

the **GTRI** connector

Published monthly for employees of the Georgia Tech Research Institute

Volume 3 Number 6

April 1987

STL Designs Automated Antenna Testing System

A team in the Systems and Techniques Laboratory (STL) directed by Henry Cotten has successfully completed a two-year project to design an automated antenna testing system for the U.S. Army.

The antenna testing system provides automated data acquisition and analysis of antennas mounted on various vehicles. It was delivered to the Army during a four-week field trip to the U.S. Army Electronic Proving Ground in Fort Huachuca, Arizona, that culminated with acceptance testing on February 27.

The U.S. Army Electronic Proving Ground has operated an automated antenna measurement system to make hemispherical pattern measurements for several years. This facility had become inadequate in terms of frequency coverage, data processing, and measurement speed and accuracy. And only the azimuth motion of the test item was under computer command; the elevation location of the probe had to be positioned manually.

The range consists of a large wooden arch (75-foot radius) that is centered over a turntable. This configuration produces hemispherical pattern measurements on various targets, especially those too massive to measure on conventional far-field ranges.

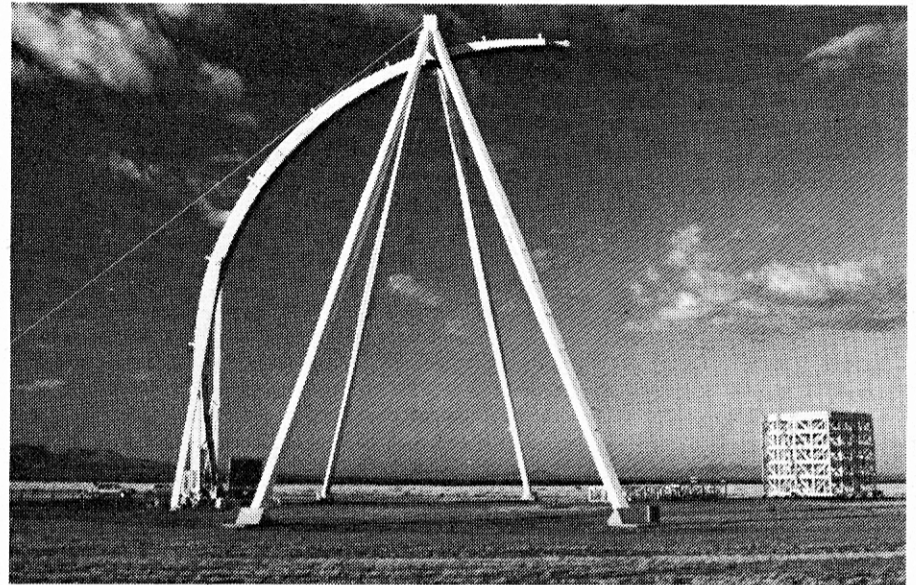
The system in use was an older one that no longer was completely fulfilling the Army's requirements. Although it performed the necessary functions

of data reception, reduction and analysis, the system could do them only in a serial manner, that is, only one process could be performed at a time. The upgrade provides for parallel operations to be performed and allows multiple users to access the system. Several other features, such as a larger hard disk, permit the creation of larger data bases.

The STL project was conducted in phases. The first phase included development of the software to run the system and procurement of the computers that do the data collection and analysis. Phase two involved equipping the range with new instrumentation and automating the elevation axis. STL currently is engaged in a follow-on phase that will utilize the same data acquisition system to operate a different type of range—a large outdoor compact range.

The contract value of phases one and two was \$1.8 million. Phase three will total \$6.75 million, of which \$1.8 million has been funded to date.

Project staff members, besides Cotten, include William Bagwell, Ava Brush, Ricky Cotton, John Estes, Mark Fisher, Connie Green, Mark Hudgens, Butch May, Scott McBride, Cindy Milum, Henry Morgan, Jo Ann Nelson, Dana Robinson, David Rodman, Frank Sawyer, Charlie Sheets, Luther Ward, and Tony White.



STL engineers designed a new automated antenna testing system for the "arch" range at Fort Huachuca, Arizona (above). The arch has a 75-foot radius and is centered over a turntable. STL developed the software, procured the computers, and equipped the range with new instrumentation. The photo at left shows installation of the drive mechanism. (Photos by Henry Cotten)

Solar Research Program Boasts Multiple Achievements

by Martha Ann Stegar, RCO

The Energy and Materials Sciences Laboratory (EMSL) has shifted its solar energy research to solar-unique processes and has come up with several technological breakthroughs along the way.

EMSL engineers are currently using the Georgia Tech solar furnace, which concentrates light to the intensity of 9,000 suns, in their search for processes that can be achieved only with the concentrated flux of sunlight. These processes utilize photon (light) energy as well as thermal energy.

"We have already come up with several unique, patentable materials or processes," reports

lab associate director Dan O'Neil, who manages the DOE Solar Thermal Advanced Research Center at Tech. "They include single crystals of ultra-high strength and purity called 'ceramic whiskers' and new types of carbon and graphite fibers." O'Neil can't go into detail about these new materials because they are not yet protected by patents.

The ceramic whiskers are made by chemical vapor deposition (CVD). Jack Lackey is decomposing volatile ceramic material in a solar furnace to form the whiskers, which are used to reinforce composites.

CVD is a new research area for EMSL. Lackey also is using this technique to deposit anticor-

rosion coatings on metal, to produce extremely fine and pure ceramic powders, and to fill the pores in ceramic preforms. He is experimenting with CVD as a method of laying down new materials required as substrates for the new high-speed microchips.

"We're also attempting to modify the crystalline structure of existing materials by means of concentrated sunlight," O'Neil adds. "The first materials we are looking at are carbon-carbon composites, where carbon is used in both the matrix material and the reinforcement. These composites are extremely hard and durable materials used in high-temperature aerospace applications such as missile nose

cones, rocket nozzles, and advanced brake systems."

EMSL scientists are investigating the possibility that new high-temperature forms of carbon called "carbynes" are produced by solar radiation. Carbynes reportedly have been discovered in meteorites. They are as hard as diamond, with high resistance to fracture, wear and thermal shock, and very light in weight.

Prospects for further breakthroughs can be significantly enhanced by an ultra-high-flux solar furnace which has been designed by Tom Elfe to concentrate solar energy to the equivalent of 25,000 suns at a single spot.

See "Solar," page 3

Hazardous Material Control and Emergency Response Course Trains People to Save Lives

by Carrie Stikeleather, EDL

Livingston TN: A railroad tanker car blows up, taking most of the town with it. **Bhopal, India:** A chemical plant leak leaves 3,000 dead. **Miamisburg OH:** A train derailment and chemical spill injures 200—17,000 evacuated. **Atlanta GA:** A tank truck overturns on the Interstate, releasing hundreds of gallons of flammable chemicals. Three catastrophes and one potential disaster—all examples of the serious threat posed by the transportation of hazardous materials.

More than 5 million chemicals have been catalogued, with new ones added every day. The fraction of those that are classified as hazardous range from such familiar materials as gasoline and kerosene to exotic ones like methyl isocyanate, the chemical involved in the Bhopal disaster.

Although the Department of Transportation and other federal agencies offer specific guidelines for dealing with incidents involving hazardous materials, such incidents are usually complicated and frightening, and their safe handling may require special training or equipment. Even emergency personnel who are well-trained to handle everyday problems may not know what to do when an unusual disaster strikes. And the consequences of not knowing what to do can be devastating.

According to Georgia Tech's Hazardous Materials Group Leader, Dr. John C. Nemeth, help is at hand. To help alleviate some of the dangers posed by the ever-increasing use of hazardous chemicals in industry and their transport, EDL's Environmental, Health, and Safety Division has developed a Hazardous Material Control and Emergency Response course. The five-day course (offered for the first time in September 1986) is designed to train firemen, police, paramedics, environmental scientists, and industrial emergency personnel to properly protect themselves, others, and the environment if an incident involving a hazard should occur.

Course topics feature emergency medical treatment of contaminated victims, hazardous material containment, patching and stabilization of leaks, treatment of hazardous material release, and decontamination.

Hands-on training and demonstrations include the decontamination process, tractor-trailer tank stabilization, railroad tanker patching, and hazardous material recovery.

In a simulation exercise, each class organizes its own Emergency Response Unit and responds to a simulated hazard such as a chemical spill.

The next course is scheduled for May 18-22 at the Cobb County Research Facility. Says assis-

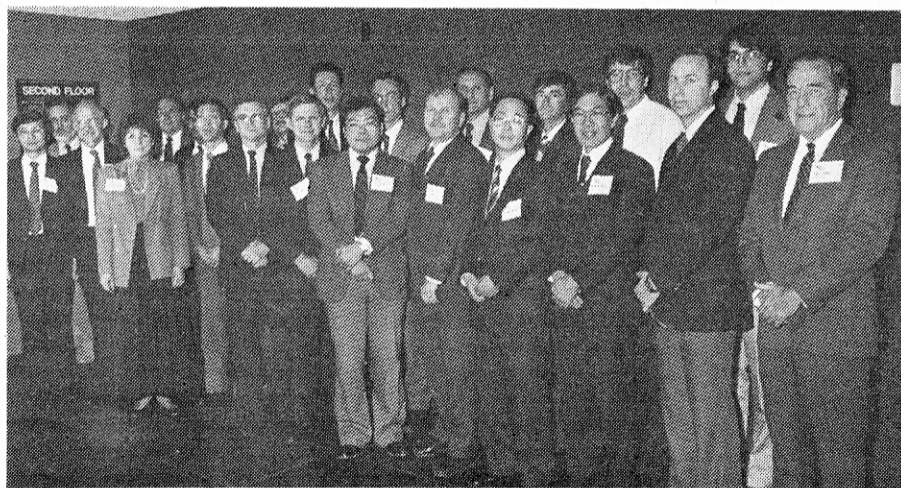


Participants in EDL's new Hazardous Material Control and Emergency Response Course get to practice what they learn in a simulation exercise. Above, a tanker truck emits a cloud of "noxious" gas. At left, the man in the center is being "decontaminated" by emergency response workers. (Photos by Steve Pike)

tant course director Kevin Kamperman, "Every day people are being injured or killed and the environment is being contaminated because of incidents

involving hazardous materials. The purpose of our course is to train people to safely manage the hazards of today's world."

Zeolite Program Clients Attend Technical Meeting



EMSL hosted the second annual technical meeting for member companies of Georgia Tech's Molecular Sieve and Zeolite Research Program on campus March 19-20. Here, participants pose for a group photo. (Photo by Anita Edwards)

Representatives of nine member companies of Georgia Tech's Molecular Sieve and Zeolite Research Program were briefed on research progress and helped plan future research objectives at a technical meeting on campus March 19-20. A tenth firm joined the program too late to attend the meeting, which is held annually.

The companies, each of which pays \$20,000 a year to belong to

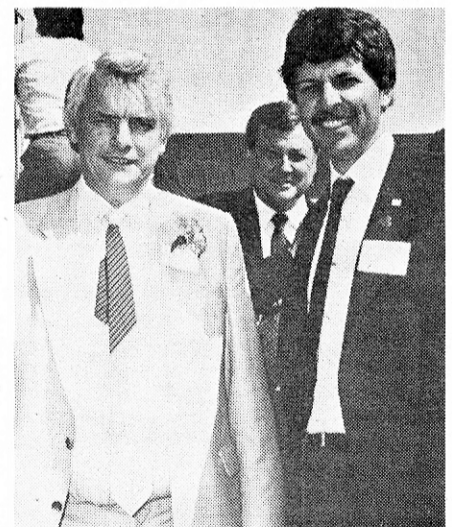
the program, comprise five American firms—Catalytica, Goodyear Tire & Rubber, Phillips Petroleum, Tenneco and Texaco—and five international firms—Akzo Chemie (Netherlands), Rhone-Poulenc (France), Toray (Japan), Toyo Soda (Japan), and Laporte (England). The program is administered in the Energy and Materials Sciences Laboratory and has been in place about 2½ years.

The first day was a technical meeting with presentations by Georgia Tech researchers and by four of the member companies.

On the second day, each company and Georgia Tech presented their recommendations for research direction for the next three years, and a consensus recommendation was reached.

"We agreed to emphasize synthesis of new molecular sieve crystal structures and compositions with potential applications as catalysts and adsorbents," said Dr. Tudor Thomas, director of the Molecular Sieve and Zeolite Research Program.

"A significant aspect of the meeting was the participation of our students who work in the program," said Dr. Rosemarie Szostak, the program's chief scientist. "Those making technical presentations included graduate students Vinayan Nair and Jeffery Brinen, undergraduate student Ritesh Kuvadia, and post-doctoral fellow Dah-Chung Shieh."



Cordele will have a new dry and cold storage warehouse employing 100-150 people, due in part to an EDL economic study in which researcher John Warden reported that demand for such a facility in south Georgia exceeded existing warehouse space. EDL Director David Clifton (right) is shown here at the groundbreaking with one of the principal investors, Peter Queally of Ireland. Local leaders hope the business will serve as a magnet for food producers and processors in south Georgia and north Florida. The EDL research study was conducted under a Tech economic development research program started last year, with funding from the Governor and the General Assembly, to help Georgia communities attract industry. (Photo by Dawn Taylor)



The new Emory-Georgia Tech Biomedical Technology Research Center held its inaugural convocation March 20. Shown left to right are Dr. John Basmajian, consultant in the Office of the Vice President for Research (Georgia Tech); Jim Toler, chief of ECSL's Biomedical Research Division and co-director of the Georgia Tech Bioengineering Center; and Dr. John Watson of the National Heart, Lung, and Blood Institute. Dr. Watson gave the keynote address, and Toler also was one of the speakers. (Photo by Margaret Barrett)

Solar (from page 1)

EMSL also has found innovative ways to maintain and improve the facilities used in its solar research. Paul Mackie has modified an experimental solar furnace to reorient the mirror field from horizontal to vertical. He and Tom Brown (now in STL) have developed a point-focus camera to realign the mirror field of Georgia Tech's 550-mirror solar thermal facility. The camera scans the field and provides feedback to a control system so that proper corrections can be made. EMSL has proposed to NASA that it be used in space.

GTRI's patented molecular monolayer deposition process for improving the anti-fouling

characteristics of separatory membranes is being applied to the solar arena in a task headed by Lois Speaker. EMSL is adapting the process as an anti-fouling treatment for heliostat mirrors made of plastic film. Aluminized polymer mirrors are cheaper than glass. Unlike glass, however, plastic normally attracts and holds dirt, and won't wash clean. EMSL scientists are designing and developing an anti-sticking chemical layer to treat the surface and to alleviate this problem.

O'Neil foresees a whole new spectrum of solar-unique materials and processes. "The ultimate application of several of the processes may be for manufacturing in space," he says.

RAIL Celebrates Decennial

On March 27, the Radar and Instrumentation Lab celebrated its tenth anniversary. RAIL was officially 'born' March 1, 1977.

Lab Director Ed Reedy opened the celebrations with a brief history and some highlights:

- RAIL's early, rapid growth from 115 to 220 employees which resulted in new labs being formed from RAIL, for example, the Computer Sciences and Technology Lab which was later reorganized into ECSL.
- Development of the longest running and most successful short course at Georgia Tech (in dollars generated and attendance), "Principles of Modern Radar."
- Move of the major portion of RAIL from the campus to Cobb County in November 1978.
- Establishment of a field office in Fort Monmouth, New Jersey, in 1983.

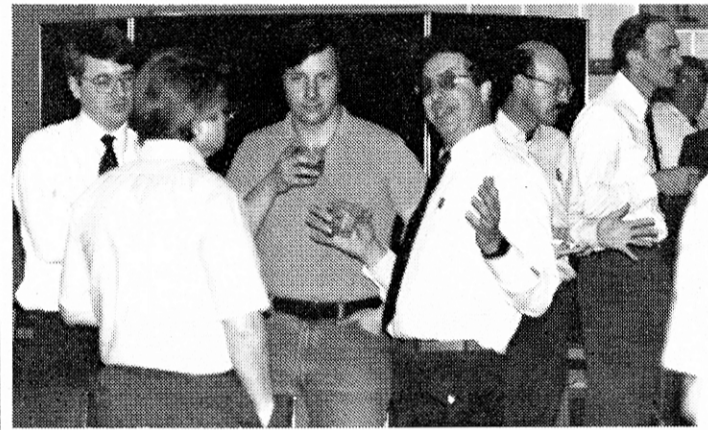
- Formation of several spin-off companies: Gulf Applied Research, Pulsetek, and AEI/ESI.

Nick Currie gave a slide presentation showing RAIL's worldwide activities. RAIL has done research in Canada (Toronto and the Arctic Circle), St. Croix (Virgin Islands), Hawaii, Kwajalein in the South Pacific, France, Germany, Australia, and Japan.

Bob Trebits showed a humorous film depicting the trials and tribulations of many employees who have taken part in field operation trips over the decade.

Employees who were in RAIL at its inception, and who are still working in the Lab, were introduced—along with former RAIL employees now in other GTRI areas or working at other companies.

Jerry Eaves was the lucky winner of the slogan contest. His entry was "The RAIL Thing!"



Toasting RAIL's first decade of existence at the Decennial Celebration on March 27 are (L-R) Sam Piper, Powers Garmon, Ben Perry, Bob Trebits, Jeff Holder, Ross Gagliano, and Ray Eford. (Photo by Marvin Cohen)

Ninth Task Team Appointed

A ninth task team has joined the eight others that recently began examining GTRI's various work and procedural systems in search of greater cost effectiveness. The new Organizational and Policy Effectiveness Task Group has organized with Jim Scheer (RAIL) as leader. Other members are Jim Gallagher (EML), Larry Holland (SEL), and Herndon Jenkins (ECSL).

"Many important functions and operational aspects of GTRI's activity are not directly addressed by our more formal systems," said GTRI Associate Director Howard Dean. "Instead, they are addressed through our management and organizational structure, as well as our policy-derived guidelines. It is these non-procedural fundamentals that this team will assess."

PROFESSIONAL ACTIVITIES

ECONOMIC DEVELOPMENT LAB

John Nemeth spoke on the recycling of hazardous wastes at the Georgia Department of Community Affairs—Southeastern Recycling Conference on April 3.

Claudia Huff made a presentation on stress management to the Atlanta section of the Society of Women Engineers on March 24.

On March 10, Chuck Ross spoke on "Georgia Tech's Energy Integrated Dairy Farm" at the Georgia Cogeneration Society meeting in Atlanta.

GTRI's first "Introduction to Machine Vision" workshop was given by Costa Soulakos and Chris Thompson April 3 in Atlanta. It drew some 20 participants.

David Clifton spoke on "Georgia Tech: A Century of Service" at a regional seminar in Orlando April 27-28. The seminar, titled "The Higher Education-Economic Development Connection: Making the Partnership Work," was sponsored by the American Association of State Colleges and Universities, SRI International, and the National Association

of Management and Technical Assistance Centers.

On February 2-6, David Chatham, educational coordinator in the Macon office, attended the American Society of Engineering Education Annual College/Industry Education Conference in Orlando, where he was especially active in discussions on the "open" site concept for the AMCEE/NTU network.

The March issue of *Building Operating Management* featured an article on "Weighing Dual-Fuel Options" by Doug Moore.

ELECTROMAGNETICS LAB

Abbas Torabi presented a paper entitled "Photoluminescence Studies of Coupled Quantum Well Structures of the AlGaAs/GaAs System" at the International Society for Optical Engineering Conference on Advances in Semiconductor Structures, held in Baypoint (FL) March 23-27.

ELECTRONICS & COMPUTER SYSTEMS LAB

Jim Mahaffey presented a paper, "On-Line Testing Techniques for Real-Time Program Development," at the Fourth European ROLM Users

Group Conference in Garmisch-Partenkirchen, West Germany, held February 25-27.

ENERGY & MATERIALS SCIENCES LAB

Hans Spauschus presented an invited paper, "Characterization of Failure Mechanisms—Key to Productivity," at the 1987 American Society for Metals International Conference on Reliability in Los Angeles on March 25.

OFFICE OF THE DIRECTOR

Lanny Feorene was an invited speaker at the Manufacturing Management Conference held March 24 in Atlanta in conjunction with Southcon.

RADAR & INSTRUMENTATION LAB

Principles of Modern Radar is a newly published book which is an outgrowth of RAIL's highly popular and big money-making short course by the same name. The book is edited by Ed Reedy and Jerry Eaves.

SYSTEMS ENGINEERING LAB

Bud Sears will represent GTRI at an Electronic Warfare Symposium in Tokyo, Japan, and will speak on "The Role of Modeling and Simulation in the Development, Testing, and Employment of Electronic Combat Resources." The objective of the

symposium, sponsored by Sogo Electronics, Inc., is to expose a cross section of Japanese government and industry to EW.

Chris Fowler has earned his MBA from Georgia State University.

SYSTEMS & TECHNIQUES LAB

GTRI will host a meeting of the Electronics, Communications, and Computer Resources Panel of the SDIO Civil Applications Advisory Committee at Georgia Tech on April 29-30. STL Director Charles Watt is a member of the advisory committee and chairman of the panel. The meeting will feature presentations on SDI developments and related technologies by Georgia Tech researchers, Army Missile Command SDI program managers, contractors, and others.

Pat Burns presented a paper entitled "Some Novel Concepts for Antenna and RCS Measurements" at the Fifth International Conference on Antennas and Propagation, held March 30-April 2 at the University of York, United Kingdom.

Susan Williams and Larry Corey presented a paper entitled "An Aperture Projection Method for Sidelobe Analysis of Uniformly Illuminated Planar Phased Array Antennas" April 7 at IEEE Southeastcon in Tampa.

PERSONNEL NEWS

ECONOMIC DEVELOPMENT LAB

Delora Gould is a new senior secretary with the Asbestos Group.

Patricia Parkhill joined the Augusta Regional Office as an RE I.

The following have resigned their administrative secretary positions:

Pam Ford, Augusta Regional Office; **Melissa Merritt**, Gainesville; and **Delorise Music**, Brunswick.

ELECTROMAGNETICS LAB

Huntsville Operations: The staff of the Huntsville Operations welcomes **Dr. John F. Stalnaker**, SRS, to work in the aerodynamics technical area. He comes to GTRI from Lockheed Missiles and Space Company, where he was a group leader in computational methods, developing fluid and mechanical codes. He is a graduate of West Virginia University and Louisiana State University.

Welcome also to **Dr. Barry D. Bullard**, RE II, who will work in the HAWK technical area. He previously was an associate professor of engineering at the University of Central Florida and a senior radar systems analysis engineer at Martin-Marietta Aerospace. He is a graduate of Southern Technical Institute, Georgia Southern College, and Florida Institute of Technology.

And welcome to **Robert H. Carnesi, Jr.**, RS I, another addition to the aerodynamics area. He is a recent graduate of Tulane University.

Other new hires include **Jeff Griffin** and **Jenny Coons** as data collection specialists.

Promotions this year go to **Dana Bailey**, senior secretary, and **Paula Ferguson**, word processing specialist.

Artificial Intelligence Branch: The AI Branch welcomes **Stefan Roth**, RS I, and **Patricia Altman**, software license coordinator. Roth will continue developing Georgia Tech's Generic Expert System Tool (GEST), and will be involved in route planning and image processing contract work. He was a student assistant and GRA in the AI Branch for 2½ years, and received his master's in ICS from Tech in December 1986.

Altman will coordinate the sale of GEST licenses to the rapidly growing government and industry market. She received an associate degree in computer science from Lake City Community College and is currently pursuing a bachelor's degree in management from Georgia Tech.

ELECTRONICS & COMPUTER SYSTEMS LAB

ECSL bids good-bye to **Tim**

Simerly of CSD and **David Hicks** of EED.

ENERGY & MATERIALS SCIENCES LAB

EMSL/OD welcomes **Dr. E. Henry Chia**, principal research scientist.

OFFICE OF THE DIRECTOR

Carolyn Mahaffey has transferred from ECSL to become a member of OOD's Research Operations Analysis/Modeling Group.

RADAR & INSTRUMENTATION LAB

RAIL's New Jersey office has dropped the designation "NCTR" and will now be known as the Fort Monmouth Office (FMO).

Welcome to co-op **William Gunn**, a junior majoring in EE, and **GRA Scott Hrastar**, who recently received his BS from Ohio State.

SERVICE GROUPS

Herschel Brown has resigned from the Research Communications Office.

SYSTEMS ENGINEERING LAB

The March Employee of the Month is **John Scholz** of the Concepts Analysis Division (CAD). He was cited for not only bringing in follow-on work, but also establishing a funding vehicle with a new sponsor with a potential cap exceeding \$2 million.

Anne Copeland has been appointed associate head of the Mission Analysis Branch of CAD.

Daniel Weir has joined the Countermeasures Development Divi-

sion (CDD) as an RE II. He has a BSEE from Georgia Tech and an MSEE from the University of Central Florida. Also joining CDD is co-op **Donald Jason Collins**.

Sherri Thurmond is a new student assistant in the Defense Systems Division.

Marti Boyce has resigned.

SYSTEMS & TECHNIQUES LAB

STL welcomes **James P. Jacobson**, RE I; **Dean G. Blockowitz**, student assistant; and two former STL co-ops: **Kenneth A. Oberkofler**, electronics specialist, and **Glen D. Hopkins**, RE I.

Marvin R. Hill, Jr. was promoted to research technologist I (not research technician as reported last month).

Personal Notes

EDL: **Tim Beck** was married to the former **Susan Trees** on March 21.

EMSL: A speedy recovery to **Tom Elfe**, who had gall bladder surgery March 26.

ECSL: Congratulations to newlyweds **Peggy Cloninger** and **Paul Glass**, an ophthalmologist. The couple honeymooned in Hawaii.

RAIL: Congratulations to **Cece Edwards** on her recent marriage. Her new last name is **Hedrick**.

Congratulations also to **Powers Garmon** on the birth of a daughter.

Mintz and Ramunno Hang up Hats



Ann Mintz (left) and Dee Ramunno will retire April 30. (Photo by Margaret Barrett)

Ann Mintz and Dee Ramunno are retiring April 30, and GTRI will never be the same.

Dee Ramunno came to Tech 11 years ago to be the administrative specialist for Dr. Donald J. Grace soon after he assumed the directorship of EES (now GTRI). Her various administrative responsibilities gave her a front row seat during a period of exciting growth and change for GTRI.

Previous positions included selling commercial and residential real estate, court reporting, and an administrative position with a nationwide firm which originated the idea of brokering the sale of newspapers and radio and television properties.

"My years at Tech have been interesting," she says, "but now I'm ready to relax and enjoy life." Her plans include lots of golf and travel, two of her favorite pastimes, as well as visiting her children and grandchildren. She and her husband, Tony, also will enjoy their soon-to-be-

built second home in New Port Richey, Florida.

Ann Mintz retires after 32 years of service at EES/GTRI. She was hired by the old Radar Branch in 1955 as a technical assistant doing data analysis on a sea clutter study (Project 157). She was promoted to research technician in 1967, and went to work for Fred Dyer constructing and assembling printed circuit boards. "We were the first at Tech to use printed circuit boards," she says.

She was called upon many times to use her considerable secretarial skills, and worked for many of the leading researchers and administrators in EES/GTRI—always in electronics. For the last 10 years, she has been senior administrative secretary to GTRI Associate Director Jim Wiltse.

Ann is considering several possibilities for her retirement years, but children and grandchildren loom large in all her plans.



Software Review

by Pat Mathiasmeier, CRSD

One of the newest courses offered in the CRSD Training Facility is **Freelance Plus**, a graphics package from Lotus for reports and presentations. **Freelance Plus** can produce word charts, graphs, forms, signs, newsletters, line drawings, logos, organizational charts, freehand drawings, and automatic charting from Lotus 1-2-3 or Symphony data.

Freelance Plus has a user command interface similar to that of Lotus 1-2-3. It should feel familiar to most 1-2-3 users and is far easier to use than most business graphics packages. Context sensitive help screens provide help on-line.

A symbol library of pre-drawn objects is available. Sixty-four subject libraries contain up to 20 items each, such as maps, text boxes, computer components, office furniture, and in-

ternational traffic icons.

Pre-defined word chart templates can be used to create bullet charts, paragraph-style charts, or many other types of word/text slides. ASCII text files created by word processing software can be imported into **Freelance Plus** and combined with any of the graphic elements.

With the automatic graphing feature, common charts such as pie, bar, line, and scatter/XY can be generated from data. Data can be entered from the keyboard, or imported from 1-2-3 or Symphony spreadsheets, or from dBASE files. These charts can be edited to change the size, color, shape, font, or fill pattern. They also can be merged with text symbols, diagrams, drawings, graphs, or maps created in **Freelance Plus** or furnished in the symbol library. Graphs created in 1-2-3, Symphony, or Graphwriter also can be imported and edited.

Freelance Plus runs on an IBM PC, XT, or AT with 364K memory. A wide variety of output devices are supported. **Freelance Plus** drawings can be routed to laser and dot matrix printers, the Polaroid Palette and Matrix cameras, several plotters, and the Videoshow 150 and 160.

the GTRI connector

Published monthly for employees of the Georgia Tech Research Institute

Vol. 3 No. 6

April 1987

Editor

Martha Ann Stegar, RCO 4-6988

Associate Editors

Dee Ramunno, OOD 4-3401

Lincoln Bates, EDL 4-6091

Gail Tucker, EML 4-3500

Joann Ward, ECSL 4-3542

Ginny Myers, EMSL 4-3678

Maggi Harrison, RAIL 424-9621

Bill Williams, SEL 4-7250

Vickie Fennell, STL 424-9611

Pat Mathiasmeier, CRSD 4-2416

Charles McCullough, Services 4-3445

Published by the Research Communications Office, Centennial Research Building, Georgia Institute of Technology, Atlanta, GA 30332. Georgia Tech is a unit of the University System of Georgia. Typesetting and printing by Walton Press, Inc., Monroe, GA. The deadline for submission of copy is the first Tuesday of each month.