EES Report
ENGINEERING EXPERIMENT STATION • GEORGIA TECH

High tech industry to get EES backing

In 1979, Governor George Busbee asked a study team from Georgia Tech to find ways for the state of Georgia to attract a strong high technology industry. The group found an ideal model for emulation in the Silicon Valley surrounding Stanford University. Since the 1930's, more than 800 advanced technology companies have sprung up in the valley, and many owe their success partly to technical assistance from Stanford. Beginning next year, Georgia Tech will assume a role similar to the one Stanford has played in California. Georgia's Advanced Technology Development Center (ATDC) will open on the Tech campus with the sole purpose of encouraging advanced technology business for the state.

In the last 20 years, Georgia has had trouble drawing high technology manufacturers, despite the state's attractive economic climate and living conditions. Between 1959 and 1976, almost 70,000 high technology jobs were created in California, in contrast to Georgia's 2,600. One reason for this gap may be the support facilities to which California firms have access and Georgia companies lack.

Entrepreneur Bill Morrison works on loudspeaker systems he is developing for commercial markets in office space he sub-leases from Georgia Tech. Morrison's new company, Acoustical Physics Laboratories, is one of the first clients for the state Advanced Technology Center to operate on the Tech campus.

The Georgia ATDC will meet this need by:

- Providing work space for fledgling companies and offering them access to an array of technical and marketing assistance from Georgia Tech professionals;
- Undertaking an active campaign, in cooperation with the Georgia Department of Industry and Trade, to recruit to Atlanta domestic and foreign firms which deal with advanced technologies. Georgia Tech staff members will identify prospects, provide them with technical data about Georgia resources and assist with visits and presentations;
- Assisting existing Georgia industries to expand into high technology product lines. This program will receive considerable emphasis since more than 70 percent of Georgia's new jobs are created by expansion of firms already in the state; and
- Providing educational programs on high technology development. The ATDC will present information to banks and other sources of venture capital. The Center also will conduct

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Computers may enhance nuclear safety

If an emergency occurred in an average American nuclear plant today, control room operators would have to analyze a flood of complex data to cope with the problem. Georgia Tech engineers hope to make the work of operators easier and more dependable by offering them an ultra-reliable computer system which automatically evaluates the plant's vital functions. EES computer science engineers are designing such a unit for the Loss-of-Fluid Test (LOFT) Integrated Test Facility at the Idaho National Engineering Laboratory. The work is sponsored by the Nuclear Regulatory Commission and the Department of Energy and its overall objective is to enhance nuclear safety and reduce the time computers are out of order.

"As it now stands, too much information is coming at control room

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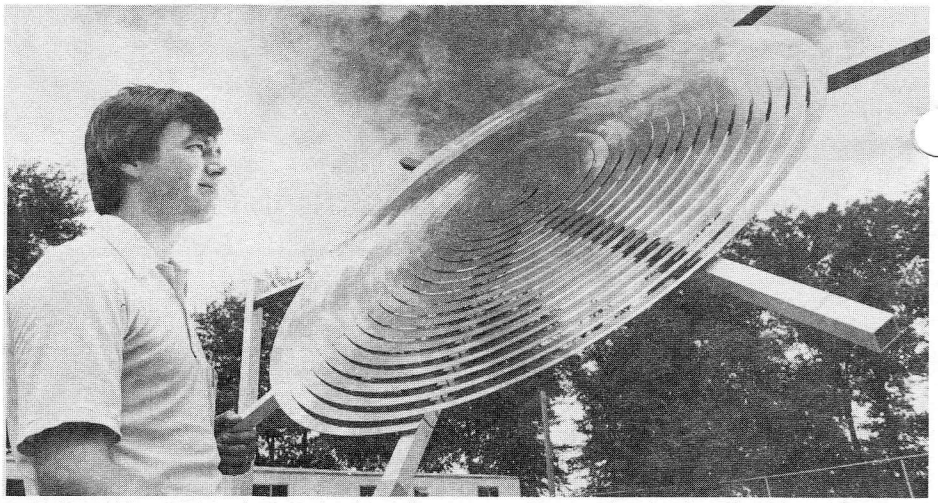
Student designs spiral-shaped solar reflector



Rick Steenblik examines his spiral solar reflector, an invention he developed while working as a cooperative student in the Engineering Experiment Station. Steenbliks's reflector may receive widespread applicaton in solar cooking, power generation for industry and solar photovoltaics systems.

Rick Steenblik was a Georgia Tech student working for EES when he began to design his own solar cooker three years ago.

"In the beginning, it didn't really matter to me whether my invention was the best way to solve the problem," the 23-year-old engineer said recently. "I just wanted to come up with something new."

Steenblik has produced much more than a novelty item. His solar reflector has many applications beyond solar cooking and it is simpler and less expensive to manufacture than presently available point focus concentrators.

With funding and encouragement from the Station, Steenblik has designed and built models of the solar concentrating device which reflect solar energy to a focal point. His invention is made from a circular piece of metal which becomes a functioning reflector when it is cut and wound into a spiral shape.

"It resembles a flattened spring," says Steenblik, who now works as a full-time engineer at EES. "By winding up this strip, each ring of the spiral becomes set at a different angle. If the placement of all of these angles is coordinated properly, then reflected light will focus on a single point rather than a broad field."

The use of metal rings set at varying angles isn't a new approach to focusing reflected sunlight. In the past, fresnel reflectors have used concentric rings and obtained this result. Steenblik's innovation has been to wind a single strip of metal into a spiral configuration.

Steenblik got assistance with the mathematics needed to plot the correct spiral shape from Dr. Dar-Veig Ho, a professor of mathematics at Georgia Tech.

With this groundwork done, Steenblik spent last summer making his six reflector models with a financial grant from EES. Each model worked satisfactorily and the largest was four feet in diameter. On slightly hazy days, it can set a stick of wood on fire in about four seconds. On a clear day, temperatures at the reflector's focal point may exceed 2,000 degrees F.

Steenblik believes that his spiral fresnel reflector could be substituted for parabolic dishes in several important solar energy applications—solar cooking; production of steam for industrial process heat and power generation; and solar photovoltaics.

Moreover, the spiral fresnel reflector should cost much less to build than a parabolic dish, according to Steenblik.

High tech center coming to Tech campus

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courses in entrepreneurship under the direction of Tech's College of Management, courses in basic management for beginning companies, a technical magazine and video-taped television programs to be shown inside high technology plants.

ATDC staff members will focus their efforts in laboratories involved in research and development as well as commercial testing. Other targeted businesses will include firms which make electronic computing equipment; industrial controls; radio and television transmitting, signaling and detection devices; electron tubes; semi-conductors; X-ray devices; and industrial instruments for measurement, display and control.

The ATDC will be housed in a three-story building with 90,000 square feet. It will be built on the north side of the Tech campus near 10th Street. The second and third floors will be divided into conventional offices. However, the first floor will be open, high-bay-type construction, with a modular partition system capable of subdivision into 2,500 square foot modules. The intention of this design is to provide "incubators" — low rent space for new companies with promising ideas and little start-up capital. Tech faculty members will be available as consultants and graduate students can serve as sources of low cost but well trained labor.

Planners estimate conservatively that more than 18,000 high technology jobs will be created in Georgia in the next 20 years, jobs which would not come to the state without the ATDC. Assuming that each new high technology position spawns one other job in a service-related occupation, the total employment increase will exceed 36,000. That adds up to an economic impact on the state of $1.7 billion annually by the year 2000. In the Center's first year of operation, the impact is expected to be $6.5 million, enough to pay back the initial ATDC investment. These figures reflect only employee income.

Nuclear control room computer system designed

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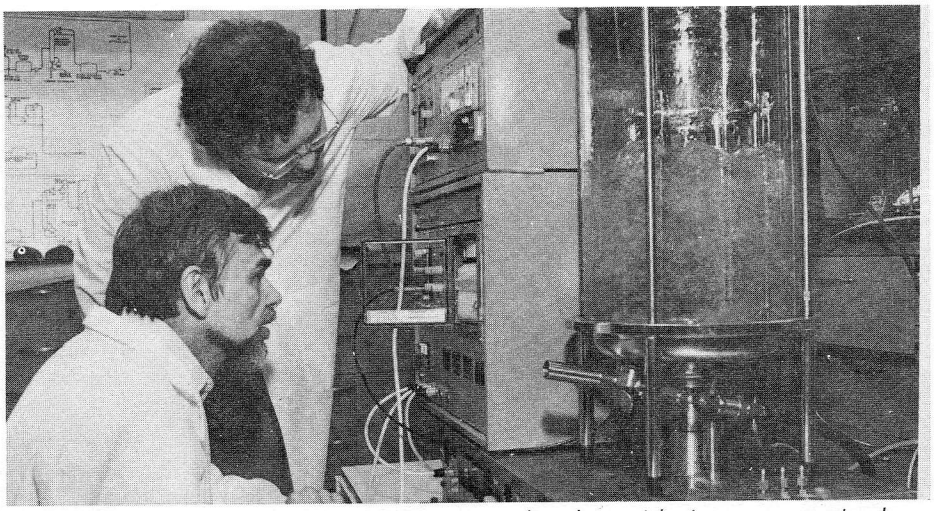
operators too fast in too many different forms," said Georgia Tech computer researcher Dr. James Mahaffey. "They don't know which data to trust and which to question. Computers could preprocess this information into more manageable form."

What are the dangers of the current system? As an example, Mahaffey cited the highly-publicized accident at Three Mile Island, Pennsylvania. He said the incident occurred when two reactor coolant valves were left closed after a routine maintenance operation because they were not included on a check list. If a computer had been monitoring the valves and had been programmed to check this condition, Mahaffey said, the incident probably would not have happened.

Computers always have been used in nuclear plant control rooms but usually in subsidiary roles. Plant operators have turned to them sparingly in emergencies because they doubted that computers were sufficiently reliable. Mahaffey accepts the validity of this criticism. He explained that most nuclear plants take years to build and that the originally specified commercial computer systems are obsolescent and no longer supported by the manufacturer by the time the plants they serve go into operation. He hopes to avoid these pitfalls by using military (mil-spec) computer designs developed for the U.S. military to produce a type of hardware which Mahaffey said is highly reliable and survivable.

The equipment defined by the military designs is relatively simple and neither exceptionally fast nor large. However, its specifications may be ideally suited for the nuclear industry's need for high dependability. This type of computer has few moving parts, can tolerate extreme temperature fluctuations, is built into a sealed box and can withstand high levels of external vibration, even earthquakes. The mil-spec version is expensive — it cost two to three times more than comparable commercial models — but Mahaffey believes the price is small to pay for improved safety in nuclear plants.



One of the most notable efforts in EES' energy research and material sciences program involves a chemical process for converting wood and other cellulosic wastes to ethanol, a fuel which can partially substitute for gasoline. Engineer Alton Colcord, left, and chemist Ron Roberts are investigating various cellulose feedstocks for ethanol production. The information they garner will be used in a new ethanol pilot plant to be built on the Georgia Tech campus.

Energy, materials analysis problems often interrelated

Energy conservation often involves broader considerations than the mere price of fuel. The bottom line cost of energy at an industrial plant also depends upon the quality and expense of fuel-burning equipment. For this reason, energy engineers need an intimate knowledge of alternate fuels as well as the materials from which energy-using systems are built. At EES, several laboratories focus their attention on the nation's energy problem. One of them, the newly organized Energy and Materials Sciences Laboratory, is emphasizing the interdependence of materials analysis and energy processes.

Energy research programs at EES already enjoy national recognition. Indicative of Georgia Tech's fine reputation in this field was the Department of Energy's decision to locate a major test site for solar energy experimentation on the Tech campus under EES supervision. Engineers at the Station have been pioneers in other areas of alternative energy research. Through one ongoing project, Tech will build and maintain a pilot plant to test an EES-developed process for converting wood materials into alcohol. At present, fuel alcohol is made from food sources such as corn. In another area, EES is making a valuable contribution to our country's political relations with Arab nations, by helping oil producing countries design solar energy systems in anticipation of the day when their petroleum supplies run out.

Materials sciences at Georgia Tech have been successful in such specialized fields as high temperature ceramics testing. But with the creation of the new lab, the Station hopes to build a more comprehensive materials sciences program which gains national stature.

The Station took a step toward reaching this goal last spring with the hiring of Dr. Hans O. Spauschus as director of these activities. Spauschus managed a large physical sciences lab at General Electric Company in Louisville, Ky., for 11 years before coming to Tech; he currently serves as vice president of the Scientific Council of the International Institute of Refrigeration. Recently, Spauschus was named director of the Energy and Materials Sciences Lab.

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EES REPORT

Mark Hodges — Editor

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EES conducting major course in EW software

Rapid innovations in electronics warfare technology since World War II have forced military planners in the U.S. to build defense networks with a high degree of adaptability. To provide the flexibility to meet continually changing threats, the Department of Defense relies on reprogrammable jamming systems which employ embedded digital computers. Since the integration of computer science and software engineering with electronic defense techniques is in a state of ongoing evolution, professionals in electronic defense need educational programs to stay abreast of the applications of computers in their work.

EES will play a key role in this educational effort in 1981. The Station is conducting several regional short courses on the topic "Electronic Warfare Software Principles" under the sponsorship of the Association of Old Crows (AOC), an 11,000 member group dedicated to the protection of the nation's security. The AOC is highly regarded by the Department of Defense and in recent years has become a focal point for airing new ideas in the electronic warfare field.

"This isn't just a minor short course," said EES Director Donald Grace. "The Department of Defense is very interested in this AOC program and Georgia Tech has put in a good deal of extra money and effort to help make the course a success."

EES electronics specialists will conduct the two and a half day seminar which was developed under the leadership of Robert Zimmer, director of the Station's Systems Engineering Laboratory. The course is designed not only for electronic warfare experts who need to enhance their knowledge of computer fundamentals but also for computer specialists in need of more background in electronic defense.

The first presentation of the short course was made at Ames Research Center near San Francisco, California, September 22-24. Plans are for the seminar to convene again sometime after Christmas at Point Mugu in Southern California. Later session dates and locations have not been set but they are expected to take place at sites in the Southeast, Northeast and Midwest.

In addition, an unclassified short course on electronic countermeasures will be given at Georgia Tech March 2-4, 1981. Further information about all of these courses is available from Robert Zimmer, EES/SEL, Georgia Institute of Technology, Atlanta, Ga. 30332. (Telephone: 404/894-3519).

Energy, materials analysis linked

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One of Spauschus' top priorities will be to avoid scattershot approaches to program development and adopt a more market-oriented strategic planning effort. "We're going to focus our technology," he said. "We've got a good base to grow from but we want to develop those areas which offer sustained long term growth."

Specifically, Spauschus plans to build a materials sciences division which does high-caliber work in high temperature ceramics, plastics, composites, thermo-chemical characteristics of heat transfer fluids, corrosion sciences, finite element analysis in prediction of structural failure, fracture mechanics, composite materials analysis and adhesive technology.

"We'll be seeking more industrial contracts," he added. "I think that our ability to give practical application to theory will be attractive to companies throughout the country. If we can achieve this, there'll be less peaks and valleys in the business side of our operation. Any time you're dealing with product-oriented companies, there's a greater chance of continuity of support than if all of your contracts are with government agencies. When a research group develops a cooperative program with a major corporation, prospects for a long-lasting relationship are excellent."

In the next few years at the Energy and Materials Sciences Laboratory, engineers in the materials sciences division will conduct many more tests while energy researchers will try to move the technologies they have developed toward the pilot plant stage.

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ENGINEERING EXPERIMENT STATION
Georgia Institute of Technology
Atlanta, Georgia 30332
(404) 894-3411
Dr. D. J. Grace, Director

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