

Station News

Georgia Tech Engineering Experiment Station

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Georgia Tech Lands Large Nuclear Power Project

In conjunction with the School of Nuclear Engineering, scientists in the Electronics and Computer Systems Lab (ECSL) have come up with an important computer application that will greatly enhance the safety and efficiency of nuclear power plants. They are designing a computer-driven system that not only will make it easy for the reactor operator to see at a glance how well the plant is running, but also will tell him what to do when anything goes wrong. At present operators have to deal with a bewildering array of data manually.

"The nuclear power industry in the United States has been very slow to adopt computer systems for primary plant control, although most plants do use computers in limited control and monitoring functions," says ECSL Project Director **Jim Mahaffey**. "The main reason is that standard commercial computers are not reliable enough — are too prone to break down under abnormal conditions."

"We are using components built to military specifications in our design," says Mahaffey, "because these computers can withstand earthquake shock, vibration, extreme temperatures, and other abnormal conditions that would cause commercial computers to fail. In addition, 'mil-spec' minicomputer systems are composed of small boxes weighing less than 100 pounds that are connected by cables. When a box does fail, it can be unplugged without the use of tools and replaced with a spare in less than 30 minutes. A final plus is that they are designed not to become obsolete for 10 to 20 years."

"Commercial reactor safety systems are usually built with redundant electro-mechanical relay devices. Consequently, the control room of a



This 1/4-scale model of the Safety Parameter Display System was built by ECSL to help its researchers and Georgia Power Co. engineers in planning and modifying the system design. Project personnel admiring the highly detailed model are (left to right): Tony Andruzzi, Jim Mahaffey (project director), Marcia Andruzzi (chief model builder), Amy Dean, Jeff Grover, Jeff Hopper, Bill Gaylord, Connie Foulke, Don Wyman, Ralph Petrie of ROLM Corp. (mil-spec equipment supplier), Casey Lang, Mike Witten, Dan Harris, and Mark Wilson. (Photo by Pat Stone)

nuclear plant looks like that of a battleship, with row after row of floor-to-ceiling dials and indicators. Keeping up with this huge, cumbersome array can overload the human capacity to respond quickly and accurately to incipient operational problems," Mahaffey explains. "Our system will condense or concentrate the data displayed so that it can be easily read at a central point. And it will display the data in a color video-graphic form that is more palatable to the human operator."

ECSL is designing this computer system for Plant Hatch, Georgia Power Company's boiling water reactor facility at Baxley. It will include a "Safety Parameter Display System" (SPDS) that will collect and display data on a set of plant operating factors that are essential to safety. Complementing the SPDS will be a more sophisticated

analysis system called OEDIPUS (Operational Envelope and Data Integrity for Power Unit Surveillance) that will advise on the course of action to take in case of trouble.

The Nuclear Regulatory Commission is requiring all nuclear power plants to install computerized Safety Parameter Display Systems as a result of the accident at Three Mile Island. Georgia Power has contracted with the Georgia Tech School of Nuclear Engineering to develop its SPDS, with ECSL doing the computer system design and engineering work. The U.S. Department of Energy has contracted directly with ECSL on the OEDIPUS project, which is expected to cost several million dollars over its three-year life span.

The OEDIPUS system will be tested and evaluated, using both simulator

(Continued on page 3)

Professional Activities Reported

ECONOMIC DEVELOPMENT LAB

Ed Hardison, Albany office, is in Korea for five weeks providing technical assistance to Korean firms.

Judi Komaki made a colloquium presentation at Purdue University and delivered an invited presentation at San Jose State University.

Safety & Health Services Branch news: **Jim Burson** spoke to the nursing staff at Doctors Memorial Hospital in Atlanta on "Occupational Safety and Health: New Noise and Hearing Conservation Standards." **William Spain** made a presentation to the Safety Advisory Committee of the Atlanta Public School System. The Branch presented a training course in occupational health for members of the Georgia Mining Association. An article by **Phil Williams** and **William Spain** entitled "Industrial Hygiene and the Arts: Hazards in Restoring *The Battle of Atlanta*" appeared in the April issue of *Occupational Health and Safety*. Williams has been named president-elect of the Georgia Section of the American Industrial Hygiene Association, and Spain was elected to the board of directors of that body.

ENERGY & MATERIALS SCIENCES LAB

Tom Elfe attended the Program Review meeting on "LoAds Transmitter Tube" at Hughes Electron Dynamics Division, Torrance, California, on March 18. **Bob**

Cassanova attended the Department of Energy Quarterly Review meeting in Washington, D.C., March 23-25. **Jim Hubbard** attended a workshop on "Asbestos Fiber Identification," sponsored by IBM and held at the IIT Research Institute in Chicago on March 22-23.

RADAR & INSTRUMENTATION LAB

Gene Greneker and **Mark Corbin** will present a paper on "Speed Timing Radar — New Methods to Quantify Accuracies Achievable under Various Target Conditions" at the Carnahan Conference on Security Technology to be held in May at Lexington, Kentucky.

RAIL will be well represented at the International Conference on Acoustics, Speech, and Signal Processing in Paris, France, this May. Presenting papers will be **William Holm** and **Jim Echard**, "FFT Signal Processing for Non-Coherent Radar Systems"; **Norberto Ezquerro** and **Linda Harkness**, "Applications of Pattern Recognition Techniques to the Processing of Radar Signals"; and **Bill Steinway**, Echard, and **Charles Luke**, "Locating Voids Beneath Pavement Using a Pulsed Radar."

TECHNOLOGY APPLICATIONS LAB

At the Georgia Tech short course on Societal Cost of Energy Alternatives, **Bill Bulpitt** lectured April 8 on "Detriments and Benefits of Increased Biomass Energy Use."

Research Communications Offers Varied Services

The new *EES Annual Report* has proved so popular that bids are being invited for a second printing. EES labs have found it to be an extremely effective contract marketing tool that describes the broad capabilities of the Station. The *Annual Report* is produced by the Research Communications Office (RCO), which assists the research programs not only at EES, but the academic colleges as well.

Here are some examples of the kinds of assistance available in direct services or publications or in arrangements for media coverage:

- **Capabilities booklets.** Work is under way on booklets for SEL, millimeter waves research, and the Microelectronics Research Center.

- **Technical magazines.** *Design News* just printed a feature, "Designing for the Disabled," suggested by RCO. *Military Electronics/Countermeasures* has accepted an RCO proposal for a story on the role of psychological sciences in enhancing our nation's electronic defense systems, based on work done by SEL.

- **Public print media contacts.** The Monday *Atlanta Journal-Constitution* carried a half-page story entitled "Tech Experiment Station Generates Praise in 40 Countries."

- **Broadcast media contacts.** The NBC-TV network covered the operation of a Tech-designed biomass fuel conversion unit at a Gold Kist plant in Valdosta.

- **News releases:** UPI picked up an RCO story from the *Atlanta Journal* business pages about Dr. Tom Tornabene, School of Biology, and his discovery of bacteria that produce hydrocarbons.

- **News conferences:** WSB-TV reported live from a conference on nuclear fusion at the Space Science building.

- **Slide programs.** Programs are now available on *Research at EES*, *Electronics Research*, *Research in the Resources Labs*, *The Industrial Extension Service*, and a number of other topics.

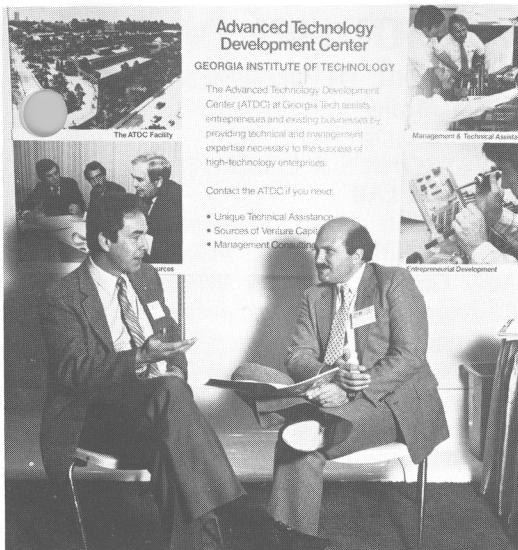
- **Exhibits.** RCO most recently assisted EMSL in preparing an exhibit on its work in solid waste disposal for industries and municipalities. The exhibit was shown at a national environmental sciences meeting.

- **Newsletters.** RCO publishes *EES Report* for external information and *Station News* for internal communication; it provides consulting assistance on other newsletters.

- **Graphics.** RCO is designing the new ATDC newsletter; it regularly provides art,



EES held its annual EW Program Review April 20-22, briefing representatives of the four services involved in EW activities on the results of current and recently completed research programs conducted by the electronics labs. SEL hosted the meeting, which originated in 1979 as a review of work done for the Air Force Wright Aeronautical Laboratories. Adding to the national prominence of the meeting was the presence of the Joint Technical Coordinating Group on Aircraft Survivability and Countermeasures. Here, Charles Ambuske, Air Force Program Manager for EW Techniques Analysis, is surrounded by EES personnel Gerald Carey (left), Lloyd Lilly (back to camera), and James Wiltse. (Photo by Charles Haynes)



Bob Schwartz (right) discusses high-technology industry with a visitor to the RCO-designed ATDC exhibit at TECH-EX '82. (Photo by Pat Stone)

design and layout aid on numerous EES publications.

- **Special projects.** RCO is assisting with efforts to bring a significant exhibit of ancient Chinese science and technology to Atlanta to kick off the Tech Centennial Observance in 1984.

- **Tours.** Most recent was a visit to EMSL by 100 attendees at a USDA conference on solar energy and biomass.

- **Contract information systems.** RCO coordinated publication of a directory of sponsored research projects, and work is in progress to design an information retrieval system that will provide a continuously updated master file of research projects. This should be a great help to research units for writing contract proposals.

For assistance and information, call **Ray Moore** or **Lee Hughey** at ext. 3444. Work is assigned on a priority basis. Labs ordinarily contribute a portion of the costs of publications.

Former EES Employee Gets High Post In Defense Department

Edith W. Martin, former director of EES' Computer Science and Technology Lab, has been appointed by President Reagan as Deputy Under Secretary of Defense for Research and Advanced Technology. She will oversee a budget of \$4 billion, 60,000 employees, 73 laboratories, and a broad research network.

Martin received her Ph.D. in computer science from Georgia Tech. As a member of the Radar and Instrumentation Lab, she was head of the Software Development Branch and chief of the Computer Science and Technology Division. The division achieved lab status in July 1979, and she served as its director until early 1980. Later that year, the lab merged with the Electronics Technology Lab to form the current Electronics and Computer Systems Lab. After completing her Ph.D., Martin left Georgia Tech in 1981.

Overflow Crowd In EDL Short Course

The Economic Development Lab, in cooperation with the Georgia Industrial Developers Association and the Southern Industrial Development Council, offered its 15th annual course in Basic Economic Development March 28-April 2. The course provides an introduction to the theory and fundamentals of economic development. It addresses an audience of persons planning to enter the development field and new professionals with public and private development agencies, such as chambers of commerce, public utilities, banks, and area planning commissions.

The course, a perennially popular offering, filled up quickly with 59 enrollees from 13 states, and applicants were turned away. Course director was **Bob Cassell**, a Tech retiree who is now executive director of the Southern Industrial Development Council. Cassell has directed the course since its inception. Lecturers from EES were **David Clifton** and **Bill Howard**.

EES Schedules Short Courses

May 25-27. *Supervision of Asbestos Abatement Contracts.* Directors — Jim Burson and William Spain (EDL).

June 3-4. *Poultry Processing Noise Abatement Workshop.* Faculty — Craig Wyvill (TAL).

June 15-17. *Computer Modeling of Electromagnetic Signatures.* Administrator — Harold Bassett (RAIL). Faculty will include members of RAIL's Modeling & Analysis Division.

June 30-July 1. *Case Studies in Occupational Safety and Health.* Director — Phil Williams (EDL). Faculty will include members of EDL's Safety & Health Services Branch.

Registration deadlines are usually ten days prior to the course starting date. For further information, contact Continuing Education.

Nuclear, Continued

studies to test its performance under realistic emergency conditions and actual experience with the system installed on one of the two live reactors at Plant Hatch. The operations of the two reactors — one with the advanced information system (OEDIPUS) and one with only the minimal SPDS — will be compared to see what improvements result from the installation. These studies will aid in the final design of the computer-driven system.

"Our work will definitely advance the state of the art in reactor safety system design," Mahaffey says. "I have long been interested in computer control of real-world systems, particularly in the application of 'mil-spec' computers to nuclear power plant control. Other countries, like Canada, the U.S.S.R., Germany, the U.K., Argentina, use computer-driven control systems — why shouldn't we? After all, the U.S. builds the best computers in the world."

By the way, there are two versions of the OEDIPUS: a modest system called OEDIPUS and an improved, expanded system called — what else? — OEDIPUS REX (Role Expanded). And of course, the space in which the system is installed is called the OEDIPUS Complex. Whoever said engineers don't have a sense of humor?

Did You Know That . . .

RAIL's research on using short-pulse radar to detect voids under concrete highways (see Jan. '82 *Station News*) is based on techniques for detecting buried land mines developed a dozen years ago for the U.S. Army Mobility Equipment Research and Development Command (MERADCOM)? Two current EES engineers, **Robert Wohlers** of SEL and **Hendrik Prinsen** of STL, designed and built some of the original antenna, transmitter and receiver equipment under a contract with MERADCOM while they were employed by the Calspan Corp.

Dedication Set For Solar Total Energy Plant

The world's first solar total energy system for an industrial plant will be dedicated on May 10 at Shenandoah, Georgia, about 25 miles south of Atlanta. And Georgia Tech scientists not only played a significant advisory role in its design and construction, but also will assume a lead role in monitoring and evaluating its operation.

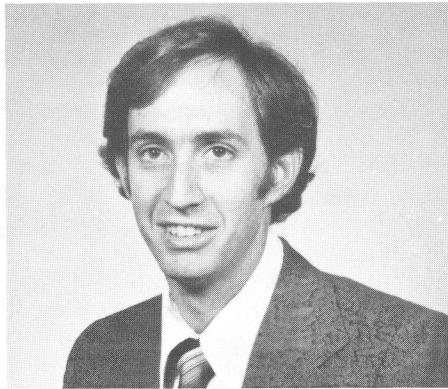
The \$28-million demonstration project is funded by the Georgia Power Company and the U.S. Department of Energy. It involves the design, construction, operation and technical evaluation of a solar energy system that will provide electrical power, process heat, and cooling to a knitwear factory operated by Bleyle of America, Inc. Georgia Power owns and will operate the system.

A five-acre field of 114 parabolic dish solar collectors, each 23 feet in diameter, will heat a silicone transfer fluid. This liquid, in turn, will super-heat steam to turn turbines that will generate electricity. Waste heat will heat and cool the plant and provide steam for clothes pressing. The factory's conventional power source will be used as a backup system for cloudy days.

Dr. **James I. Craig** of the School of Aerospace Engineering directs the Georgia Tech portion of the project, assisted by **Sheldon M. Jeter**, Mechanical Engineering. They set up a solar and weather data station at the site three years ago, and have been collecting and processing data ever since. The resulting insolation and meteorological profile was helpful in designing the energy system and will be useful in assessing the performance of the facility in the future.

Douglas M. Moore of EES' Technology Applications Lab has been working full time at the Shenandoah site since mid-January and expects to be there a year. He will monitor the system's performance, coordinating the work of the Tech graduate students and professors on the project.

Sandia National Laboratories is the government technical representative on the project, and General Electric is the prime contractor.



Doug Moore, TAL, is Tech's on-site monitor for the solar total energy project at Shenandoah.

ATDC Update

Cube Construction Inc. of Atlanta has been awarded the contract to build Phase I of the Advanced Technology Development Center, based on a low bid of \$2,364,224. Construction should be under way by the first of May and take about 14 months to complete. The Center will be located at the corner of Tenth Street and Greenfield, N.W.

The architects, Cooper, Carry & Associates, are preparing plans and specifications for Phase II. Bids probably will be let in July, with construction beginning shortly thereafter.

Phase I will comprise a one-story office structure connected by an atrium to a three-level building providing rental space to entrepreneurs. The Phase II facility will continue the rental space design of Phase I.

Congress Invites EDL Testimony

On March 24, EDL Director **David Clifton** and **Sherman Dudley** of EDL's Industrial Extension Division testified before the U.S. House of Representatives, Small Business Subcommittee on General Oversight, about the Georgia Productivity Center's experience with transferring technology and increasing productivity.

Their testimony was very well received. In fact, one participant recommended to the committee that, if they did nothing else as a result of the day's hearing, they should seek to implement the Georgia Productivity Center program on a national basis because it's precisely what small businesses need.

Personnel News

ECONOMIC DEVELOPMENT LAB

Jim Muller was married to Nancy Falkenberg on April 24.

ELECTRONICS & COMPUTER SYSTEMS LAB

Welcome aboard to research engineers **Bill Gaylord**, **Mike Witten**, **Amy Dean**, and **Clark Weeks**; **Steve Cathcart**, research scientist I; and **Melissa Ergle**, senior secretary.

New M.S.E.E.s are **John Daher** and **Larry Jackson** (Georgia Tech), and **Tony Andruzzi** (Auburn). Congrats!

Barry Cown is recovering at home from a March heart attack.

Mary Lou and **Jim Coleman** had a son, Charles David, on March 26.

ENERGY & MATERIALS SCIENCES LAB

Chuck Ray and **Les Henton**, Materials Sciences Division, have moved from Cobb County to the Emerson Building.

SERVICE GROUPS

Gerald Hill, Jr. is a new stores clerk II in Facilities Management.

SYSTEMS ENGINEERING LAB

Harland B. Armitage has joined the Flight Operations Group as a senior research engineer.

Sam Blankenship has transferred from EML to SEL. He and Brenda had a baby girl, Hannah, on January 19.

Nick Pomponio and Marianne Youngblood were married on March 13.

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