

# The GTRI Connector

## Never be afraid to say:

- "I don't know."
- "I made a mistake."
- "I'm sorry."
- "I need help."

Source: *Hope Health Letter*, The Hope Heart Institute, Seattle, WA—quoted in *communication briefings*, March 1992.

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## Tech bats 1000

By Martha Ann Stegar, RCO

**"Z**ero deficiencies!" an elated Bob Lang exclaims.

This month, Georgia Tech accomplished a remarkable achievement: In a rigorous, week-long unannounced inspection by the Defense Investigative Service (DIS), seven government inspectors were unable to discover a single deficiency in the way Tech employees carry out security procedures or in their knowledge of security requirements.

"We have come so far in the last three to four years," Lang says. "A few years ago, we were cited with more than 30 deficiencies. I don't think we've ever had zero deficiencies before, and certainly, it's unheard of with an unannounced inspection!" A defense contractor usually is given 30 days notice before a semiannual inspection.

"But zero deficiencies are not the culmination of our efforts," Lang adds. "It's just the start. We're at the brink of a whole new era in security. This means we're no longer in a corrective mode—we're in a proactive mode. Now DIS can become more responsive to our suggestions and recommendations on alternative methods to get the same result."

Georgia Tech is one of the largest defense contractors in the Southeast, and certainly the most diverse. "We deal with practically every agency that subscribes to the *Industrial Security Manual*, as well as other government agencies with security concerns. We perform a broad spectrum of services for sponsors as varied as the Army, Navy, Air Force, FBI, Department of Justice, and Department of Agriculture," Lang points out.



Lang says DIS "went over us with a fine-tooth comb. They searched everywhere and interviewed close to 50 people in a random selection. Not one showed a lack of knowledge of correct procedures," Lang says proudly.

"Our diversity makes it harder to achieve a perfect score," he comments. "It's relatively easy for a small contractor, or one with only one large program." He says that the Department of Defense recognizes that Tech is different from other contractors, but that its defense posture is as high or even higher.

A security inspection is essentially an audit of security procedures carried out by people working on classified projects. DIS concentrated on programmatic reviews this time, according to Lang. The inspectors interviewed everyone related to a project at every stage from proposal to final deliverables.

"All the interviews were positive," Lang says. "In years past, there was some evidence of a 'we vs. they' attitude. Now all the comments reflect a feeling that Security is part of the project team."

Lang credits Tech's success to the people actually doing the work. "It's the security knowledge and awareness of the people out there," he says. "The Research Security staff

does a great job—that's what we are trained to do. But we're here support the research employees."

Security education is the key, Lang feels. His office has been emphasizing that through publications like the *Buzz Session* flyers and the *Security Blanket* newsletter, seminars, and individual laboratory sessions. "We want to have more specific briefings focusing on individual labs, projects and problems," he says.

He feels that people respond favorably when someone explains why a certain procedure must be followed. "And we try to convey to them that if they know a better way to do something, tell us—this is a team effort, and all of our collective experience and expertise will make us a winning team. After all, the *Industrial Security Manual* is a guidebook, not law. All our sponsors want is for us to fulfill the intent of the manual."

Lang stresses: "Our people knowing what to do and say is the driving factor. Research Security is only the facilitator—it's the people out there who make it work." □

## U.S.-Russian exchange results in agreements to explore joint venture possibilities

By Lea McLees, RCO

**V**isits between GTRI and Russian colleagues in radar development and applications are resulting in agreements to explore new applications of Russian radar technology.

One "protocol of intention" has been signed by the Georgia Tech Research Corporation (GTRC) and a Russian company, Antei

*Continued on page 2*

**"Zero deficiencies are not the culmination of our efforts. We're at the brink of a whole new era in security. This means we're no longer in a corrective mode—we're in a proactive mode. Now DIS can become more responsive to our suggestions and recommendations on alternative methods to get the same result."**

— Bob Lang

## Observed & Noted

Georgia Tech may gain access to some technologies it has never had before through a set of agreements now being negotiated between GTRC and a Russian company. *Read about it on pages 1 and 2.*

GTRI presented a draft of its Strategic Plan to Georgia

Tech officials on February 20. *See page 2.*

Vic Tripp and Johnson Wang have formed a company to market the innovative spiral-mode microstrip antenna they have developed. *Details are on page 3.*

More than 100

GTRI employees are working on advanced degrees—most of them at Georgia Tech, but some at other schools. This month we profile Rae Adams—an unlikely graduate student pursuing an unusual degree in an unconventional program—on pages 4 and 5.

GTRI is completing a Quality Assurance Plan that will satisfy the minimum requirements imposed by the Department of Defense. Milton Bennett tells about it on page 6.

Also on page 6 are tips on improving visual aids to

achieve greater impact on your audience.

GTRI volunteers, led by Wiley Holcombe, helped stage a Toothpick Bridge Building Event for Atlanta-area school children in February. *Story and pictures on page 7.*

All three intramural teams fielded by ESML made it to the playoffs in the season just ended. *Details and pictures are on page 8.*

Which GTRI staffer is the mother of a multiple Grammy award winner? *You'll find her name on page 8.*

Georgia Tech  
RESEARCH INSTITUTE

## News & Notes

### GTRI Vision

*"It is the vision of the Georgia Tech Research Institute to become the premier university-based research institute in the nation. This encompasses national leadership in the quality of applied and basic research for industry and government sponsors, as well as the highest quality service programs which support economic development in the State of Georgia. This statement is fully supportive of the Georgia Tech vision to become the nation's premier technological university. The achievement of these joint goals will be enhanced by collaborative research with academic faculty, supervision of doctoral student research, and origination of new academic courses within institute programs."*

*(From the GTRI Strategic Plan)*

### Russian

From page 1

Corporation, and another is being prepared, according to Larry Corey of MATD. The protocols simply state that Georgia Tech representatives will explore whether research sponsors are interested in certain applications of Russian technologies, and Antei will respond to what Georgia Tech learns, Corey said.

"For example, we would try to get sponsors to consider the possibility of using Antei radar technology. If sponsors were interested, Antei would supply the technology and Georgia Tech would help with the testing and modification," he explained.

The agreements are only pledges of effort—there is no guarantee that technology exchange will result, Corey cautions. However, they are a first step toward joint technological ventures between the United States and Russia.

Progress toward the agreements began when Corey and George Ewell of TSDL traveled to Russia in November 1991 to hear from that country's scientists, researchers and engineers on technologies available for export. Eleven U.S. representatives made the trip sponsored by OTI/NTI, Inc., a joint venture by U.S. and Russian companies.

Then in early March, Russian radar specialists Dr. Veniamin Efremov and Iosip Drize visited Georgia Tech to discuss opportunities for corporate ventures, at the invitation of Corey and Ewell. Efremov, constructor general of Antei Corporation, is the chief designer of the TOR and SA-8 surface-to-air missile systems. He has worked with airborne radar and heads an organization of at least 100,000 people. Drize, Efremov's assistant, has been instrumental in production and development of the TOR radar system.

The TOR system is the subject of the already signed protocol. An inexpensive, effective radar technology, developed 15 years ago to protect Russian civil and battle targets, it has the range and accuracy needed for drug interdiction, Corey said. A modified TOR system might track planes dropping drugs to boats off U.S. shores, for example.

"The TOR could possibly be applied to other uses," Corey commented. "It's already on the shelf. We might be able to buy it for a fraction of the cost of developing it ourselves."

Low-cost phased arrays are a potential protocol subject. Phased arrays are made up of modules that together identify and track targets. While the United States has never achieved large-scale economical production of these components, Russia has—and potentially can produce them cheaply.

The phased arrays might be used in Strategic Defense Initiative ventures, Corey said.

"The proliferation of nuclear weapons to terrorist states is certainly a problem," he commented. "In this case, we would be working together to build a ballistic missile defense system against terrorist states."

Participation in certain aspects of the potential joint ventures is a controversial topic and probably would require State Department consideration, Corey stated.

"All we can do is try to match the needs of our sponsors with the capabilities the Russians have and be able to test, evaluate and modify," he added. "We're hoping we've opened the door to some long-term cooperative agreements, and have access to technology we've never had before—which might be good for Georgia Tech." □



**George Ewell (left) and Larry Corey (right) swap hats with visiting Russian radar specialists. Wearing Georgia Tech caps are (left to right) Dr. Veniamin Efremov, constructor general of Antei Corporation, and his assistant, Iosip Drize. (Special photo)**

### GTRI presents Strategic Plan to review panel

By Martha Ann Stegar, RCO

GTRI presented its Strategic Plan to a university panel in a four-hour public session February 20. GTRI's plan, which was in a preliminary draft form, was well received by the panel, and the Director's Office subsequently got a number of favorable comments about the plan and its presentation.

GTRI Director Don Grace kicked off the presentation, stressing that GTRI's plan focuses on increasing quality, expanding interaction with the academic schools and the research centers at Tech, and diversifying sources of funding.

Associate Director Gerald Carey analyzed the external factors affecting GTRI's future and summarized key R&D trends. He stated that the Department of Defense budget, while cutting back on production, will maintain its reliance on R&D. Carey added that a tremendous opportunity for basic research is opening up at the National Science Foundation with a recommended doubling of its budget. He also said that GTRI's research capabilities dovetail nicely with most of the "critical technologies" that are receiving increased investments. Other trends he mentioned included: Industrial R&D funding is leveling off, and there is a trend toward forming research consortiums. Government labs are trying to perform more research in-house. Outside contractors will be required to demonstrate their technical capability before receiving contract awards, and sole source contracts could be in danger.

In a "benchmarking" report, Devon Crowe presented preliminary results of an ongoing survey of organizations competing with GTRI, including university-affiliated, not-for-profit R&D, and for-profit R&D organizations.

Charles E. Brown discussed GTRI's key strengths and weaknesses, as well as externally driven constraints.

Bob Shackelford said that GTRI plans to build upon its strengths and ameliorate its weaknesses by focusing on the following objectives and strategies:

- Improve the robustness of GTRI's sponsored programs
- Substantially increase interactions with the schools and centers
- Substantially increase support of Ph.D.-level GRAs
- Improve GTRI's outreach programs for greater service to the state
- Evolve TQM program, and initiate quality improvements

He also discussed major jeopardies that GTRI may face in the near future and possible contingency alternatives to cope with unfavorable conditions.

The director of each of the 20 research laboratories then presented his or her lab's strategic plan. Although each plan was specific to a particular lab's capabilities and situation, several common threads ran through them all: increased academic interaction, greater use of students, diversification of sponsor base, upgrading of staff capabilities and educational level, and the uncertainty of the economic environment.

Executive Associate Director Shackelford stressed that the GTRI plan is a "plan under construction." The Executive Council is reviewing the lab plans, as well as the service department plans, and will incorporate important planning issues in the overall GTRI plan. GTRI's overall and unit plans will be refined and finalized within the next few months.

Tim Gilmour, Vice President for Strategic Planning, chaired the review panel, which consisted of President John Patrick Crecine and the following members of the Institute Resource Allocation Advisory Committee: Peter Freeman, Linda Martinson, Demetrius Paris, and Mike Thomas.

The meeting was one of a series of public dialogues held for every major unit of Georgia Tech to present their plans. The purpose of the meetings, according to Dr. Crecine, was "to provide a forum for addressing key issues surrounding unit plans and to provide units feedback on how to proceed with their strategic plans." □

*(Note to readers: For further information about GTRI's draft Strategic Plan or your individual unit plan, please contact your lab director or unit manager.)*

## Playing a role in the wireless revolution: GTRI researchers form company to market new class of broad-band antenna

By John Toon, RCO

A new type of small and inexpensive broad-band antenna could play an important role in the ongoing "wireless revolution" in personal, office and mobile communications, say two GTRI inventors who have formed a company to market the device. Their firm, Wang-Tripp Corporation, holds an exclusive license from the Georgia Tech Research Corporation to market the innovative spiral-mode microstrip antenna the two engineers developed.

"We are at the beginning of a revolution in which many wires and fiber optic cables in telecommunication systems will be replaced by wireless systems," says Johnson Wang, co-inventor of the device. "This antenna could be a key component of that revolution."

The antenna developed by Wang and Victor Tripp combines the broad-band frequency performance typical of cavity-backed spiral and sinuous antennas with the surface mount capabilities, size and efficiency of flat microstrip patch antennas. Because it can be manufactured using conventional printed circuit board technology, the new antenna also can be relatively inexpensive.

### Many uses

Its small size, low cost, and ability to receive a wide range of frequencies make the antenna desirable for many uses, including personal communications systems, inter- and intra-office communications, wireless local-area networks (LANs), cellular telephones and other mobile systems, global positioning system (GPS) receivers, intelligent highway systems, direct broadcast satellite systems, and many other applications, the inventors say.

Because the antenna is less than a third of an inch thick at frequencies about 1 GHz, it can be placed onto vehicles such as automobiles and aircraft without cutting into their skins. Traditional spiral or sinuous antennas are two or more inches thick, requiring a cavity to be cut into the surface where they are mounted.

The antenna's diameter is a function of the desired frequency, but for most applications will be between two and six inches. That would allow it to be "pasted" onto many surfaces.

While most microstrip antennas offer a bandwidth of less than 10%, the Wang-Tripp antenna offers bandwidths of as much as 900%. When compared with cavity-backed spiral antennas, the new design offers advantages of low profile, low cost, and high efficiency.

A subclass of the Wang-Tripp antenna has its size reduced to one-half or one-third the normal size, which reduces frequency bandwidth to 300% or less. For most practical systems, however, the reduced bandwidth still provides a significant advantage over the bandwidth of the conventional microstrip patch antenna.

Because of its broad-band capabilities, a single antenna could serve several systems operating on the same vehicle. That would allow an automobile radio, cellular telephone or other communications equipment

to share a single antenna, Wang notes.

Tripp and Wang believe the growing use of global positioning systems (GPS) to provide precise location information for delivery vehicles and other needs will expand the market for their antenna. Such devices require antennas with high enough gain to receive signals from satellites in space, yet they must be small and inexpensive enough for widespread use.

"There is a need for GPS antennas on all kinds of vehicles, and our antenna is particularly well-suited for vehicle mounting because it is conformable, small and can suppress interference in a multi-mode operation," Tripp says.

The antenna also could be used over much shorter distances to replace cables in local-area networks for computer systems, and in communication systems within and between buildings. Such applications are now limited by existing antenna technology, he adds.

"Ten years ago, it would have been hard to imagine what was going to happen with the personal computer revolution," he comments. "I think we are going to see similar things in the wireless communications industry."

### New licensing program

Tripp and Wang started the company under a new licensing program designed to help researchers commercialize technology developed at Georgia Tech. In exchange for reduced licensing fees, Georgia Tech retains partial ownership in the company through the Georgia Tech Research Corporation (GTRC) and will receive royalties from products that are sold.

"We feel that Georgia Tech has been far-sighted in granting this license to the inventors," says Tripp. "There are a lot of other ways they could have gotten this technology into the marketplace. We intend to show them that this was a good choice."

The corporation has an agreement from a seasoned executive in the microwave industry to serve as its president. The company's first level of financing came from its inventors and the management team, but a second level is expected to involve external investment, Wang notes. He projects \$60 million to \$90 million in sales during its fifth year of operation if adequate financing is available.

Small quantities of the antenna are now being manufactured for evaluation by potential customers. The company expects to soon make available a line of products in the 2-18 GHz frequency range.

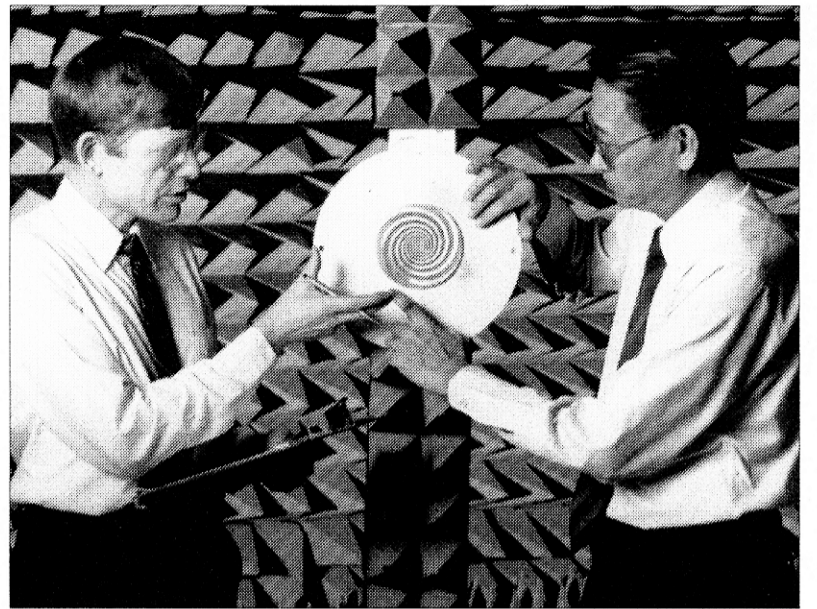
The research was originally sponsored by the U.S. Air Force's Wright Laboratory. GTRC has applied for two patents to protect the technology. □

## College of Computing Schedules April Events

Following is a calendar of events scheduled by the College of Computing (CoC) in April. For more information on any of these lectures, please call Molly Croft at 853-2682.

### APRIL

- 2 Jim Gray, Digital Equipment Corporation, "The Case Against Geographically Distributed Databases," DEC Distinguished Lecture Series, Reception at 3 p.m., Lecture at 3:30 p.m., CoC Room 17



Researchers Victor Tripp (left) and Johnson Wang examine a new type of microstrip antenna in GTRI's compact range test facility. (Photo by Gary Meek)

- 2 President John Patrick Crecine, "The Role of Multimedia and Graphics in Education," Graphics, Visualization and Usability (GVU) Brown Bag Series, noon, Pettit Building 102

- 3 Gene Winograd, Emory University, "Flashbulb Memories of the San Francisco Earthquake," Cognitive Science Colloquium, 12-1:30 p.m., CoC Room 101

- 9 Srdjan Kovacevic, "Compositional Model of Human-Computer Interaction, Graphics, Visualization and Usability (GVU) Brown Bag Series, noon, CoC Room 201

- 10 Ronald R. Grawert, Vice President of Technology, GTE, Industry-Faculty Lunch Seminar, hosted by GCATT, "New Telecommunications," noon, Georgia Tech Faculty Club. Seating is limited. Phone 853-9360 for reservations. The cost is \$8, payable at the door.

- 16 Alex Kirlik, "Environments that Support Skilled Activity: Implications for Interface Design," Graphics, Visualization and Usability (GVU) Brown Bag Series, noon, CoC Room 201

- 23 Jim Foley, "Brainstorm on the Future of GVU," Graphics, Visualization and Usability (GVU) Brown Bag Series, noon, CoC Room 201

- 23 Professor Victor Basili, Computer Science Department, University of Maryland, Distinguished Lecture Series, 3 p.m., CoC Room 17

- 24 Paul Thagard, Princeton University, "The Roots of Analogy," Cognitive Science Colloquium, 12-1:30 p.m., CoC Room 101

- 28 Professor Juris Hartmanis, Cornell University, Distinguished Lecture Series, 3 p.m., CoC Room 17

- 30 Erika Rogers, "Visual Interaction and Intelligent Computer Displays," Graphics, Visualization and Usability (GVU) Brown Bag Series, noon, CoC Room 201 □

**The antenna combines the broad-band frequency performance typical of cavity-backed spiral and sinuous antennas with the surface mount capabilities, size and efficiency of flat microstrip patch antennas. Because it can be manufactured using conventional printed circuit board technology, the new antenna also can be relatively inexpensive.**

**Profile  
&  
Insight**

**The unlikely graduate student**

By Rae Adams, ESTL

**H**ad someone a year-and-a-half ago told me that I would have a master's degree in photography and earn that degree in only a year while I worked full time, I would have told them, "No way. I'm too old. Impossible. I don't have the time. Can't be done." I would also have had to eat every one of those words.

I certainly didn't fall into the category of "traditional student" when I thought about returning to school. I was 39 years old. I had a full-time position at GTRI—I was (and am) a research associate in the Environmental Science and Technology Laboratory. I had a family to support. And I hadn't been in graduate school for more than a decade. Previously, I had completed 48 quarter hours of graduate work in English and was close to finishing a master's degree, but had left school because my husband had relocated for his work and we had a new baby.

Photos © from Rae Adams' portfolio:  
Top: Krog Street Barrels, Atlanta.  
Bottom: Mushroomrooms, East Lake Drive, Atlanta.



I had always thought that I would go back, but the years passed.

Now, ten years later, I had reached a point professionally where I needed the master's degree; yet, returning to graduate school in English would mean repeating the work I had done a decade earlier.

I decided instead to pursue a graduate degree in photography. Over the years, photography had progressed from a means for me to document my travels and take snapshots of my daughter to an obsession with the black-and-white fine print.

**The Zone System**

In one way or another, almost all photographers eventually develop techniques that allow them to achieve some sort of control over their photography. To achieve the controls over film and print processing that I desired, I had taught myself the Zone System. I didn't want to miss even one photograph because the negative was underexposed, underdeveloped, overexposed, overdeveloped, or any combination thereof. When using the Zone System, the photographer changes the exposure of the negative and the developing variables (time, temperature, agitation, and developer type/concentration) to yield an appropriate gray scale that matches his or her visualization of the scene.

The Zone System began as the personal method of Ansel Adams, one of the foremost landscape photographers of the 20th century. He developed the Zone System in the early 1940s in response to his students' difficulties in achieving consistent photographic controls. Over the years, the Zone System's principles have become mythicized and obfuscated.

After teaching myself the system, I understood why many photographers lamented that it was too complicated, too obscure, too difficult to apply in the field. However, the system made good sense to me. And it worked. What didn't make good sense to me was the way the books were written and the materials that they contained. No one text contained a systematic presentation of the materials necessary for implementing the system. Furthermore, many of the texts contained information that was no longer applicable to modern, thin-emulsion films, which require different techniques than the older emulsions. Still others took the cavalier approach of advising the novice to "do as I do," even though each photographer's developing techniques are as individual as his/her fingerprints.

My thesis topic was to grow out of my own frustration with current texts on the Zone System.

**What school?**

I examined a number of options, but the one that seemed to me the best for my situation was an institution that had a short residency program, allowing me to continue working at ESTL. The program had to be fully accredited by a recognized, regional accrediting agency, and it needed to be flexible enough to meet my area of interest. Goddard College (in Vermont) seemed ideal. I submitted a detailed plan of study with my application, outlining my interest in developing a Zone System text for beginners, and was accepted for the January 1991 semester.

Goddard offers an on-campus program, but its nonresident program has attracted more and more students, like me, who must continue their "lives" while pursuing a degree. It does not have a set curriculum for each field of study in its graduate, nonresi-



Rae Adams and her daughter, Rachel (Photo © by David Carter)

dent program, unlike more traditional institutions. Instead, Goddard designs a program for the student to enable that student to achieve the following: mastery of existing theories and approaches in the area of interest; a contribution to the field involving original research; and a product incorporating the results of the research that is of benefit to the greater community.

**The requirements**

At the beginning of each semester, I attended a nine-day residency in which my thesis advisor and I planned the work that I was to accomplish during the semester. Faculty advisors are carefully paired with student interests. My thesis advisor, John Layton, was an adjunct faculty member at Goddard and was chosen specifically by the college to meet my needs.

During the semester, I was required to submit a written report every three weeks to my advisor. These reports consisted of results of my research in my thesis area, critical analysis of reading materials, critical papers, and a summary of other activities, which in my case included field and darkroom work, and workshops and exhibitions attended.

For those of you who may think that *nontraditional* and *nonresident* mean *nonwork*, let me set the record straight. My reports ranged from 60 to 90 typewritten pages every three weeks. I was carrying 15 hours a semester, and I spent at least 50 to 60 hours a week on my graduate studies, in addition to working a 40-hour week at Tech.

I read approximately 115 books for my course work and over 200 articles, monographs, and technical reports. I attended ten photographic exhibitions and three workshops. For the portfolio, I exposed some 350 rolls of film and spent 44 days photographing in the field and in studio work. I spent approximately 175 hours in developing film for the portfolio alone. (I used several hundred other rolls of film in testing developers and variables for the thesis.)

My field work consisted of trips to 27 locations, including the Smoky Mountains, the Sierra, Bryce Canyon, Zion Canyon, Chaco Canyon, the Four Corners area, Arches National Park, Canyonlands National Park, Joshua Tree National Monument, Big Sur area, Point Lobos, and my favorite place on the face of this earth—Death Valley.

Unfortunately, photography happens to be a demanding artistic and technical medium of expression. Fortunately, I'm an inveterate traveler.

I couldn't have maintained this pace without the support of my husband and daughter. My husband took over most of the

household chores. My 12-year-old daughter, at her request, prepared all our meals. Many nights she told me, "Mom, get out of the kitchen. I'll take care of dinner. You don't need to help. Go do your homework." That was certainly a change. During the year that I was in school, I cooked only two meals and never picked up a vacuum cleaner.

Even though my first semester ended in June 1991, I continued working through the summer at the same pace: photographing, testing film, and beginning to sort through hundreds of negatives to choose 25 for a portfolio of black-and-white prints. My phone answering machine had (and still has) the message: "I'm in the darkroom and can't answer your call." My family and friends began calling me "mole person." I wondered why daylight looked so bright. My fingernails turned purplish-black and stayed that way. It was the fingernails that elicited the most comments.

I had investigated a number of print developer and paper combinations and had settled on amidol (2,4-diaminophenol dihydrochloride) as my developer of choice. I found that it yielded excellent separation of close values. However, amidol is not a nice chemical. First, it stains. It stained my darkroom walls with purplish black streaks. It stained my clothes. It stained my fingernails, and it doesn't wear off—the nails have to grow out. The usual comments when people saw my nails were "What happened?" "Was it an accident?" "Did it hurt?" Second, amidol isn't too healthy to be around. It can cause skin burns and respiratory problems, and it is absorbed through the skin. Many photographic workers no longer use amidol, preferring instead developers that do not have its handling difficulties (it also oxidizes readily) and are less expensive (currently about \$50 per 100 grams, enough for only 10 printing sessions).

Naturally, I was concerned about working with amidol. So were two of my co-workers in ESTL, Toni Hurley and Scott Brueck, who asked why I wasn't wearing gloves. I told them that the gloves I had tried didn't hold up to the chemicals and didn't allow enough touch sensitivity when I worked with delicate emulsions. They suggested that I try a nitrile glove, N-dex (Best Manufacturing Company). Just the thing.

My colleagues in the Communications Branch of ESTL, Stephanie Babbitt and Nancy Davis, gave me advice on layout and design for the final preparation of my thesis into a text that would present the material effectively. Chris Papanicolopoulos discussed sensitometry and optics with me. Robert Wallace answered my questions on photographic chemistry. Many others in ESTL encouraged me during my studies. I appreciated their support.

**The obstacles**

Two incidents occurred that placed an additional burden on my already hectic life during the year that I pursued the degree.

The week after I began my studies, my 100-pound greyhound, with his usual ebullient and loving nature, jumped on the bed early Sunday morning. The jump escalated: he accidentally stepped on my eye and, with a well-placed dog claw, lacerated the cornea almost completely through. A year after the accident, my eye is still healing.

During the summer, I suffered another injury, this time artistic, and one with which I have not yet come to terms. As part of the work on my graduate portfolio, I had photo-

graphed for 10 days in the desert southwest in June, primarily the Four Corners area and northern Utah. I had processed 27 of the more than 100 rolls of film I had shot on this trip when, in August, our house was burglarized and the remaining undeveloped 60 rolls were stolen. The purported burglar and his accomplice have since been arrested, but my film was never recovered. I have visions periodically of the gelatin emulsion molding in some basement somewhere and the latent images fading back into the oblivion from which I created them.

**The outcome**

My course work enabled me to deal with the aesthetic issues, such as how to begin photographic visualization and how to determine an appropriate Zone VIII density in the negative according to the photographer's artistic requirements, and the technical issues in the primer, including deriving D log H curves, testing film according to sensitometric principles, and using alternatives to traditional procedures (such as extreme compensating developers, selenium toning, and reciprocity failure) to achieve more extreme Zone System controls. I found that modern emulsions are far more amenable to expansions and contractions of the contrast range than many workers believe, and I developed appropriate paradigms to enable workers to expand or contract the tonal scale as much as five zones in either direction.

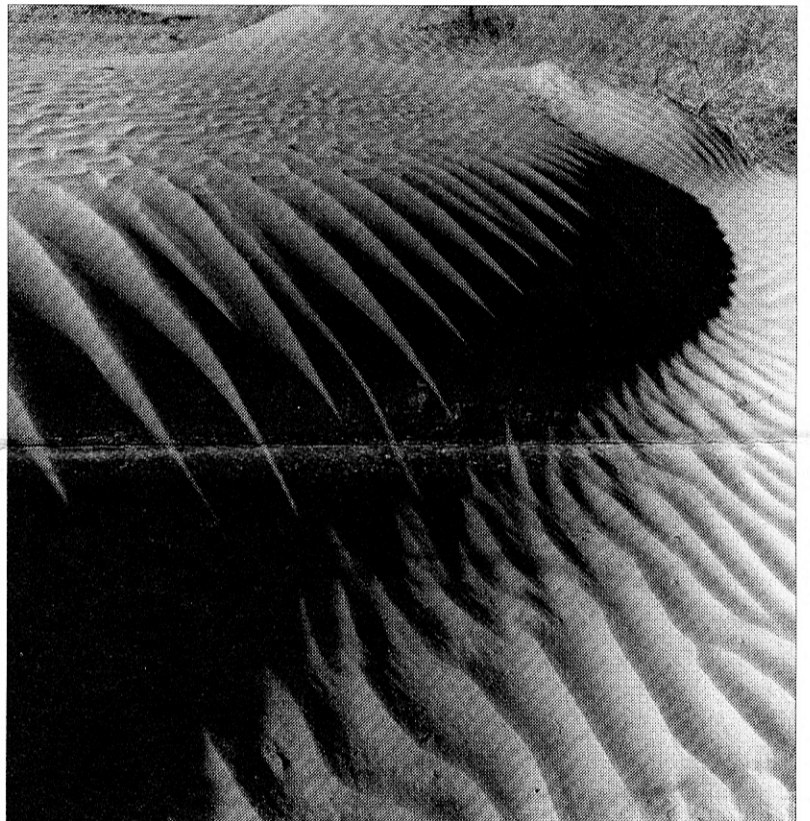
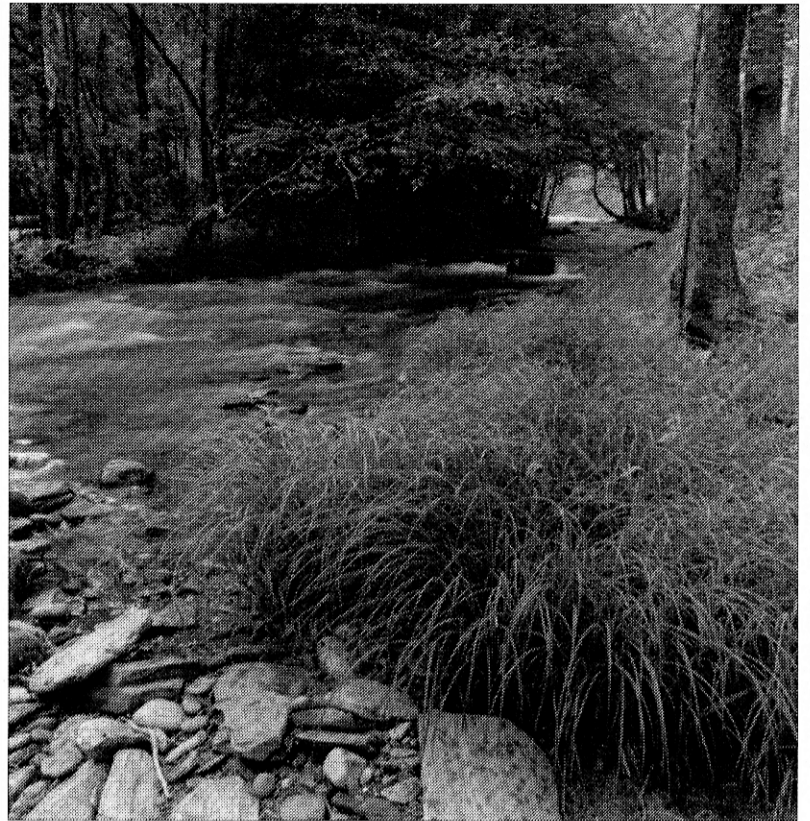
My thesis metastasized. It obtained a title: *A Zone System primer: A methodology for thin-emulsion films*. At 236 pages (desktop-published on a Macintosh and in camera-ready copy), it turned out to be double the length I envisioned when I began.

The primer is now being field-tested by photography students. I hope in the next few months to begin seeking a publisher.

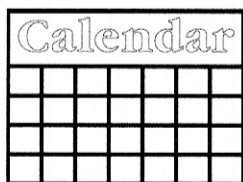
After I had returned from graduation ceremonies in January, my husband asked me, "Well, how do you feel about all the work you had to do this past year?" I replied, "It was the best thing I've ever done."

In fact, I'm thinking of going on for a Ph.D. □

*(Rae Adams is engaged in technology transfer in ESTL's Communications Branch.)*



**More photos © by Rae Adams:**  
**Top: Little River, Smoky Mountains.**  
**Bottom: Dune, Stovepipe Wells, Death Valley.**



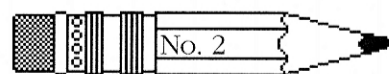
**Coming up!**

**Annual picnic in May**

GTRI will hold its Spring Fling picnic on Wednesday, May 20, from 11 a.m. to 2 p.m. next to the Purchasing/Central Receiving Building at Hemphill and Eighth Street (same place as last year). More information will follow, but put this event on your calendar now! □

**GTRI employee meetings set**

The annual GTRI Present and Future meetings have been scheduled as follows: There will be one campus meeting on Thursday, October 8, in the spacious new Georgia Tech Theatre for the Arts (adjacent to the Student Center). It will be followed by two meetings in the Cobb County Building 1 auditorium—on Friday, October 9, and Monday, October 12. It is hoped that as many GTRI employees as possible will attend the campus meeting to facilitate a good exchange of ideas, so block out this time on your calendar today. □



Queries  
&  
Quotes

Focus on  
Quality

GTRI QA plan nears completion

By Milton Bennett, OOD

For some time now, the Total Quality Management Office has been working on a Quality Assurance (QA) Plan that will satisfy the minimum requirements imposed in all of our ongoing Department of Defense (DoD) sponsored contracts, and the additional requirements contained in a limited number of those contracts. This plan, when completed, will become an integral part of an overall improvement process which we hope will guide GTRI researchers when faced with cradle-to-grave encounters with either potential or actual contractually imposed QA requirements.

As many of you know, every DoD contract is subject to the standard inspection requirements outlined in Federal Acquisition Regulations (FAR) Part 46.202-2, and this results in the clause set forth in FAR Part 52-246-8 or 52-246-9 being included in the General Provision section of most contracts. The clauses are entitled respectively: *Inspection of Research and Development—Cost Reimbursement* and *Inspection of Research and Development (Short Form)*.

A few of our contracts will contain a different clause if the contract is on a fixed price or time and materials basis or is for services or supplies instead of research and development. These clauses represent what is identified in the FAR as the Basic or Standard level of Quality Requirements. Other levels are the System and Program levels. The appropriate level is determined based on the classification of the contract item involved and its technical description, complexity, and application as set forth in Table 46-1 of the FAR. The FAR also indicates that the contracting officer is to consult technical personnel before including the System or Program level specifications in a contract.

The System level requirement is more demanding than the Basic level and is imposed when Military Specification MIL-I-45208A, *Inspection System Requirements*, is incorporated into the contract. The Program level requirement is even more demanding and is applicable when MIL-Q-9858A, *Quality Program Requirements*, is included.

When either MIL-I-45208A or MIL-Q-9858A is included in a contract, a number of other Military Specifications or Standards are also likely to be incorporated. Some of these requirements already have been included in a few contracts, and more can be expected in the future. Some of the more common ones that can reasonably be expected to show up in GTRI contracts are:

- MIL-STD-45662, *Calibration Systems Requirements*
- DoD-D-100B, *Drawings, Engineering and Associated Lists*
- DoD-STD-100C, *Engineering Drawing Practices*
- DoD-STD-2167A, *Defense System Software Development*
- DoD-STD-2168, *Defense System Software Quality Program*

and a variety of other Specifications/Stan-

dards dealing with topics such as Reliability, Maintainability, Work Breakdown Structure, Configuration Management, and Integrated Logistics Support.

One way to think about the different levels of contract Quality Requirements is to recognize that, at all levels, the contractor (GTRI) is responsible for providing and maintaining an inspection system that is acceptable to the Government; accepted general scientific and engineering principles and practices are to be followed; and the contractor is responsible for delivering quality products and services that meet or exceed contract requirements/specifications.

At the System and Program levels, both the number and complexity of contractor and Government inspections are increased; the number of requirements/specifications is also increased and they become much more detailed and apply to components, sub-components and processes; and the requirement for record keeping and documentation is greatly increased to demonstrate that quality practices and procedures are being followed, that inspections are being conducted, and that all necessary corrective actions are being taken.

The GTRI Quality Assurance Plan is being written as a generic plan which should satisfy the basic quality requirements of any contract, and which with fairly minimal tailoring may be adapted to satisfy the quality requirements of those contracts requiring System or Program quality levels. The current plan is based largely on a prior project QA Plan written several years ago by Jim Cox for a project performed for the Sierra Research Division under an Air Force sub-contract. However, much of the material has undergone extensive editing and/or rewrite to change it from a project-specific plan to a generic and tailorable plan and to incorporate changes which have occurred in the interim.

The Plan is now about 75-80% complete, and it is hoped that the remaining section can be finished within a month. At that time, copies of the entire "draft" plan will be distributed to interested project directors, laboratory directors, and other staff members who ultimately will be involved in its implementation.

If you are interested in this topic and would like to have the opportunity to participate in this review process, please contact the writer by phone (894-6239) or PROFS (MBENNETT). In the interim, if you have comments or suggestions which you feel should be considered, we would be delighted to hear from you. We welcome all of your inputs since we hope to make the Plan a useful and workable document that not only will satisfy Government contract requirements, but—even more importantly—one which will help to enhance and improve the quality of our performance under all projects for all sponsors. □

Enhancing your presentations

By Lee Hughey, RCO

I have attended numerous meetings during the past year where professionals have made presentations. What strikes me is how often a presentation loses its impact because the speaker did not follow proper guidelines for using visual aids.

Here are some examples of how presentations are diminished when the right parameters for visual materials are not chosen.

- Using type or lettering that is not large enough for the audience to read.
- Using colors that are inappropriate in the background or foreground.
- Putting too much information on a single chart.
- Putting more than one logo representing the organization on a chart.
- Presenting data in one form, such as a table, when another, such as a graph, would be better.

These are just five basics that could be changed to improve a presentation and take full advantage of the way the materials are designed and displayed.

First, when choosing type size, select those large enough to be seen and read by your audience. Generally use a type face no smaller than 14-point, if your audience is 50 or fewer people. A better size is 18-point. Point sizes of 24, 30 and 36 are best for headings and subheadings. Remember, the larger the point size, the larger the type face. Most presentation packages and many word processing softwares allow you to choose font size. By following these standards you will eliminate the need to say, "I know you can't read this chart, but here it is anyway."

Color is an excellent medium for impact, but if used incorrectly it can reduce rather than enhance a presentation. Choose colors that are "eye pleasing," such as light-color backgrounds with dark type or medium-color backgrounds with light-color type. For example, yellow or very light blue type on a medium blue background is good. Other colors include light green foreground on medium blue background or red on a light gray background. Don't choose colors that are stark or have too much contrast. Reversing colors does not present as well either.

Far too many charts, whether text or data, present too much information. Choose your words carefully. You don't have to explain everything! Phrases of seven or fewer words are best. Tables of data may impress your audience, but few are able to read them and assimilate the information. So put key items on the chart and present only what you want the audience to remember. This compels the audience to take away only the most important points.

If you use an organizational identity on your charts, select only one. Logos have value, but using more than one distracts the audience from your message. It does not follow that "if one logo is good, more than one is better." It just doesn't reinforce your message, so stick to one good one.

Representing data in one form, such as a table, is okay, but putting that data in a bar chart, pie chart, or graph is better. The visual impact leaves a stronger impression than numbers alone can convey. If you don't have enough data for a visual chart, then a table of data is acceptable. The key is not to overwhelm the audience with rows and columns of information.

Remember, most of these suggestions are designed to help you deliver your message in the most effective manner. Always try to think of your audience and what you want them to remember. Make it as easy as possible to digest your message. Following these guidelines should allow you to focus on the key points you want to deliver, and those you want the audience to absorb. □

## Eighty-six bridges crushed

By Wiley Holcombe, EOL

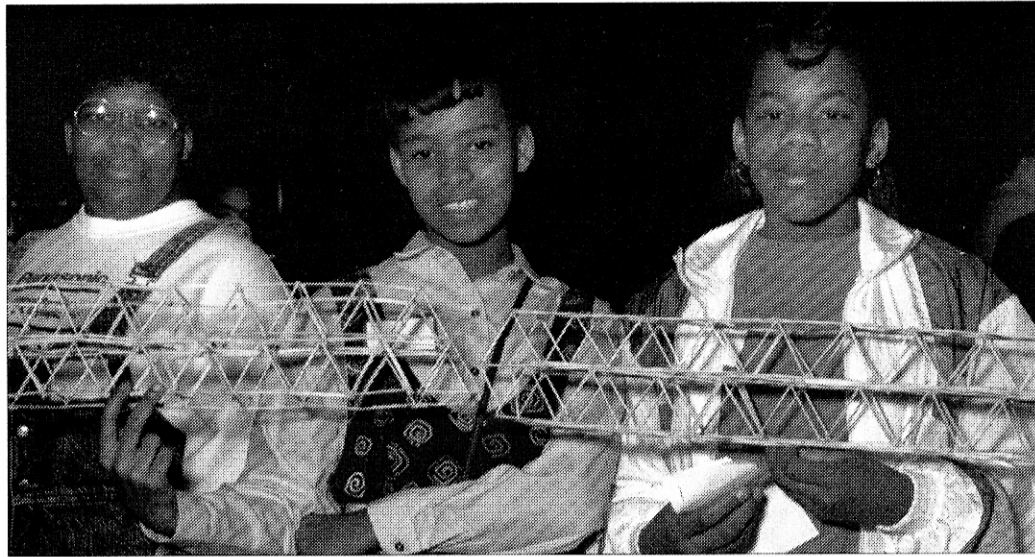
The Atlanta Chapter of the Society of Manufacturing Engineers (SME) sponsored a Toothpick Bridge Building Event at SciTrek, The Science and Technology Museum of Atlanta, on Saturday, February 22, the final day of Engineers Week 1992. The goal of the event was to provide an opportunity for young people to participate in an extracurricular activity with a technical, mathematical and scientific aspect.

The event, which received rave reviews, attracted entries from 110 children and teens ranging from 5 to 18 years of age, along with entries from three adults. The entrants represented 27 schools, including elementary, middle and high schools.

Each participant was allowed a maximum of 500 toothpicks and 1 1/4 ounces of white glue to construct a bridge 20 to 25 1/2 inches long and weighing no more than 4 ounces. The bridges were weighed and inspected for compliance with the rules, then loaded until they broke. The maximum sustained load was recorded.

Each entrant received a certificate that included the performance of his or her bridge and an SME Adventures in Manufacturing poster. No prizes were given for bridges, but 30 door prizes were given away in drawings held during the event.

Volunteers tested 86 bridges exhibiting a wide variety of designs, sizes, shapes and weights. Some bridges were very attractive, some very well constructed, and some performed well on one or both of the measures of performance—breaking force or the ratio



Prospective Georgia Tech engineers? Three participants display the bridges they built for the Toothpick Bridge Building Event sponsored by the Atlanta Chapter of the SME.

of breaking force to bridge weight. A bridge built by a nine-year-old held an incredible 147 pounds, and two bridges sustained over 100 pounds. In terms of pounds per pound of bridge, six bridges held the equivalent of more than 700 pounds, and one supported 1,021 pounds.

The 36 volunteers who staffed the event included five faculty from GTRI, two faculty from the School of Industrial and Systems Engineering, two faculty from Southern College of Technology, six Georgia Tech students, and six Southern Tech students. Two volunteers built the testing machine with materials and parts donated by two local companies through Tech alumni.

The Atlanta SME Chapter promoted the event using a Georgia Tech mailing list of 355 elementary and middle schools in the 14-county metro Atlanta area. They modeled the event after a similar activity sponsored by the Sarasota, Florida, SME Chapter.

The Atlanta Chapter hopes to repeat this or a similar event in the future. Please forward any questions or comments to Toothpick Bridge Building Event, Atlanta SME Chapter 61, 962 McLendon Drive, Decatur, GA 30033. □

**Jason Collins, Dan Howard** (COML), and **Kevin Martin** (EE) have prepared a Record of Invention for the scanning electron beam nanolithography system they have developed.

**Dave Flowers** was a site administrator and instructor for the Naval Air Warfare Center short course in AOC Advanced EW Principles taught February 24-28.

### Economic Development Lab

In February, **Dave Swanson** spoke on the university's role and industry's needs in technology transfer at the Federal Executive Management Seminar in Denver.

**Art Brown** had an article, "Business Tips: Marketing Planning and Strategy," in a recent issue of *Business Affairs Network*, published by the Columbus Chamber of Commerce.

The Congressional Office of Technology Assessment referenced the Industrial Extension Service in an October 1991 report entitled "Competing Economies—America, Europe, and the Pacific Rim."

### Electronic Support Measures Lab

**Neil Lareau** presented a paper, "Technology Insertion into Aging Military Systems Using RAM-based FPGAs," at the Programmable Logic Design Conference in Santa Clara (CA) March 31.

**Terry Tibbitts, Kim Cole, and Robert Raboud** gave a week-long course on MIL-STD-1750 Computer Architecture at Warner Robins AFB March 9-13.

## Professional Activities

### GTRI staffers get Old Crow awards

Eight persons from GTRI and one from EE recently received Gold Certificates of Merit from the National Headquarters of the Association of Old Crows: **Bud Sears** (CAL), **Jim Wiltse** (OOD), **George McDougal** (CAL), **Dave Flowers** (CMDL), **Dave Schmieder** (EOL), **Don Wilmot** (PDO), **Lee Edwards** (ESML), **Albert Mullikin** (EOL), and **Jay Schlag** (EE). The awards are for service to the electronic defense industry and the Association and are based on recommendation letters from their colleagues in the field. They were presented at a meeting of the Atlanta Chapter of the AOC by the chapter president, Guy Morris (RSAL).

### Countermeasures Development Lab

**Mike Minardi** coauthored a paper with Dr. **Mary Ann Ingram** (EE) and James T. Carr of Bell South entitled "Adaptive Crosstalk Cancellation in Dense Wavelength Division Multiplexing Networks" that was presented in a poster session February 5 at the Optical Fiber Communications Conference in San Jose (CA).



A young entrant in the event watches the dial as her bridge is tested by a volunteer. (Photos by Rae Adams)

### Environmental Science & Technology Lab

**Paul Schlumper** recently gave an OSHA Overview presentation at the Golf Course Superintendents quarterly meeting.

February 12-14, **Kirk Mahan** and **Richard Sesek** attended an overhead crane safety course presented by the North American Crane Bureau and received NACB certification.

**John Nemeth** is program chair for the annual University System Symposium on Research. This year, the program will be held at the University of Georgia in Athens May 8-9. The symposium's topic is "Designing Tomorrow's Environment Today."

### Modeling & Analysis Lab

A book written by Dr. **Brian A. Stevens** and Dr. Frank L. Lewis (University of Texas at Arlington) and titled *Aircraft Control and Simulation* was published in February by John Wiley & Sons, Inc.

### Office of the Director

**Ron Bohlander** has succeeded **Wiley Holcombe** (EOL) as chairman of the Atlanta Chapter of the Society of Manufacturing Engineers. **Craig Wyvill** (EOL) is chairman-elect, and **S. Manivannan** (ISyE) is treasurer. □

# Focus on Folks



**The ESML intramural teams**  
**Left: The Sixty-niners basketball team (left to right): Ben Slocumb, Russell Leath, Rob Raboud, Kim Cole, Fred**

## ESML intramural team updates

The Sixty-niners, who are in the basketball B-league, went undefeated for the season, and had to have three out of the four games they played called by the mercy rule, as they were 35 points ahead. Unfortunately, they lost a close one (46-42) in the first-round playoffs. They'll try again next year.

In the wallyball B-league, the Wild Weasels also went undefeated and were first in their bracket. They lost 1-2 in the second-round playoffs. The No-names ended first in their bracket with a record of 3-1. They lost 1-2 in the first-round playoffs. □

**McKeen, Lou Fertig. Not shown: Walter Addison, Rob Kossler. Above: The Wild Weasels wallyball team (from left); Lee Evans, Steve Millar, Matt Bradley, Mark Foreman. Right: The No-names wallyball team (clockwise from left): Michele Brown, Andy Slack, Tom Autrey, Wendy Hanigofsky. (Photos by Greg Wright)**



## Sick Bay

Best wishes for a speedy recovery to **Charlie Crawford** (AERO), following surgery last month to repair a fractured pelvis due to a fall at his home, and to **Fred Nathanson** (RIDL), who is recovering from a fractured hip and total hip replacement surgery.

Cobb County staffers held a reception March 18 for **Ed Reedy** to celebrate his return to work after corrective surgery.

## Our Sympathy

... to **Sam Alford** (TSDL), whose brother died in February, and to **Bill Myles** (TSDL) and **John Adams** (EDL), whose fathers also died in February. □

## Personnel News

### Aerospace Lab

New staffers are **Ron Walterick**, RE II; **Jerry Clark**, senior secretary; **Ram Sham**, GRA; and **Erik Dreyer**, student assistant.

### Economic Development Lab

Joining EDL in March were **Paul Lewis**, SRA with the Southeastern Trade Adjustment Assistance Center, and **Ron Norsworthy**, RE I in the Rome Regional Office.

### Electronic Support Measures Lab

Two EE majors are new student employees of ESML. **Dan Rasmussen** is a student assistant in the Emitter Identification Branch, and **Jim Schutz** is a co-op in the Advanced Technology Applications Branch.

### Environmental Science & Technology Lab

**Tim Radtke** resigned in late February and **Richard Sesek** in early March.

### Materials Science & Technology Lab

Dr. **Mario Ocelli**, formerly with Union Oil Company of California (UNOCAL), has joined MSTL as a PRS. He will set up a pro-

gram to develop and test new clay-based zeolites and pillared clay catalysts for the petroleum refining and petrochemical industries. This will represent a new capability for MSTL and Georgia Tech, and will support both the Zeolite Research Program and the joint Chemistry/Chemical Engineering/GTRI Focused Research Program in Surface Science and Catalysis. Plans are to develop working relationships with two Georgia industries: kaolin (clay product development) and poultry (new zeolite feed additives). Dr. Ocelli has his PhD in physical chemistry from Iowa State University, and 20 years of experience in process engineering and industrial R&D with chemical and petrochemical industries. He is the author or coauthor of 23 U.S. patents and nine foreign patents.

### Microwave & Antenna Technology Development Lab

**Andy Dugenske** has transferred to the Manufacturing Research Center, and **John Tehan** has resigned.

### Modeling & Analysis Lab

**Bruce Rakes** has resigned.

### Office of the Director

**Jim Wiltse** retired as of December 31, 1991. During March, he has been coming into the office periodically to complete work on books, articles, and other activities.

**Pat Winn** retired January 31.

**Lese Cooper** has transferred from the Agricultural Research Program Office.

**Mike Murphy** has transferred from OOD to the Continuing Education Department.

### Signature Technology Lab

**Kathy Chi** joined STL February 13 as an RE I, coming from General Dynamics, San Diego. She has a chemical engineering degree from the University of California at San Diego, and is pursuing as MS in mechanical engineering at Georgia Tech.

### Threat Systems Development Lab

**John Mills** has transferred from the Electromagnetic Environmental Effects Lab. □

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## Personal Notes

### Achievers

Congratulations to **Gayle Warren** (MAPS), who was graduated magna cum laude from Kennesaw State College with a BBA in finance and is slated for promotion to RA I April 1.

Last month, **Violet Buck** (TSDL) attended the Grammy awards ceremony in New York City, where her son Peter's musical group, REM, garnered three Grammy awards.

**Rod Beard** (STL) has been promoted to lieutenant colonel in the Georgia Air National Guard. He is a member of the 165th Tactical Airlift Group in Savannah.

### Wedding Bells

**Peggy Bel** (EDL) was married in March.

### Cradle Roll

Congratulations to Lydia and **Morris Kesler** (STL) on the birth of their daughter, Sophia Elizabeth, February 25.

**Ellen Barrett** (ESML) had a baby boy, Andrew Tyler, February 12.

Mindy and **Marvin Cohen** (MAL) welcome Amy Tovah, born March 10.

**Nancy Kelley** (EOL) is the proud first-time grandmother of Katherine Ross Ziebertz, born February 1.

Belated announcement: Kimberly and **Tony Hynes** (PSL) have a baby girl, Lucy Elizabeth, born November 8. She has already traveled to Europe and attends Tech's basketball games.