not affected by variations in household current.



Accessory for food processors

Millions of GE food processors are now in use, and the Company recently introduced a special accessory, the Versa-Disc[®] insert kit, which provides four bladed processing inserts for French fry cutting, thick slicing, thin ripple slicing and coarse shredding. The kit can be used with GE's model FP-1 and FP-2 food processors, and features a convenient rack for counter, cabinet or drawer storage.



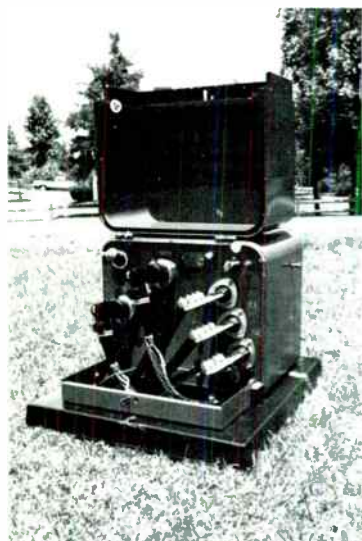
Hot air corn popper

GE has entered the hot air corn popper market with a compact model called Col. Popper. Tasty popcorn, up to four quarts per batch, is pumped up and out of the machine through a chute in which is inset a cup for melting butter while the corn is popping.



Space-age fluorescent

Resembling a manned orbiting space lab, GE's new circular fluorescent lamp, Circelite[®], offers consumers energy savings, long life and easy screw-in installation. The Circelite tube uses only 44 watts to produce as much light as a 100-watt incandescent bulb.



Energy-saving transformer

A new, compact transformer for residential developments has been produced by General Electric, which includes such benefits as reduced installation costs and energy-saving features. The Suburbanite[®] transformer is designed for single-phase applications, and requires ten gallons less oil than GE's Mini-Pad[®] transformer. The unit's small size allows it to blend into almost any background.



An 'energy bank' for hot water

Instead of wasting the heat from the compressors of home central air conditioners, GE's new Hot Water Bank heat recovery unit reclaims this energy to heat water

up to 160 degrees F. The water is stored in the home's hot water heater tank for future use. The unit is available through GE central air conditioning dealers.



'Intelligent' vehicle controls

To move industrial materials more efficiently, electric forklift truck operators need reliable vehicle controls. GE has seven new products which expand GE's line of EV-1[®] controls, using microprocessors and thick-film-hybrid circuits for greater reliability.



Eyeguards for the energetic

With eye injuries in sports on the increase, an optometrist has designed a protective eyeguard which uses Lexan[®] polycarbonate resin. Called the Rainbo Prescription All-Sport Eyeguard, the wraparound frames are designed for prescription glasses.



'Add-on' heat pumps—new way to save Btus

The "add-on" heat pump, working in partnership with oil or gas furnaces in U.S. homes and offices, could significantly increase this country's effectiveness in meeting today's energy needs if it were only used more.


That's the feeling of a number of people both in and out of General Electric, which now designs and manufactures the all-electric Plus-1 Weathertron® heat pump system.

When "added on" to a forced-air fossil fuel heating system, the Plus-1 can be set to keep the indoor temperature at a desired level without the use of the furnace. A switch-over to the fossil fuel system automatically takes place when the heat pump can no longer handle the complete heating requirements. By working in concert with the furnace, the Plus-1 provides economical operation and reduces use of fossil fuels.

"It is probably the most exciting, practical product in the marketplace today to help minimize the energy crisis," comments Hans J. Rueschmann, manager—Distribution Sales, Central Air Conditioning Department, in Tyler, Tex.

Supporting Rueschmann's statement is Schenectady's Vernon A. Rydbeck, manager of Electrical Energy Utilization and Development. "If one-third to one-half of the 15 million buildings now heated by oil were to take advantage of the add-on, the nation would save 500,000 barrels of oil per day in imports, and reduce yearly heating bills by \$2-to-\$3 billion."

"The add-on not only saves oil and money," adds Rydbeck, "but provides central air conditioning in the bargain."

Heat pump technology has been around for more than 40 years. After GE entered the scene, it made key improvements in the area of the pump's compressors. Says Schenectady's Dr. William Sheeran, manager of the Research and Development Center's Thermal Branch: "GE improved the efficiency of the heat pump dramatically and today is the world leader in heat pump production." 

PERSPECTIVES

The birth

Book by former GE

Dr. Herman A. Liebhafsky knows the General Electric silicone business. He knows when and how it began. Where



it is today. And what the future may hold. He knows how important it is, and how important it was. Author, historian, professor emeritus and, from 1934-67, GE chemist, Liebhafsky has chronicled the rise of silicones at the Company in a book, "Silicones Under the Monogram."

At the outset, Liebhafsky, who has four other books to his credit, states that the silicone project at General Electric, which eventually provided mankind with a variety of products from resins and polymers to space heat shields and "moon boots," was "one of the most important of the Company's corporate chemical research programs."

When you look at the business today, that statement certainly holds up. Among the project's results, of course, was the establishment in the late 1940s of what is now GE's Silicone Products Business Division at Waterford, N.Y. Worldwide, silicones are today a billion-dollar-a-year industry. Sales emanating from GE have more than doubled in the past five years, and since mid-1978 some 50 U.S. patents on silicones have been awarded to the Company.

of an industry

chemist chronicles the rise of silicones.

Silicones have intrigued scientists since as far back as 1823, notes Liebhafsky, and fundamental understanding of silicone chemistry was provided in the early 1900s by British chemist Frederick S. Kipping. But it wasn't until the 1930s, about the time that GE broadened its chemical research lab under Dr. Abe Lincoln Marshall, that the major breakthroughs in silicones came. Eugene A. Rochow, not quite 30 years old, was asked to devote most of his time to silicone research. On May 10, 1940, he discovered an improved process for making methylchlorosilanes—"the most important process in the world's silicone industry today" because it showed that silicone molecules could be made to order for many purposes, and done so economically.


The industrial age of silicones, according to Liebhafsky, had begun. Organic and inorganic substances were chemically combined. The resultant material resisted heat, cold, chemicals and weathering. Its shape ranged from a petroleum-like liquid to a glass-like solid. From its basic forms—adhesive sealants, elastomers, fluids and resins—came scores of products for use in more than 30 different industries.

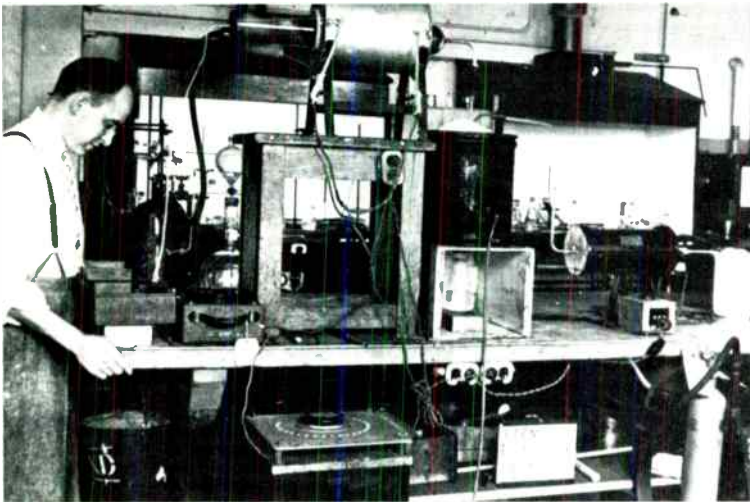
In the fall of 1944 General Electric introduced silicones to the world at a press conference. It may have looked like fun and games to reporters because the "nutty putty" was so resilient it could bounce and stretch and be molded into all kinds of shapes. A cartoonist for *Collier's* magazine showed GE scientists wrestling with



their remarkable invention. Although the press may have been skeptical, General Electric wasn't. It knew silicones were most durable and useful substances and that they would soon change the way in which we lived.

"The future holds many challenges and opportunities for GE silicone technology," comments Thomas H. Fitzgerald, general manager—Silicone Products Business Division. "It will be important through the 1980s to develop product and application innovations as well as improved process technology to counter rising raw material, energy, labor and environmental compliance costs. GE Silicone Products Business Division is committed to programs that will sustain market growth in the specialty chemical materials arena, and maximize process efficiency, thereby retaining a strong competitive position in a very competitive business environment."

Liebhafsky, in closing, wrote in his book: "The silicone industry has done the world much good. It will continue this course. Those who enabled it to survive and grow deserve the world's gratitude." 



Silicone pioneer Eugene Rochow, working in the GE chemical lab in the 1940s.

The GE calendar: stalking the perfect image

by Devere E. Logan



GE calendars above show change from art to photography.

The 1980 version is now up there on the wall—over 650,000 walls, assuming that all of the record number of GE calendars that were printed got placed by their legion of users both inside and outside General Electric.

They're up there, combining beauty and function in one carefully organized format. They're on the walls but—like most such projects—few of their users will have any idea of the blood, sweat and tears required of a lot of GE people to put them there.

The GE calendar consists of twelve striking photographs (thirteen, if you include the December subject repeated from the previous year). But those who look closely will notice that they aren't just *any* twelve beautiful photographs. The distinctive thing about the GE calendar is that each photograph relates to some General Electric business interest. Thus Detroit's Renaissance Center for September 1980 is not only a remarkable urban-development accomplishment—it's filled with GE power distribution equipment. And that night photo of Egypt's Sphinx and Pyramids isn't

just another tourist's snap—power for the lighting comes in part from GE gas turbines.

These GE tie-ins are sensible, in view of the calendar's chief purpose: to provide GE's sales force with an additional marketing tool; one that keeps good customers reminded of General Electric every day of the year.

Financing of the calendar depends on the orders received for it from GE operations—so that it continues to exist only as GE businesses give it their support.

But the GE relationships also make the process of producing the calendar much more of a challenge for all those around the Company who share in its development.

Consider the idea for a photograph relating to the fact that GE appliance and TV factory service now extends to Hawaii. Sounds ideal, doesn't it? A tropical isle, swaying palms, pristine beaches, exotic flowers and swivel-hipped natives, and with a GE service truck snuggled under the coconut trees.

But you never saw that "perfect" tropical

scene on the calendar. It wasn't that we didn't try. With the great cooperation of the GE service people in Hawaii, we dispatched an award-winning photographer from California who returned after days of cloudy skies bearing color film posing as black-and-white. A year later we tried again for our portrait of paradise. This time, we selected an island photographer who could watch the weather. His effort, shot from a helicopter that afforded a panoramic view of the coast, documented how concrete, steel and urban sprawl had masked the face of paradise.

Despite disappointments, we do come up with enough outstanding illustrations to assure a GE calendar that is growing in popularity.

The photographic format has been used since 1971, though early GE calendars of the 1920s featured original illustrations by such famous artists as Norman Rockwell, Maxfield Parrish and N.C. Wyeth. Commissioned paintings were used exclusively on the calendar until 1970, when several photographs were added.

Calendar designer Leonard Wolfe, who sifts through hundreds of potential shots to find the perfect few, emphasizes that "they must be outstanding photographs that are visually appealing—the sort of scenes that someone will enjoy looking at for a month."

Major natural attractions easily meet this criterion: the Carlsbad Caverns, Bryce Canyon, the Rocky Mountains, the Alps, Mount Shasta and Lake Tahoe are some of the popular subjects of past calendars. Landmarks such as Yankee Stadium, the White House and Independence Hall are also popular choices.

Ideas are submitted by most GE components, although others arrive from employees and various business associates. Each idea must be investigated. Is the subject really scenic? A polaroid test shot may tell. Is it technically feasible? A professional photographer knows. Should we push ahead and take the shot? Only one out of ten ideas reaches this stage. We choose the best professional photographers for calendar assignments, since artistry, not just technical ability, is critical to success.

Art d'Arazen is one who has contributed more photographs to the GE calendar than any other industrial photographer. He has repeatedly risen to the challenge of creating dramatic pictures from subjects that are sometimes undramatic. Among his talents: the ability to integrate complex lighting with multiple exposures to achieve perfection.

"I enjoy working with the large format of

the calendar," he says. "It allows me to create much as an artist who's been given a canvas adequate to capture all the beauty of a subject."

Among d'Arazen's favorite calendar assignments: the Statue of Liberty at sunset (Feb. '78) shot from a helicopter with its door removed; Snowmass, Colo., ski resort (Jan. '76) photographed while hip-deep in snow awaiting the correct light; and Independence Hall (Dec. '75) in which time exposures of auto taillights were used to conceal a sidewalk unexpectedly torn up for repairs.

From an original list of about 100 ideas, only about 15 are photographed—allowing for three backups. Each subject is shot thoroughly, with different compositions, shutter speeds and lighting. Dozens of rolls are shot, but only one photo will prove to be "best."

That one shot often results from impeccable timing. Freezing on film the precise moment when a train passes, a plane zooms by or a car appears at the exact scenic bend in the road demands the timing of a trapeze artist.

There was that GE locomotive in the Orient, for instance. Negotiations took weeks. They were conducted, of course, in the native tongue. Could the locomotive stop on the spot? Most certainly. Would the engineer be informed? Most certainly. Then, on cue, with our photographer's finger poised on the shutter, our star train sprang into view and flashed by, gone in an instant. Our assignment had lost a great deal in translation—and again, the calendar lost a potentially exciting picture. □



Calendar designer Leonard Wolfe (left) discusses photo selection with Fairfield's Devere "Dee" Logan.

COMMUNICATION LIFELINE.

Members of the first American expedition to conquer Pakistan's K2—at 28,250 feet, the world's tallest mountain after Mt. Everest—are shown using General Electric "PE" Series FM two-way radios to communicate between camps. Jim Wickwire, one of the first two Americans to reach the top, stands at camp 3 with K2 in background. Dr. Bill Sumner (inset), another climber, radios from camp 1, located further down the mountain.

Nicknamed "the Savage Mountain" because of its treacherous avalanches, K2 is located in the remote Karakoram Range on the frontier of Pakistan and China. Until the U.S. expedition succeeded, the mountain had been scaled only twice, by the Italians and Japanese. *National Geographic*, in its May 1979 issue, reported on the Americans' climb.

U.S. expedition member Terry Bech has written GE's U.S. Mobile Radio Department, noting, "The radios were remarkable for their performance. They were first used on the approach march where temperatures rose to 125° F. and everything was continually exposed to blowing dust and sand. As we gained altitude, the temperatures dropped until, at 26,000 feet, the radios were giving us effective communication at temperatures below -25° F. with continual exposure to blowing snow and ice."

He continues: "The overall performance of the GE radios was incomparably better in durability and ruggedness than similar competitive radios used by the Americans on Everest in 1976. Our thanks to you for helping us all come back alive!—and successful."

