The GTRI Connector

Vol. 7 • No. 8 *Published Monthly for the Georgia Tech Research Institute Family* July-August 1991

Gilb's laws of unreliability

- Computers are unreliable, but humans are even more unreliable.
- Any system which depends on human reliability is unreliable.
- Undetectable errors are infinite in variety, in contrast to detectable errors, which by definition are limited.
- Investment in reliability will increase until it exceeds the probable cost of errors, or until someone insists on getting some useful work done.

ATDC presents faculty awards

A GTRI engineer has received one of three faculty research commercialization awards presented for the first time this year by the Advanced Technology Development Center (ATDC).

Chris Thompson of GTRI's Environmental Science and Technology Lab was honored at a June 26 ceremony, along with Mike Sinclair, Office of Interdisciplinary Programs, and Bill Putnam, College of Computing.

Thompson's project involves Optical Redundant Arrays of Inexpensive Disks (ORAID) technology. Until now, the development of ORAID technology has been severely hampered by the cost of developing a custom controller and associated software. He is developing a low-cost, high-performance parallel storage system that will have applications in document storage and multimedia systems. Market testing is planned immediately upon completion of the prototype through a cooperative relationship with a leading optical storage supplier.

Sinclair, a key designer in the development of Tech's Olympic video, is developing a 3-D digitizer. He will design and build a proof-of-concept prototype device capable of optically scanning a 3-D object and converting the result into machine readable form. The technique is based on projecting a plane of incoherent light onto a slowly rotating object that produces an illumination contour where the plane intersects the object at its outer surface. This system has potential applications in many fields such as CAD-CAM, architectural modeling, computer animation, reconstructive surgery, and special effects for film and television.

Putnam, along with Ph.D. student Keith Edwards, is working to commercialize the Montage Multimedia Electronic Mail System, developed in the College of Computing. The system provides a fast, inexpensive, easy-to-use and auditable channel for the exchange of information in almost any media type or format between users of computer workstations. No product currently available offers the same features or flexibility. With some refinement, Montage would become an attractive product in the multibillion-dollar computer workstation market.

ATDC Acting Director Wayne Hodges and Tech President John P. Crecine made the presentations. Said Hodges: "This program allows ATDC to be a very active part of Georgia Tech's commercialization process. Through this program, our goal is to become an exit point for technology at Georgia Tech."

ATDC established the Faculty Research Commercialization Program as a demonstration project to provide support to move innovative technology-based concepts from the lab to a fully functioning product prototype. The program, open to all Georgia Tech academic and research faculty, provides initial support, valued at approximately $50,000 per project, for equipment, materials, graduate student funding, and faculty release time. ❑

ATDC Acting Director Wayne Hodges (left) and President John P. Crecine (center) presented the first three awards in ATDC's new Faculty Research Commercialization Program to (L-R) Michael Sinclair, William Putnam, and Chris Thompson. (Photo by Tedd Stafford)

"This program allows ATDC to be a very active part of Georgia Tech's commercialization process. Through this program, our goal is to become an exit point for technology at Georgia Tech."
– Wayne Hodges

Observed & Noted

CAL researchers, led by Harold Engler, have developed a generic Doppler processor that sharply cuts the cost of simulating Doppler processing in real time--and helps engineers choose the best processor for radar systems. *See page 2.*

■

GTRI's State Advisory Board was briefed on GTRI's achievements and future plans at a meeting July 8. *Read about it on page 2.*

■

Lead poisoning is a national health risk, particularly to our children. *Learn what ESTL is doing to combat this danger on pages 2 and 3.*

■

Emergency loans for employees, TQM news, realignment of two labs, setting international standards for software engineering--*all are discussed on page 3.*

■

GTRI says farewell to Dan O'Neil as he takes up his new post at the University of Oklahoma. *A retrospective of Dan's career at GTRI is on page 4.*

■

President John P. Crecine recently issued a statement commenting on the research overhead rate cap of 26% proposed by the federal Office of Management and Budget. *The text is on page 5.*

■

Information, Please! Ann Campbell tells how to get a foreign language article translated into English, and Joe Schwartz tells how to take better pictures. *See pages 6 and 7.*

■

We ***Focus on Folks*** *on page 8.* News includes the birth of 10 (count 'em, 10!) babies, the presentation of 10 papers, and the addition of 15 new employees.

News & Notes

Doppler processor offers versatile tool for testing radars and countermeasures

By Mark Hodges, RCO

A simulator developed at GTRI should make it easier for engineers to choose the best processor for Doppler radar systems.

"We're the first to come up with a processor that simulates all Doppler processing methods in a single hardware configuration and does so in real time," says project director Harold Engler of the Concepts Analysis Laboratory.

Radar systems routinely use the Doppler effect to extract valuable target information from signals. Doppler techniques not only make it easier to distinguish a target from its background "clutter," but they also show whether an object is approaching or receding, and at what speed.

Because several different algorithms are used for Doppler processing, engineers must decide which works best in a given radar before building an appropriate signal processor. Making this selection has been difficult and time-consuming because no one system can simulate how each of the different algorithms might work in a given radar configuration.

Engler believes that his laboratory's Generic Doppler Processor will fill this gap.

According to Engler, the proof-of-concept system can perform the three main types of Doppler processing by simulating analog filter banks, Fast Fourier Transforms, or special correlator methods. He says that the reprogrammable processor will be useful to electronic countermeasures developers, intelligence analysts, and radar designers.

Until the 1980s, it was prohibitively costly to make simulations of Doppler processing in real time. However, the task has become possible with the development of inexpensive and powerful digital signal processing chips and boards.

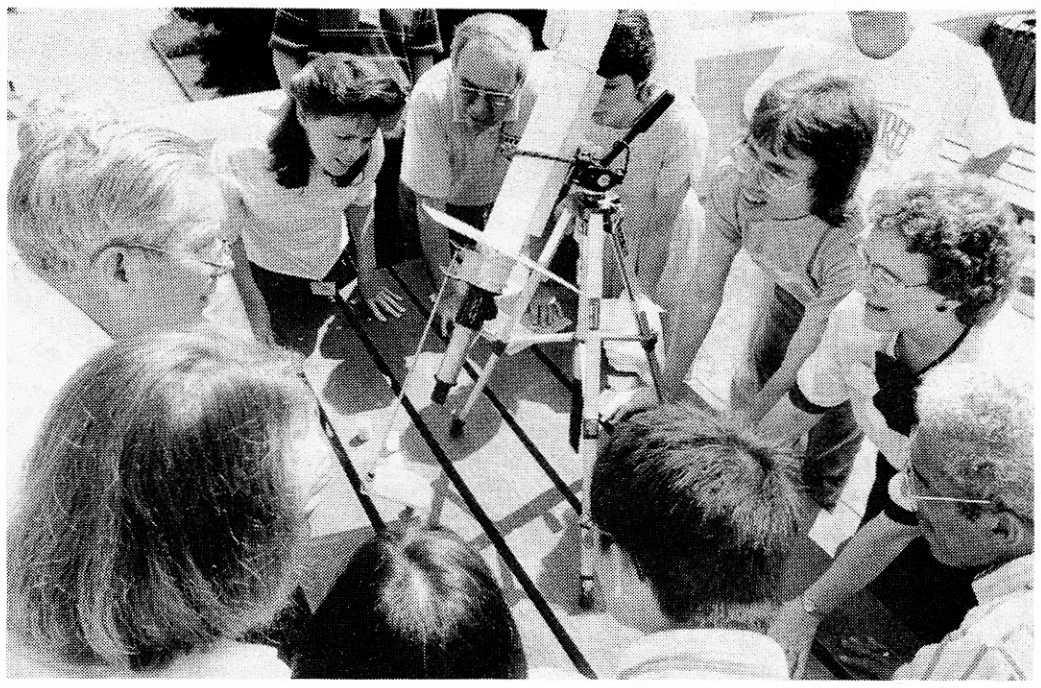
"Before these parts were available," says Engler, "an array processor that cost several hundred thousand to over a million dollars would have been needed. It would have required racks of equipment and would have been difficult to program."

His group found ways to further reduce the cost of Doppler simulation. Normally, the accurate simulation of a Doppler processing technique requires a heavy computational load, but GTRI engineers designed algorithms that reduced these computations by 10 to 1. This improvement in processing efficiency made it possible to reduce the number of signal processing boards needed to simulate Doppler filters—and, in so doing, sharply cut system development costs.

As one measure of the system's promise, it recently was the subject of a feature story in *Microwaves and RF*, a prominent technical publication. Engler also is discussing applications of this new technology with several research sponsors.

This research was funded through the Senior Technology Guidance Council, a group that distributes internal funds at GTRI to worthy projects.

Other collaborators on the project include research engineer Philip D. West and graduate research assistants Mark D. Austin and Thomas R. Gardos. ❑



GTRI staffers observe the partial solar eclipse on July 11. (Photo by Joe Schwartz)

GTRI's State Advisory Board gets update on research, marketing

GTRI's State Advisory Board met July 8 to hear about the funding challenges facing the Institute, future marketing plans, and research activity during the past year. The Board also heard from Seventh District Congressman Buddy Darden, and were briefed on GTRI's contributions to Operation Desert Storm.

Director Don Grace told the Board that concerns about changes in federal overhead rates and the downsizing of the Department of Defense have led GTRI to diversify beyond its traditional sponsors. But he noted that despite this "unusual year," GTRI increased its research awards by 11% over the previous 12 months.

Executive Associate Director Bob Shackelford briefed the Advisory Board on a proposal from the U.S. Office of Management and Budget to cap the administrative overhead rate paid by the federal government at 26%. He also described new prospects for sponsored research, and warned that budget problems—specifically, an inability to offer significant salary raises—could hurt GTRI's efforts to retain its top performers.

Congressman Buddy Darden suggested the Congress may focus more attention on basic research through programs such as DARPA, which he said has a proven track record of advancing high-value technologies. He also discussed how lessons learned in Desert Storm will affect procurement efforts in the future.

The U.S. ability to destroy Iraq's command and control structure played a decisive role in the outcome of the Gulf War, Laboratory Group Director Jerry Carey told the Board. He noted that GTRI researchers worked night and day to rush modifications of several key systems into the field. Computer systems developed in GTRI helped pilots plot the best routes through hostile territory.

The State Advisory Board provides input on how GTRI can serve the needs of the state. Members of the Board come from across the state and represent a broad range of occupations, including legislators, businesspeople, journalists and University System administrators. ❑

Getting the lead out

By Lincoln Bates, EDL

Lead poisoning and kids made the cover of *Newsweek* in July, conferring the stamp of "national issue" on the health risk of lead. Public awareness may be a recent phenomenon, but GTRI researchers have been working on this problem for four years and efforts are expanding.

In June, the Environmental Science and Technology Lab (ESTL) began delivering a two-day course to public housing authority representatives across the country. The course was developed via a cooperative agreement with the U.S. Environmental Protection Agency (EPA) and the Department of Housing and Urban Development (HUD). To be offered 15 times by October, the course will train some 3,300 officials to manage lead-based paint and to implement HUD's lead-based paint guidelines. Aspects include health hazards, legal ramifications, insurance, abatement work, hazardous waste issues, worker protection, and federal regulations.

"The course has been an eye-opener for many attendees," says course director Dave Jacobs.

The lab trained a nationwide network of risk assessment firms last year, he says, and it has helped establish standards for laboratory analysis of lead dust samples. "We also contracted with EPA to assess test kits that people can buy to check for lead in their homes," says Jacobs, adding that the kits are not very effective, but they might be the best technology available at that level.

Just how extensive is the lead problem? An estimated 3 million tons of old lead paint are in 57 million American homes. According to a 1990 HUD survey, 90% of all nonelderly public housing units built before 1980 have lead-based paint in them. Nearly 75% of all private housing built before 1980 contain some lead paint; 20 million of those homes have too much lead and 3.8 million of those have children living in them. Reportedly, one in six children under age 7 has enough lead in his blood to be at risk.

Children face the greatest danger because their developing nervous systems are more susceptible to lead poisoning and because they're more likely than adults to transfer lead-contaminated dust from hand to mouth.

Just how extensive is the lead problem? An estimated 3 million tons of old lead paint are in 57 million American homes. Reportedly, one in six children under age 7 has enough lead in his blood to be at risk.

Minuscule amounts—1 milligram daily—in childhood can result in hyperactivity, behavior problems, learning deficits, and other disorders.

Paint is the major, but not the only, source of lead. Elimination of the substance from gasoline has helped, but one noxious legacy from the leaded-gas era is lead in the soil. Most structural steel has lead paint on it, and demolition of structures such as bridges can release lead into the environment. Smelters and battery plants may be localized polluters. EPA estimates that lead in water causes at least some exposure. Consumers may encounter lead in ceramic glazes or old toys. And home remodelers, both professional and do-it-yourselfers, can endanger themselves if they don't take proper precautions against lead dust.

In 1990, ESTL began working with the Macon Housing Authority to assess the lead-based paint in its structures targeted for upgrading. The ongoing project, notes Jacobs, has enabled researchers to (1) evaluate new HUD guidelines, (2) field test a portable lead analyzer developed by ESTL's Chris Papanicolopoulos, (3) look at various abatement technologies, (4) conduct worker surveillance, and (5) address the hazardous waste problem.

According to Jacobs, the lead contamination issue won't be quickly resolved. ESTL researchers have considerable work ahead of them, including more evaluation of test kits, further research on testing and abatement methods in Macon and Augusta (and possibly Atlanta), development of protocols for in-place management of lead-based paint (it is impossible to deal with all buildings at once), work with the federal Centers for Disease Control to establish a statewide prevention program, and training of local health department officials in assessment of abatement practices. Also, he adds, there's a need for a national clearinghouse to compile and examine data on lead-based paint—another possible niche for GTRI to fill. ❑

Emergency loan procedures announced

New, streamlined procedures for employees who need emergency loans have been announced by Dr. Linda Martinson, Vice President of Planning, Budget and Finance.

Any permanent employee of Georgia Tech, who has fringe benefits, is eligible to submit a request for a loan not to exceed one week's net pay for a maximum of $300 and no more frequently than three times a year.

These no-interest loans are for use ONLY in financial emergencies, such as car repairs, major appliance failure, illness or death in the family, and similar unexpected events.

GTRI employees needing an emergency loan should contact Marianne Thompson in the Human Resources office (894-3445) for further information and a copy of the loan request form. The form contains an authorization for the Office of Payroll and Records Services (PARS) to deduct the amount of the loan from the employee's paycheck in installments not to exceed one week's net pay.

The loan funds will be available within 24 hours of the time the employee delivers the request to PARS. ❑

Focus on Quality

Upcoming courses include seminar led by TQM founder

Two TQM education opportunities are coming up in September, and GTRI's TQM Director, Fred Cain, is urging GTRI staffers to take advantage of them.

The first opportunity is a two-day seminar in Atlanta on September 5-6. It features Dr. Edwards Deming, a world leader in the quality field whose teachings helped Japanese business transform itself to achieve an "industrial miracle" after World War II. The seminar, "Instituting Dr. Deming's Methods for Management of Productivity and Quality," is being sponsored locally by the Atlanta Area Deming Study Group. Its objective is "to enable participants to develop a refined understanding of Dr. Deming's management principles toward a goal of instituting those principles in their workplaces." For more information, see your lab director or service department manager.

The second opportunity is a new Georgia Tech course that has just been developed by Dr. Jane Ammons of the School of Industrial and Systems Engineering. She will offer the course—*ISyE 4897: Special Topics in Total Quality Management*—for the first time during the fall quarter on Tuesdays and Thursdays, 8-9:30 a.m. Dr. Ammons has invited GTRI faculty and staff to audit the course.

"This is an introductory course in the philosophy and application of Total Quality Management," Ammons says. "Students should gain an understanding of what TQM is, how it is being utilized in industry and business today, and basic skills for its application."

Her background includes working with Dr. Deming, as well as several organizations, both large multi-national corporations and small nonprofit entities, in the implementation of TQM. She has conducted TQM short courses for both GTRI and the GIT Business Office. Currently, she is serving on a task force to establish the National Quality Engineering Education Award.

Call Dr. Ammons at 894-2364 or PROFS JAMMONS if you would like to audit her course.

User-Support Councils established

GTRI is establishing six Lab-Director User-Support Councils as part of the TQM process. The charter of each council is to assess the merit and effectiveness of support systems, services and resources, and then to make or recommend improvements and corrections.

The participants of each council will include the lab directors sharing a particular MAPS group, as well as the MAPS group leader and the Facilities Management building supervisor. They will address issues of local interest and will have the forum to build a working rapport. They also will have the opportunity to agree on and the authority to implement improvements when within their means to do so. When implementation actions are beyond the means of the council, the recommendations will be forwarded to OOD and other responsible parties.

Each council has the prerogative to set its own modus operandi that works for it. However, the TQM Director will meet at least once a quarter with each council or its chairperson to review progress.

All GTRI employees are encouraged to interact with their supervisors to bring appropriate issues to the forefront for action. ❑

Two GTRI labs to be realigned

GTRI's Executive Council has decided to realign the mission areas of two laboratories and merge their staffs into existing lab units. The labs are the Electromagnetic Science and Technology Laboratory (EMSTL) and the Engineering Sciences Laboratory (ESL).

The Council agreed in July to disband EMSTL and divide its staff between the Microwave and Antenna Technology Development Lab (MATDL) and the Signature Technology Lab (STL). In early August, a decision was reached to realign ESL and reassign its staff and research mission areas to the Electronic Support Measures Lab (ESML).

GTRI Assistant Director Pat O'Hare said these decisions were made because both EMSTL and ESL lacked the backlog of research projects necessary for continued financial stability. He added that MATDL, ESML and STL have been significantly strengthened by their new staff members.

According to O'Hare, a committee chaired by Neal Alexander of MAL recommended that EMSTL be dissolved. He called this report a "spectacular job...the most impressive report we've seen."

Associate Director Ed Reedy added: "The realignment and absorption of ESL into ESML was deemed necessary by the Executive Council to take full advantage of ESML's currently strong financial position and to solve a relatively severe financial situation that has developed in ESL over the past year or so."

Ivy helps set software engineering standards

Richard Ivy of the Threat Systems Development Laboratory recently was part of an IEEE-sponsored U.S. delegation to the 1991 Plenary of ISO/IECJTC1/SC7, an international standards development body concerned with software engineering. The Plenary, which was held in Stockholm, Sweden, June 10-14, was attended by 81 delegates from 20 countries. Ivy participated in several meetings of the Advisory Group for SC7 and SC7 working groups, and gave presentations on an Information System Environment Model which he is developing and on software engineering terminology.

At the closing session, Ivy was elected chair of a committee on Software Classification and received a special vote of appreciation from SC7. He has represented GTRI on the international body for the past three years, serving on a committee concerned with developing a Software Engineering Reference Model. He will host meetings of both committees at GTRI November 18-21.

At the International Test Conference in Nashville (TN) October 31, the IEEE Computer Society will award Ivy a certificate of appreciation for his technical contributions to ISO/IECJTC1/SC7. ❑

TQM founder Dr. Edwards Deming leads a seminar in Atlanta. And Georgia Tech Professor Jane Ammons invites GTRI staffers to audit a TQM course fall quarter.

Two labs have been dissolved and their staffs reassigned to three other labs.

Profile & Insight

O'Neil goes to Oklahoma: Leaves behind energy legacy

By Lea McLees, RCO

Energy.

That word describes not only departing laboratory group director Dr. Dan O'Neil's research interests at GTRI—it also describes one of the man's most appreciated attributes, say co-workers such as Don Wilmot, director of GTRI program development.

"He's a very aggressive, positive guy," Wilmot says of O'Neil, who is leaving GTRI July 31 to become the University of Oklahoma's first-ever vice president for research. "He's helped our office and all the lab directors take a positive attitude toward expanding into new customer/research areas."

ESTL Director Dr. John Nemeth agrees. "Incisive, high-energy—just as quick a study as I've ever run across," Nemeth says.

O'Neil, a principal research scientist and GTRI employee for almost 16 years, leaves his directorship of the EOL, ESTL, MSTL and PSL labs to take on research policy and administrative responsibilities at the 24,000-student University of Oklahoma. Among his goals is promoting growth in sponsored research and other funding, which currently totals $75 million to $80 million.

O'Neil also will serve as dean of the graduate college at the university's campus in Norman, Oklahoma, overseeing about 4,000 graduate students and nine colleges. He plans to work toward increased enrollment of doctoral students, particularly in engineering, sciences and business.

Additionally, O'Neil is to direct the university's Sarkeys Energy Center, which has an externally sponsored program of $10.5 million and involves an estimated 1,000 students in energy-related master's and doctoral programs. He also hopes to teach a graduate course in organic and physical chemistry of polymers one semester each year after he's settled.

"It's clear that part of the major growth at universities will come with an emphasis on energy and environmental research," O'Neil says.

"We [GTRI] also hope to achieve the application of what we've learned in defense work in the non-defense arena. How can this work be applied to areas such as the environment and manufacturing?"

— Dan O'Neil

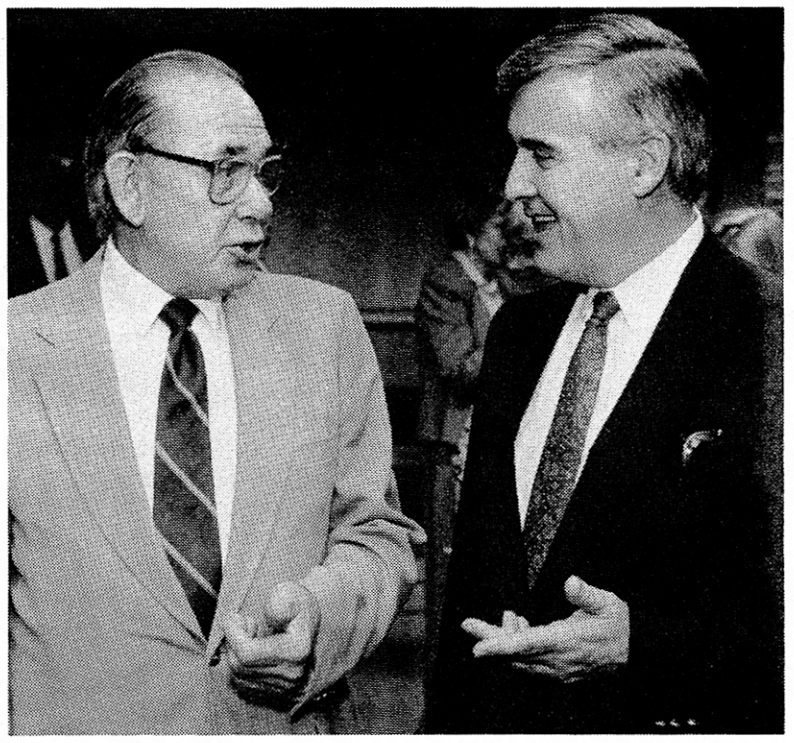
16 years at Georgia Tech

O'Neil joined GTRI, then called the Engineering Experiment Station, in 1975. He had just helped to establish the new University of Limerick in Ireland, that country's first institute of technology. O'Neil set up a cooperative education program there that today enrolls 3,400 students.

As co-manager of program development since GTRI's 1990 reorganization, O'Neil has been responsible for enhancing GTRI's work in non-weapons technologies such as the environment, energy and transportation.

"As an institution, we are trying to build up our base in basic and applied research and exploratory research for the Department of Defense," O'Neil explains. "We also hope to achieve the application of what we've learned in defense work in the non-defense arena. How can this work be applied to areas such as the environment and manufacturing?"

O'Neil has worked actively with conservation and renewable energy programs, such as solar thermal energy and entrained flow pyrolysis, the production of biomass oil from wood scraps or other agricultural refuse. The Georgia Tech process is 72% efficient, producing in excess of 60% oil, and is judged one of the leading biomass fuels and energy technologies in the world.



GTRI Director Don Grace (left) and Dan O'Neil enjoy a jovial moment at O'Neil's farewell reception July 30. Dr. O'Neil will be the first-ever vice president for research at the University of Oklahoma. (Photo by Joe Schwartz)

O'Neil has enjoyed his work at Georgia Tech because it offered him a variety of different opportunities. "The diversity of the projects with which you can get involved at a research institute is probably most satisfying for a person who doesn't want to be a narrow specialist," he explains. "I think I've been able to help establish a pretty high profile nationally and internationally for Georgia Tech in energy, particularly renewable energy."

And constant growth has provided new challenges. GTRI has expanded from a $10-million operation to a $100-million operation in O'Neil's 16 years here, and it has been called upon for expertise in 50 countries around the world. O'Neil himself began with a three-person group and now works with around 350 people in a variety of technologies ranging from microelectronics to advanced materials.

"We are an excellent model of what can be done with state investment," O'Neil says. "It is rare to find anywhere in the world an entity which returns $10 for every $1 the state puts into it."

With growth, GTRI has become an 'engine of change' in Georgia, O'Neil adds. "We've contributed to the transition from agriculture to manufacturing and service sectors," he says. "We have done much to elevate the perception of Georgia as something more than a rural southern state."

He emphasizes the 'we.' "I've been able to work with a lot of people who've been good, conscientious and productive—a lot of people to admire," O'Neil says. "One thing I've learned is that no one person can do anything by himself. It takes attitude, aptitude, tools and application to get things accomplished."

And O'Neil possesses qualities that make him good at working with others, says Kathryn Logan, interim MSTL director. "I've been impressed by his enthusiasm, cooperation and leadership capabilities," she says.

Future plans

All those qualities—and O'Neil's boundless energy—should help propel an endeavor he has proposed to Georgia's Washington legislators and will continue to participate in from Oklahoma: development of regional centers for renewable energy around the United States.

"My intention was to get some sort of technological research and demonstration center established in Atlanta and associated with Georgia Tech, which would be mandated and approved by the U.S. Department of Energy and Congress," he explains. "The centers would help spawn industrial companies which would preferentially locate in certain areas, be supported by state investment, and have the university infrastructure to support them."

Georgia Tech has maintained a history as a national and international leader in renewable energy, despite the federal research and development cutbacks of the 1980s and low oil prices. The school has been one of the last major universities working in renewable energy, making it a logical choice for one center site, O'Neil points out. Also important are the presence of excellent researchers here, as well as home-grown technologically and economically viable processes which can contribute to long-term energy solutions.

"With my large energy program at Oklahoma, the involvement of major players in the environmental field, and work with people here who won't be dropping the ball—hopefully, within 12 months time, we can get legislation in place to make it a win-win situation for all parties concerned," O'Neil says. ❑

☞ *Special Interest Ad*

Wanted: Ambassadors to Korea

Do you like to travel? Have you ever wanted to experience life in another country in depth, not just as a tourist? Do you believe the way to world peace is through people-to-people friendship and understanding? Then The Friendship Force is for you!

The next outgoing exchange scheduled by Friendship Force Atlanta is to Seoul, Korea, September 11-25. The entire cost of the flight and the first week's hosting in Korean homes is an amazingly low $899, thanks to special assistance from Delta Air Lines. The optional tour the second week costs an additional $845.

Interested? Contact Martha Ann Stegar (RCO) at 894-6988 or PROFS MSTEGAR. But hurry! Only a few places are left!

Note: *If you are looking for kindred spirits to share a favorite activity or interest with you, why not run an ad in the* Connector*? To place your Special Interest Ad, mail it to GTRI* Connector*, RCO/GTRI 0800 or PROFS it to MSTEGAR.*

(Following is a statement prepared by President Crecine in response to the proposed Office of Management and Budget cap of 26% on research overhead rates. It has been distributed to Georgia's congressmen and senators, and to OMB as part of Georgia Tech's comments on the proposed cap.)

Federally funded research in universities: impact of proposed OMB indirect cost provisions

John P. Crecine, President
Georgia Institute of Technology
July 1991

Most of the nation's research and development functions are carried on outside of the Government, in private and university-based research facilities, and are conducted by non-Federal employees. Most of the Federal Government's extramural research activities are conducted by the top 100 research universities in the United States. *Historically, there has been a clear and consistent position taken by the Federal Government in terms of the financing of research conducted by non-Federal institutions, namely, a policy which allows the full recovery of all costs associated with the conduct of the research under Federal research contracts.* During the last decade there has been a clear trend toward more and more sharing of the total costs of research, where either the institution performing the research or some other agency (usually an industrial firm or State government in the case of public universities) share in financing the recovery of total research costs—"cost sharing."

The rules for determining total costs have become increasingly elaborate and, in the case of research universities, subject to tighter restrictions and definitions of exactly which costs and institutional operations were directly associated with research. The Government has traditionally viewed this as a cost accounting problem and has focused on increasingly precise measurement of those costs directly associated with research (e.g., increasingly elaborate procedures for measuring the time a faculty member spends directly on research as opposed to the educational and service activities of a university.

Over the past 20 years, the rules for calculating indirect or overhead costs associated with research have become more elaborate, precise, and restrictive as well. Research universities have educational, service, and research missions. Allocating central costs among the varied activities of a research university so as to determine costs that legitimately belong in the pool of indirect costs that can fairly be attributed to research has become more complicated and restrictive. Universities with significant numbers of Federally financed research contracts often have a team of Federal auditors permanently located on their campuses, examining procedures for keeping accurate records of direct costs attributable to specific research projects and auditing those costs the university includes in its indirect cost pool. Future research contracts between the institution and the Federal Government then include an indirect cost charge which is a percentage of the direct costs. This charge is based on Federal auditors' recommendations.

More than a decade ago, OMB imposed new procedures for keeping track of researchers' time spent on particular research projects (OMB Circular A-21 guidelines). This was in response to an abuse where an individual was simultaneously billing the government for 100% of his salary for research at Stanford University on a Federal contract and for 100% of his salary for research at Stanford Research Institute on another Federal contract. The OMB response was to force research professionals to keep more accurate track of actual time spent on Federally funded research activities.

Recently, OMB has proposed new procedures for calculating the elements of indirect costs attributable to research that can then be recovered by the institution through an indirect cost charge on future research. Indirect cost rates for current and future contracts are now based on audited indirect cost experience by the institution in previous years, so charges temporarily lag actual experience. There are several broad categories of indirect costs and explicit accounting guidelines for each. One of these categories is "administrative" expenses. Another category is "depreciation or use allowances for buildings and equipment" associated with research.

The regulations governing research cost reimbursement have always been in the context of "total cost recovery" for the institution or university.[1]

In June 1991, OMB proposed a set of regulations that would limit the administrative component of indirect cost reimbursement to 26% of a research project's direct costs. The proposed[2] 26% administrative cap was in response to another set of abuses by Stanford University. The 26% cap is independent of the true cost structure of the institution conducting the research, the nature of the research, or any consideration of the accounting system employed by the institution which determines whether a particular cost is the basis for a direct or an indirect charge. Whatever the real evidence, the answer to the question (as determined by Federal guidelines and accounting procedures) of the size of the administrative component of indirect costs, the Federal government will only allow the institution to recover up to 26%. If the real, indirect administrative costs are more than 26%, the Federal government will not allow full cost recovery. Based on current Federal auditing procedures, all or nearly all research universities' true administrative costs exceed 26% of direct costs.

This artificial constraint on full cost recovery destroys the consistency in Federal policy to date and will not allow full recovery of the costs of research. *It is interesting to note that the proposed regulation applies only to universities and not to the other providers of Federal research services, whose indirect costs are generally 50% to 100% higher than those of universities.*

The artificial constraint on full cost recovery, in effect, creates powerful incentives for a university to internally organize its research in a way that isolates research from other university missions (e.g., separates research from education) so that many administrative charges can be direct costs, thus escaping the 26% cap, rather than indirect charges and subject to the cap. For example a department of electrical engineering or chemistry in a research university would usually use the same organization to supervise educational programs as to supervise its Federally sponsored research programs. Under these circumstances, departmental administration would be an indirect cost that has to be distributed between education and research functions. With a 26% cap, there is a powerful incentive to conduct all research in an organization unit that only does research so that departmental administrative costs would all be direct charges and not subject to the 26% cap. *The actual effect of the proposed OMB provision to cap indirect administrative costs at 26% is to dictate a particular kind of organizational arrangement in research universities* and could be seen as overly intrusive. The real total costs of research would most likely be higher under an arrangement where research is separate from other university functions, creating the need for dual administrative structures.

If, indeed, the purpose of the Federal government is to determine accurately the total costs of Federally funded research activities in universities, and to prevent inefficiencies and overcharges, creating an artificial cap on *one* cost component does not seem to be a sensible or fair way to approach the issue. More careful auditing and more precise accounting would seem more appropriate.

If fairness and accuracy in determining total research costs is the objective, then careful examination of existing Federal reimbursement practices for use of equipment and facilities would seem to be required. As research, especially in the physical sciences, engineering, and medicine, becomes more capital intensive, this component of research costs becomes more and more important. If one examines equipment and facility usage charges or depreciation expenses, one instantly sees that universities seriously underrecover research costs. Federal cost-recovery guidelines assume a 50-year life (2% depreciation/usage charges) for buildings and research facilities, a 15-year life for equipment and instruments, and a 7-year life for computers. Each of these guidelines leads to a 100%-300% under-recovery of capital costs. *If the Federal policies toward recovery of indirect costs of research by universities are to be re-examined, then clearly the largest single "abuse" is the gross disparity between true equipment and facility costs and the charges allowed by the Federal Government.*

The primary impact in research universities, public or private, of the under-recovery of total research costs—whether that underrecovery is due to an artificial cap on administrative costs or grossly inadequate equipment and facility charges—is a negative impact on undergraduate education. Quite simply, the costs of the under-recovery of research costs are, nevertheless, real costs incurred by the institution and must be financed somewhere else in the budget. In private universities, this must come partly from private fund-raising efforts, but more often from higher tuition charges to their students. In public universities, it primarily comes in the form of higher student-faculty ratios, State appropriations, and higher tuition costs. *The proposed regulations (26% cap) and existing policies (under-recovery of capital costs associated with research) ultimately attack the educational programs of the nation's public and private research universities.*

If the policy objectives of the Federal Government are aimed at weakening the undergraduate educational programs of the nation's research universities or at reducing the amount of Federally sponsored research done in universities vs. other for-profit and not-for-profit institutions, then it would seem preferable to use more direct approaches. If the policy objectives are to reduce overall costs of Federally sponsored research and create incentives to fairly report true costs in determining both direct and indirect charges, then there are much better ways to proceed—approaches that should be applied to all institutions performing research services under Federal sponsorship. ❑

Footnotes:
1 It may be that the Federal granting agency requires some other entity to "share" the costs by participating in the financing of the research project, but always in the context of an accurate calculation of total project cost.
2 This proposed regulation was recently embodied in the House NSF Authorization Bill (H.R. 2282).

President John P. Crecine on the 26% overhead rate cap:

"The proposed regulation applies only to universities and not to the other providers of Federal research services, whose indirect costs are generally 50% to 100% higher than those of universities."

"Clearly the largest single 'abuse' is the gross disparity between true equipment and facility costs and the charges allowed by the Federal Government."

"If the policy objectives are to reduce overall costs of Federally sponsored research and create incentives to fairly report true costs in determining both direct and indirect charges, then there are much better ways to proceed—approaches that should be applied to all institutions performing research services under Federal sponsorship."

Queries & Quotes

"How do I ...?" Ann Campbell and Joe Schwartz share some practical 'how to' tips.

Information, Please!

How to get a translation for a foreign language article

By Ann Campbell, Library

Did you ever find the perfect article—only it was in a language you can't read? You need a translation. Maybe one already exists. If not, you will have to arrange for your own. Where can you find one and what will it cost?

Locating existing translations

• **Translated journals**, English versions of foreign language journals, appeared in large numbers in 1958 after the launch of Sputnik. Initially, any Russian scientific or technical journal available to the West was translated. By 1962, key Russian journals were identified, and published translations for these journals continue. Japanese and other foreign language journals have been added to the translated journal literature. Some journals are translated cover-to-cover. Others translate selected research articles and synopses of untranslated articles. Another type of published translation journal contains selected articles from several key journals on a subject. The source journal of a foreign language article can be checked for an English version in *Journals in Translation* (Z6944.T7 J6X in the Reference Department).

• **World Translation Index** is a database of over 175,000 existing translations in science, technology and medicine. Translations made since 1984 are covered. They are in western languages and from any language source. Some 65% of the articles are translations into English. About half are from documents originally published in Russian. Another 30% are from Japanese or German originals.

Translations cited in WTI may be obtained in several ways. Many are published translations and can be obtained wherever the journals are held. Citations to translations not published in translation journals indicate the translating organization from whom the translation can be ordered. In addition, the International Translations Centre provides copies of translations cited in WTI. Price of an ordered translation ranges from photocopy costs to more than $100. Call the Library at 894-4511 for a search of this database. The print version of *World Translation Index* (A7401.W622X) also is available in the Library.

• **The National Translation Center** at the Library of Congress is creating its own database. The database contains citations to one million translations of journal articles, technical papers, and patents in the natural, physical, medical and social sciences. Forty percent of these items are owned by the Center. Access to this database is available only through the Center, which provides searches ($10) and copies of translations it owns ($35). Payment can be by check or credit card. Contact the Center at: National Translation Center, Cataloging Distribution Service, Library of Congress, Washington, DC 20541, telephone (202)707-6147.

Finding a translator

If you cannot locate an existing translation, you need to find a translator. Translating requires a high degree of general education, excellent literary and verbal skills, complete fluency in source and target languages, as well as an understanding of cultural mores and customs, technical language, business practices, and etiquette. Professional translators are accredited by the American Translator Association, U.S. Department of State, and the U.S. Federal Court System.

• **The Modern Languages Department** at Georgia Tech has faculty skilled in Russian, German, French, Spanish, Chinese and Japanese. Contact Susana Rodriguez or Stefanie Scott at 894-7327 for current availability and pricing.

• **Georgia Tech Information Services** (894-4511) at the Library maintains a file of translation services that specialize in scientific and technical translations.

• **The Atlanta Association of Interpreters and Translators, Inc.** (587-4884) is a nonprofit professional association that can put you in touch with independent professional translators. There is no charge for the referral service.

• **The Yellow Pages** of the telephone book lists "Translators & Interpreters." Some firms offer specialization in legal or business documents, subject areas such as science or medicine, or in the less common languages. These firms also provide interpreters—if you have a visitor who is not fluent in English.

What will a translation cost?

Most translation firms charge a set price per 100 words. Be sure to inquire about the minimum. It varies from a low of $25 to a high of $65 for the eight firms I surveyed. The Translation Company of New York, Inc. prices are typical. These are per 100 words from the following source languages into English:

French, Italian, Spanish, Portuguese, German	$12
Dutch	$13
Danish, Norwegian, Swedish	$16
Russian, Polish, Romanian	$16
Japanese, Korean, Chinese	$17
Arabic, Farsi, Hebrew	$18
Greek	$24

Independent translators usually charge by the page or document. Some will want to see the document prior to giving a price.

Turnaround time varies from three days to two weeks. Most translators will provide rush service for an additional fee. Be sure to inquire about this service if you have a deadline.

For assistance with translations or any other research needs, please contact me at the Library at 894-4511. ❑

Georgia Tech
RESEARCH INSTITUTE

How to shoot a picture that's worth 1000 words

By Joe Schwartz, RCO

If you can master the basic skills required in using a camera in a lab setting, then you can get usable photos of your experiments. Once this point is reached, you can move on to looking at the subject and trying to compose an image that says everything you want to say while leaving out things you don't need to mention. (For example, you might want to say, "Here's our cool piece of equipment, isn't this worth giving us a few million bucks of funding?" as opposed to saying, "Here's our really cool piece of equipment, and some paper towels, and the lab's favorite soft drink, and there's the edge of the table, and there's half of our lab assistant in the background. Could we please have millions of dollars?") At the risk of making my job obsolete, I think there are some photo tips I could share that would help even the most seasoned researcher take better photos.

Let's go over some basic photographic concepts that will help you take better pictures of your experiments. Since there are so many different possible film and equipment configurations, let's consider equipment before moving on to composition and other tricky photo stuff.

FILM

The three main film types are color slide, color print, and black and white print; depending on how the photos will be used, you will need to use one or more of these films. If you are sending your photos to a publication that uses black and white, you'll want to use that because, if you send a color print, it'll end up looking flat. If you are sending it to a publication that uses color, you'll want to use slides. If the only purpose of the pictures is for display, then color prints are fine; if you take color prints, you can make black and white prints directly from the negatives, so they're reasonably versatile. You can get black and white or color prints from slides, but it is a fairly expensive and tedious process.

All these films come in various speeds. To keep things simple, let's only worry about two speeds—100 and 400. It's even easier if you're shooting black and white, because while you can choose from 100 and 400, the 400 looks so good that there isn't really any reason not to use it. So if you need to shoot black and white, go to your local camera shop and ask for Kodak Tri-X—you can't go wrong.

Color is a little different. If you're shooting something that doesn't move, and you've got decent lighting, then 100 is fine. You can also use it if you have a flash, or if you are taking a time exposure (on a tripod). If you're shooting something in low light, a computer screen, or something that moves, then use 400. Today's films are good enough that you can shoot 400 film without a great loss in quality over 100. There are faster films, for shooting at 1600 and even 6400, but that's another article altogether. Kodacolor Gold is a good print film, but for slides I'd go with Fujichrome. ➛

CAMERAS

Automatic (point and shoot) cameras can handle many simple photo tasks, but keep in mind the focus probably won't be as tight as if you could do it yourself, and you can't shoot computer screens and other things that require time exposures. Often they will have an optional fast shutter speed so you can catch quick events, and some even have a choice of lens. They can be particularly handy in the field when you don't want to lug a huge bag of camera gear with you. These cameras take all the guesswork out of taking pictures, so if you have trouble with basic camera operation, then this is the way to go. If you don't need to use an automatic camera, then don't. The focus can never be as good as you could do yourself, and your options are somewhat limited by them.

If you have a standard 35mm SLR, then you'll be wanting to make some choices. There are a few things to keep in mind here. First, your shutter speed and your depth of field play against each other. In other words, you can shoot something fast and only focus on a little of it, or you can shoot something slow and keep more of it in focus. If you use a tripod and are shooting things that stay fairly still, then you can get as much depth of field as you want.

The f/stop is a measure of how much light the lens lets into the camera: the more light, the bigger the opening, the bigger the opening, the less depth of field you have. The numbers for f/stop are inversely related to the amount of light allowed through the lens. At f/22 the lens opening is very small, allowing less light through, which gives you a great depth of field. But to shoot at f/22, you need to either shoot at a very slow shutter speed, or use a really bright flash, or buy really fast film. At the other extreme, f/2 opens the lens very wide, allowing a lot of light in and giving a fairly shallow depth of field. Usually an f/stop of f/2.8 or f/4 is fine as long as you make sure your main subject is correctly focused.

Another thing that influences the depth of field of the lens is its focal length. A wide-angle lens (28mm) has greater depth of field than a telephoto lens (135mm).

Should you use a flash?

It depends on your subject and setting. Often you can get excellent results with existing light. If you need to use a flash, you are usually best off if you can point it away from your subject (toward the ceiling, for example) and put a white card behind it. Bouncing your flash in this way increases the amount of light coming from the ceiling, while at the same time it fills in the shadows that are caused by overhead lights because much of the light will bounce off the card behind the flash directly at the subject. This is an excellent way to avoid giving your subjects that "red eye" effect. It also keeps them from having a pitch black shadow on the wall behind them. You get less depth of field this way, but it's worth it.

What lens should you use?

By using a wide angle lens, you can show a very broad perspective. A typical focal length for this would be about 24mm. Close things are huge; distant things are tiny. By shooting right next to somebody's arm, I can make it look like a blimp. It's one of the reasons most researchers try not to insult me too much: fear of Goodyear arms, gigantic ears, and other 50's sci-fi body part mutations. Use that 24mm for equipment, especially if there's a lot and you can't get too far away. It's also a good lens to shoot a very close up shot of something REALLY small. Keep in mind you'll probably want to use a tripod to do that. Another benefit of this lens is its very broad depth of field; even wide open, a great deal remains tightly focused.

A 35mm lens is a favorite of mine. You can show lots of things and people, and for the most part they tend to retain their original shape. If you want to shoot a portrait, then an 85mm is an excellent choice. Granted not many portraits are required in research photography, but I'm just covering all the bases.

And, of course, if you're shooting really distant stuff, there are always expensive lenses in the 200mm and over range to do the job. If you need one, be sure and bring your VISA card (or a PO number), because these lenses don't come cheap, and their uses are somewhat limited.

Trick shots

There are a lot of experimental things that you can do to spice up your pictures. You can shoot at a fairly slow shutter speed to give the picture motion. Another interesting shot can be made by taking multiple exposures (using a tripod) on the same frame of film to show an experiment's progress on a single photo.

Lasers and computer screens

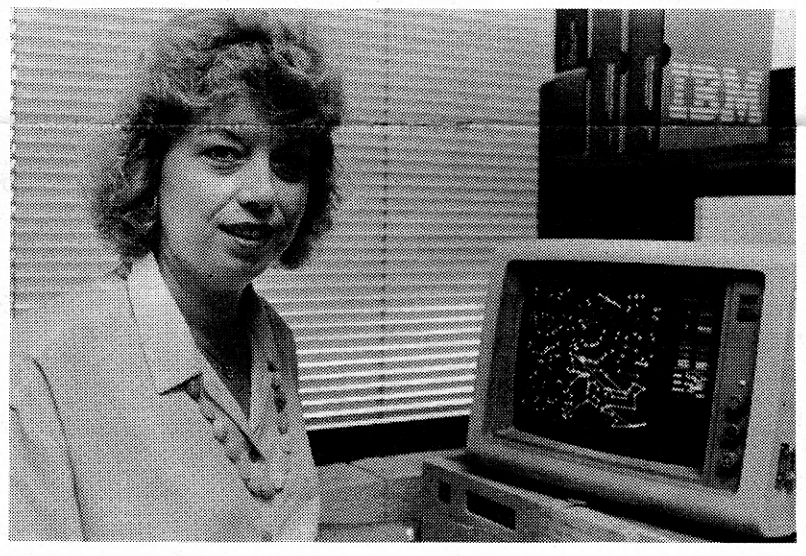
As you may know, it's really tough to get a decent photo of a lab setting that shows people working AND what's on a computer screen. To get just the screen by itself is easy: Just use about an 85mm lens, point straight at the screen, turn out the lights, and take about 1/15 of a second exposure (using a tripod). You'll need to bracket because light sources like computer screens can sort of trick the light meter in your camera. Bracketing is intentionally over- and underexposing some frames to be sure to get one that's just right.

To shoot a laser or a person working with a computer screen, you'll need to set up a tripod. In order to show both subjects, you'll need to use a flash AND a time exposure (about a 15th of a second for computer screens, a little longer for lasers). As before, this will need to be done in the dark. By determining how much light the screen puts out, you can determine how much flash to use, and, of course, bracket. It's hard to shoot someone you can't actually see or something that looks different than it will on film, but it really isn't that difficult. Get a light reading off the screen at 1/15 to determine its optimal f/stop, and then set your flash to provide that also. Since you're on a tripod and people won't be moving too much, you can focus before turning all the lights out. I can't emphasize the need to bracket enough.

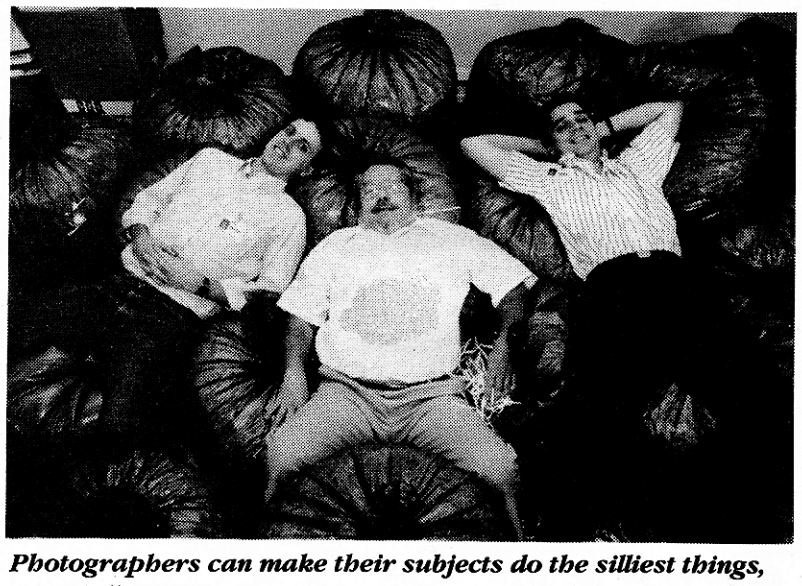
Remember, a famous (though probably now dead) photographer once said, "The difference between a good photographer and a bad one is the good photographer shows you one picture, the bad photographer shows you everything." Everything isn't going to always turn out perfectly. You won't get 36 great shots from a roll of film. Be happy with four or five. Take lots and remember: the trash can is our friend. ❑

The classic "pinhead" picture: The speaker (subject) is too small. Also, the flash illuminates only the foreground, leaving it overexposed, and the background (where the subject is) is too dark. A better photo would have been a close-up shot from a position in front of the audience.

Rule of thumb: Try not to pose your subjects in front of a window. Even with flash, the subjects receiving the full outdoor illumination look washed out.



This excellent photo shows both the computer screen and the person working at the computer--a difficult task. The photographer accomplished it successfully by darkening the room, then using both a flash and a time exposure. (See article for detailed "how to" tips.)



Photographers can make their subjects do the silliest things, especially to get a point across in an eye-catching, refreshing way. The point of this photo is: GTRI recycles paper.

Focus on Folks

Congratulations to Diane Aenchbacher and Kathryn Gilbreath, who recently received research support awards from Georgia Tech.

The *GTRI* Connector
Vol. 7 No. 8 July-Aug. 1991

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. The deadline for submission of copy is the first Tuesday of each month.

Editor & Design
Martha Ann Stegar, RCO
894-6988

Graphic Support
Jerry Webb, RCO
894-6985

Photography
Joe Schwartz, RCO
894-6980

Editorial Review
Patrick O'Hare, OOD
894-3490

Associate Editors
Lincoln Bates, O'Keefe
894-6091
Marsha Braswell, Cobb II
528-7750
Janice Davis, ERB
894-8229
Carey Floyd, Cobb I
528-7012
Eunice Kelsey, Services
894-6972
Joanna King, Baker
853-0460
Janice Porter, OOD
894-3401
Kathie Coogler Prado, CRB
894-7268

Professional Activities

Advanced Technology Lab

Don Bodnar attended the Administrative Committee meeting of the IEEE Antennas and Propagation Society in London, Ontario (Canada), and was nominated vice president of the society for the coming year. He also presented a proposal to have the AP-S annual meeting in Atlanta in 1997.

Computer Science & Information Technology Lab

John Gilmore was in Avignon, France, May 27-31 participating in an international conference on Expert Systems and Their Applications. He chaired a session on Environmental Analysis that explored situation assessment for autonomous vehicles, presented a paper on "Knowledge-Based Autonomous Systems," and participated in a panel discussion on "Artificial Intelligence for Military Operational Computerized Systems." He also had a paper entitled "Knowledge-Based Target Recognition System Evolution" published in *Optical Engineering*.

Congratulations to **Stuart McRae** and **Margaret Ray**, who have received their MS ICS degrees.

Economic Development Lab

At the annual meeting of the Georgia Society of Professional Engineers, **John Mills** was installed as president-elect for 1991-92 and received an award as the society's outstanding state officer for 1990-91.

Electromagnetic Environmental Effects Lab

Randy Pursley has received his BEE from Georgia Tech and is enrolled in the graduate program. Receiving their MSEE degrees from Tech were **Dan LaGesse** and **Ralph Herkert**.

Electro-Optics Lab

Dave Schmieder, Mike Cathcart, and **Ted Doll** will present a paper titled "Observer False Alarm Rate Effects on Target Resolution Criteria" at the 2nd Annual Ground Target Modeling and Validation Conference August 20-21, sponsored by the U.S. Army Tank-Automotive Command and the Army Belvoir RD&E Center.

Ted Doll will present a paper titled "Masking in Three-Dimensional Displays II: Effects of Spatial and Spectral Similarity" at the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics October 2-23. The paper is based on work performed in conjunction with Dr. Thomas Hanna of the Naval Submarine Medical Research Laboratory.

Huntsville Research Lab

The Future Technology Group moved into new modular offices in Building 5410 at Redstone Arsenal (AL). The move will enable the HRL staff to better support the Unmanned Ground Vehicle Project Office at the U.S. Army Missile Command.

Dr. **Barry Bullard** presented a paper entitled "Detection, Acquisition, Classification and Identification of Rotary-Wing Aircraft" (coauthored by **Patrick Dowdy**) at the 37th Annual Tri-Service Radar Symposium held at Peterson Air Force Base, Colorado Springs (CO) June 25-27.

Modeling & Analysis Lab

Chris Barnes coauthored "On the Design and Performance of Residual Quantizers," which appeared in the Proceedings of the Data Compression Conference, held at Snowbird (UT) April 8-10. He also coauthored with **Faouzi Kossentini** and Prof. **Mark Smith** (EE) "A Perspective View of Finite State Binary Residual VQ," a paper that was presented at the International Symposium on Circuits and Systems, held June 11-14 in Singapore.

Office of the Director

Jerry Carey has accepted a two-year appointment to the Scientific Advisory Board of the U.S. Air Force, beginning in October.

Radar Systems Applications Lab

At the 37th Annual Tri-Service Radar Symposium, **Guy Morris** presented a paper on "Cepstral Techniques Against Repeater Jammers," coauthored by **Sam Piper**, and **Linda Harkness** presented a paper on "Modern CFAR Parameter Optimization in an Electronic Warfare Environment," coauthored by **Mel Belcher** and Morris. Harkness also had a publish-only paper, "The Air-to-Air Electronic Countermeasures Model and Its Role in Radar System Vulnerability Testing." ❑

GTRI personnel receive Georgia Tech recognition

Research support awards

Two GTRI staff members received monetary awards for their outstanding contributions in support of research activities at the recent Faculty and Staff Honors Day. **Diane T. Aenchbacher**, administrative assistant, Microwave & Antenna Technology Development Lab, and **Kathryn L. Gilbreath**, artist I, Concepts Analysis Lab, each received $1,000 for her exceptional service during the period January 1, 1988-December 31, 1990.

GTRI reps to faculty committees

Recently elected to three-year terms on Standing Committees of the General Faculty were **Joe Parks** (TSDL)—*Faculty Benefits*; **Virginia Jory** (ATL)—*Statutes*; **Nikolas Faust** (EOL) and **David Fentem** (ESL)—*Software*. ❑

Personnel News

Communications Lab

Dr. **Bruce A. Harvey** joined COML July 8 as an RE II. He is a recent graduate of Georgia Tech, earning his PhD in EE with specialization in communications theory.

Computer Science & Information Technology Lab

CSITL welcomed RS I **Jeff Moss** and senior secretary **Terrilyn Carlton** in May. Both are working on the FORSCOM Automated Intelligence Support System project.

Concepts Analysis Lab

Joining CAL in June were **D. Jason Collins**, RE I, **Donna M. Favors**, administrative secretary, and **Lisa E. Benedict**, student assistant. Donna previously worked in CAL from 1986 to 1988.

Economic Development Lab

Susan S. Lewis is the new administrative secretary in the Savannah Regional Office, and **Charles R. Davis** is a new full-time project coordinator with the Southeastern Trade Adjustment Assistance Center.

Yvonne Thomas resigned in mid-July.

Electromagnetic & Environmental Effects Lab

Joe Harris transferred to EEEL from EMSTL.

Management & Project Support

Carey Floyd has been promoted to staff assistant.

Microwave & Antenna Technology Development Lab

MATDL welcomes former GRA **Jamie L. Thomas**, RS I, **Paula M. Ross**, clerk I, and ATL transferee **Kerry P. Pullen**, SRE.

Esko Jaska resigned in June and is now with the U.S. Peace Corps.

Michael R. Sorensen, David Paul Meeks, and **David A. Price** have transferred to TSDL.

Research Communications Office

Joe Schwartz has been awarded a presidential fellowship to pursue a doctorate in marketing at Georgia Tech and is leaving RCO, effective September 20.

Threat Systems Development Lab

Faye Carpenter has transferred from MAPS 6 to TSDL.

The lab also welcomes **Eric L. Baker**, research technician I, **Yvonne M. Brown**, graphics technician I, and co-ops **Douglas E. Hope** and **Andrew M. Kroll**.

Richard Smith and **Henry Strezelecki** have terminated their employment.

Craig Kirkland is leaving August 2 to pursue a PhD, and **Don Esper** is retiring July 31. ❑

Personal Notes

Wedding Bells

Larry Edens was married to Mary Ann Dutcher June 12 in Savannah.

Cradle Roll

Congratulations to EEEL staffer **Joe Harris** and his wife, Terri, on the birth of son Dylan Andrew May 29; to Diane and **Joey Goodroe** on the birth of Benjamin Seth May 31; and to Laura and **Mark Wheeler** on the birth of daughter Lindsey Anne.

Coretta and **Mike Lee** (TSDL) have a new daughter, Christa Ashley, born June 1.

Julie and **Fred Kirksey** (MATDL) are the proud parents of a son, Caleb Andrew, born July 11. Caleb will be in Egleston Hospital for a month or so, due to some lung complications, but the doctors believe he will be fine.

CSITL welcomed more babies—all boys: Jackie and **Stuart McRae** had Maxwell May 20, Bill and **Kelly Denny** had Damien Conlieth July 8, and Greg and **Terri Smith** had Ryan Christopher July 30.

And RIDL welcomed Moore babies: Robin and **Allan Moore** had a daughter, Ashley Michelle, June 26, and Carla and **Steve Moore** had a son, Thomas Edwin, July 3.

Sick Bay

Wishes for a speedy recovery to **Bettye Dulaney** (EEEL), who had surgery in early July. ❑