AI Aids Diagnosis of Cardiovascular Disease
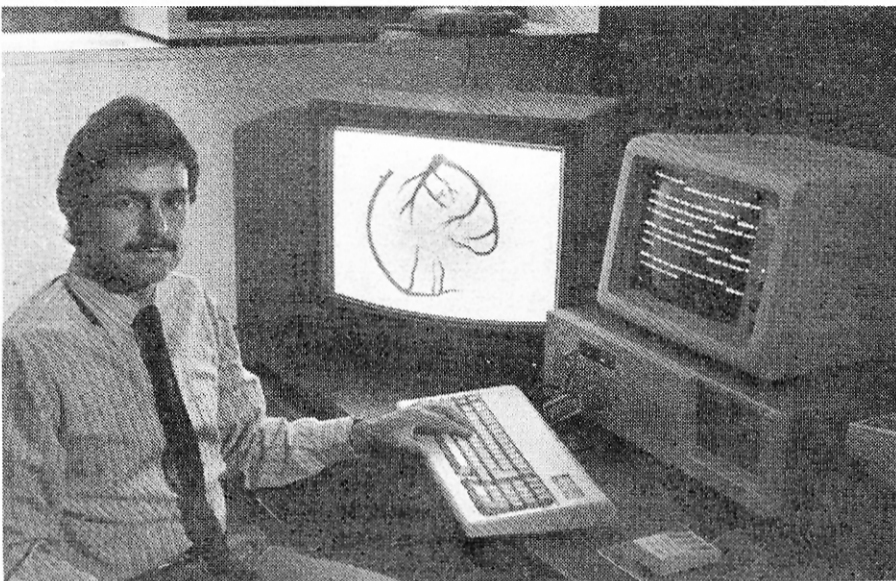
Norberto Ezquerra (ECSL) and a team at Emory University are developing artificial intelligence techniques to help diagnose heart disease. Here he is studying a digitized arterial mapping diagram on a display monitor. (Photo by Charles Haynes)

The detection of heart disease is very serious business, and the decision on the course of action to take if disease is present is made only after weighing all the diagnostic information available. One important diagnostic tool involves interpreting nuclear medical images representing the distribution of blood flow to the heart muscle.

"This is one of the most important and difficult tasks in nuclear medicine," says Norberto Ezquerra of ECSL's Biomedical Research Division. "At present, the diagnostic process involves identifying the presence and location of defects in blood flow on two-dimensional 'bullseye' computerized plots of the heart (analogous to flattened polar maps of the earth). Emory University researchers developed this technique several years ago as a way to view the three-dimensional heart in two dimensions."

To produce these maps, the distribution of a radioactive tracer (Thallium-201) through the heart muscle is captured by gamma cameras. The diagnostician interprets the information contained in these maps. There currently is no widely accepted standardized method of interpretation, so a significant degree of clinical expertise is required.

GTRI and Emory Collaborate

Ezquerra and a team of nuclear medicine specialists and scientists at Emory—Dr. Ernest Garcia, Dr. Gordon DePuey, and Mr. Lee Hise—are collaborating on a project to develop a knowledge-based system for interpreting cardiovascular nuclear medicine images, using artificial intelligence (AI). The expert system will interpret these images, analyze them, and recommend diagnostic strategies. "We're one of only three groups in the world who are applying AI techniques to nuclear medicine diagnostic imaging," Ezquerra asserts.

They began by reviewing 291 studies of patients with coronary artery disease (CAD) that had been made by experienced cardiologists and nuclear medicine physicians. From these studies they developed a set of rules for diagnosing heart problems. These rules were correlated with the evidence for CAD documented by angiography (x-ray photography of coronary vessels) and were incorporated into the knowledge base of the system.

"We're one of only three groups in the world who are applying artificial intelligence techniques to nuclear medicine diagnostic imaging."

When the research team tested their new expert system on 50 patients, they found excellent agreement between the AI system and human experts, achieving 78% to 98% agreement on several measures of coronary artery disease.

The LISP-based expert system currently resides on a dedicated microcomputer at ECSL, but efforts are under way to replicate the knowledge base on a standard nuclear medicine computer system at Emory, as well as a mainframe computer at Georgia Tech.

Look, Ma, There's No Pilot!

by Mark Hodges, RCO

The helicopter hovers in the air behind a line of trees. No people are aboard; the pilot is a computer. Ahead lies a river bridge, and three tanks are heading toward it. The helicopter's mission is to destroy them.

A computer pilot without adequate intelligence might leave its hiding place and take on the tanks one at a time. But this one waits until the tanks are all on the river bridge.

Only then does the computer move the helicopter swiftly to the bridge, destroying it and all three tanks with a single shot.

John Gilmore of the Electromagnetics Lab (EML) likes to use this illustration when describing the resourcefulness and flexibility possible in an automated combat helicopter.

With a powerful computer at the helm, such an aircraft could carry out highly complex missions.

Automated Helicopter

Gilmore isn't just speculating about a distant future. He's talking about what's possible in the next few years. His group at EML has developed and successfully simulated a route-planning system for a computer-driven helicopter.

Other researchers have computerized route-planning for ground vehicles, but Gilmore's group is the first to provide tools for automating this function in an aircraft.

"An autonomous helicopter could eliminate the limitations which plague airborne remotely piloted vehicles (RPV's)," he says.

Other researchers have computerized route planning for ground vehicles, but Gilmore's group is the first to provide tools for automating this function in an aircraft.

In RPV's, an operator at a ground base takes images seen by sensors on the helicopter and uses them to direct the aircraft's movements. The RPV can enter situations considered too dangerous for a human crew. Unfortunately, its communications link with ground base makes it vulnerable to jamming. "Enemy radar can even use this electronic link to locate and destroy the RPV," says Gilmore.
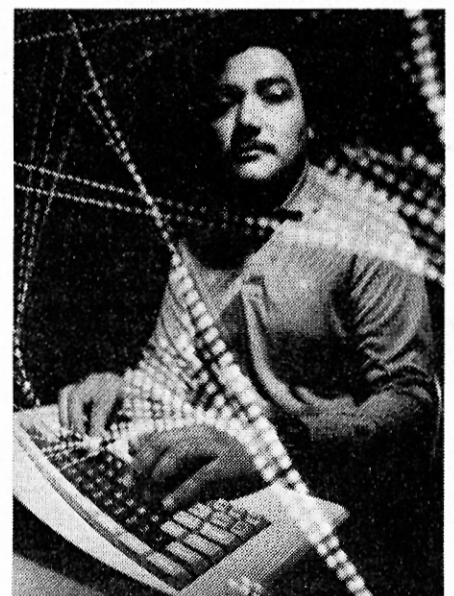
Routing of autonomously piloted aircraft is a major AI research application at EML. This photo shows Antonio Semeco's reflection as he tracks vehicle movement patterns on a video screen. (Photo by Charles Haynes)

Computer Services Enhanced

The Computer Related Services Department (CRSD) spells SERVICE in all caps. Its new manager, Al Hoover, who joined GTRI in April, sees CRSD as a strategic resource for meeting the computing needs of the laboratories and service departments. He is determined that the department will be as responsive to those needs as humanly possible.

Hoover wants users to know that he and his staff are always available for consultation and assistance. To make CRSD more responsive to trouble calls, the department will open a new Help Desk in the near future. Then the user will need to call only one number, no matter what the problem is. The operator will route the caller to the person best suited to help solve the specific problem.

"To make sure we're as responsive as we can be, the system will track how long it takes to answer each trouble call and to resolve the problem," Hoover says. "Then the Help Desk will check with the user to ask if the problem was solved satisfactorily. The system also will generate statistics on the number and types of problems encountered, which will help us manage our resources more effectively."

Hoover feels that CRSD must "market" its services to users. To that end, he is trying to improve communication between the user community and CRSD. First, he is scheduling review meetings with lab directors, department managers, senior staff, project directors—people who use CRSD services—to determine their needs and explain how CRSD can help them.

CRSD also is reviewing all of its computer charge rates to make sure that they will be competitive with outside rates, and will publish these rates.

In response to user demand, CRSD plans to accomplish the following in FY 1987: extend the applications of the Model 204 database management system, establish a cost-effective facility for microcomputer maintenance and repair, upgrade the network to state-of-the-art technology, improve mainframe operational support, add a professional database administrator, and expand the number and variety of advanced training courses designed to aid the researcher.

"We are going to do everything we can to help the university be more competitive in the research arena," Hoover asserts.
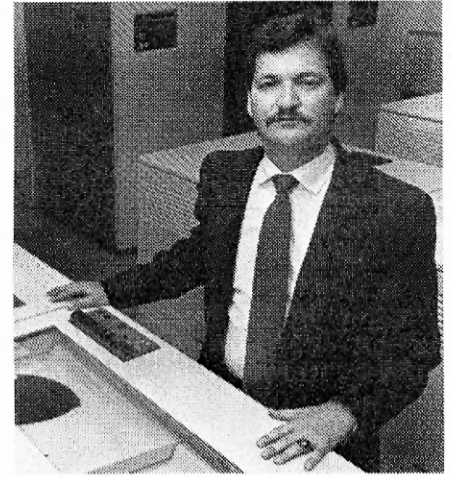
Al Hoover is manager of the Computer Related Services Department.

Hoover came to GTRI from Scientific-Atlanta, where he was manager of computer operations and system support from 1979 to 1983 and manager of engineering support from 1984 to 1986. He has an Executive MBA from Georgia State University and a BSBA in finance from the University of Central Florida.

SEL Appoints Andrews and Lowe to Administrative Posts

Harry Andrews is the new chief of SEL's Countermeasures Development Division.
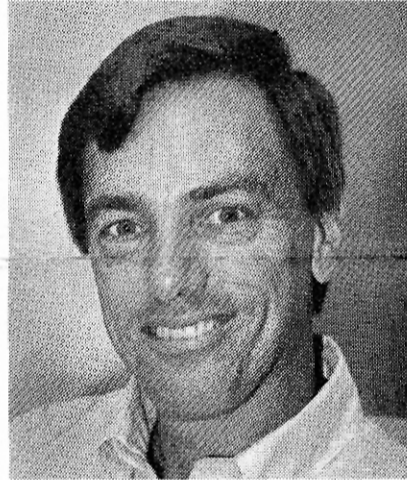
Eugene Lowe has been appointed head of SEL's Systems Requirements Branch.

On July 1, Mr. Harry Andrews and Dr. Eugene Lowe were appointed to new administrative posts in the Systems Engineering Laboratory (SEL). Andrews became chief of the Countermeasures Development Division (CDD), and Lowe became head of the Systems Requirements Branch of the Defense Systems Division (DSD). Dr. Lowe also was appointed acting associate chief of DSD.

Andrews had been acting chief of CDD since January and head of its Test and Evaluation Branch since mid-1983. Since joining Georgia Tech in 1976, he has worked in electronic countermeasures development, particularly polarization ECM, and has directed many major projects within the division.

Lowe, who came to GTRI in October 1985, works principally on defining requirements for anechoic test chambers. He has 10 years experience at Martin Marietta, where he was a senior group engineer working on airborne computer hardware and software. He previously was software manager at GEC Marconi and manager of advanced systems at Loral Information Display Systems.

Helicopter (from page 1)

Autonomous helicopters suffer no such vulnerability. They're passive systems—that is, they generate no electronic signal to the outside world. Not only are they "invisible" to electronic detection; they can also hover behind buildings and make sudden course changes not possible in a combat jet.

Civilian Applications

The military uses of such a helicopter are obvious, but applications extend into the civilian realm as well. Gilmore says that if the volcanic Mount St. Helens were to erupt again, rescue operations might imperil the lives of helicopter pilots.

"With an autonomous helicopter," he says, "this kind of threat wouldn't stop pickups of victims stranded on or near the mountain."

"An autonomous helicopter could eliminate the limitations which plague airborne remotely piloted vehicles."

Another use might be for nuclear accidents like the recent disaster at the Soviet Union's Chernobyl reactor. If radiation levels were too intense for humans to come near a malfunctioning nuclear plant, an autonomous helicopter could provide surveillance.

The Georgia Tech route-planning approach is flexible. The computer pilot isn't locked into a given plan, once it's generated. Software exists for detecting and resolving conflicts. The system could generate up to 500 alternative routes nearly instantaneously.

Gilmore hopes to apply some of these concepts in the near future. The Defense Advanced Research Projects Agency (DARPA) is now seeking contractors to build the first autonomous airborne vehicle. Gilmore's group is teaming with Sperry Corporation in submitting a proposal. He would use his group's route-planning

approach to develop an expert system—a computer which would be programmed with some of the experience of a human pilot. It could respond to situations not explicitly planned for in advance.

"Once the expert system is proven," Gilmore says, "it could be installed in any helicopter."

Heart (from page 1)

Future Plans

Future plans include fully automating the interpretation process; adding capability to make recommendations for diagnosis and therapy; and combining or fusing together different imaging modalities, such as nuclear images, angiographs, and magnetic resonance images, for more accurate diagnosis. Methods are

already being developed to display a 3-D reconstruction of the arterial structure of a patient's heart, based on multiple-view angiographs, and then to project the 3-D structure onto a 2-D polar map.

Ezquerra says the expert system will be a useful tool not only to aid the physician in the diagnostic process, but also to train clinicians to interpret the medical images. The ultimate result may be longer lives and better health for many people.

GTRI Says Good-bye to Six Retirees

Six recent retirees were honored at a reception in the Alumni-Faculty House Ballroom on June 26: Tze I. Chiang, Grant B. Curtis, Jr., Marie C. Harden, Leslie E. Henton, Ralph Lamade, and Walter L. Reagh. Although only two of them could be present, they were joined by their families, friends and coworkers in a celebration of their years of valuable service to Georgia Tech.

Walt Reagh

In paying tribute to Walt Reagh, retiring manager of the Instrumentation and Calibration Department, GTRI Assistant Director Pat O'Hare cited his dedication to the state of the art during his 35 years at Tech. "Many were touched by his work," O'Hare said, "and a number of his protegees have gone on to successful careers." Calling him a "bulldog in sheep's clothing," O'Hare commended him for his quiet dedication to meeting his clients' requests, saying he was "truly a craftsman."

Grant Curtis

Grant Curtis, senior research engineer in EDL, retires after 20 years at Tech. After eight years of outstanding work in energy conservation in the Physical Plant Department, Curtis joined EES-TAL in 1979. He is the author of some two dozen research reports, most notably the *Wood Energy Handbook.* Georgia Tech has applied for a patent on a plant fiber binding material for charcoal briquettes which he invented. "This led to his only overseas assigment," said coworker John Adams, "to apply his 'wood cookies' to the renewable energy technologies project in Sudan."

Tze Chiang

Tze Chiang, principal research scientist in EDL, was unable to attend the reception because he was lecturing in China at the invitation of the Chinese government. His 28-year career at Tech spanned in-depth applied research in areas ranging from high-tech to agribusiness. About half of his 70 research studies dealt with forest products and resulted in seven new plants in Georgia. His work has attracted international attention, and he has conducted studies in four foreign countries, said Division Chief Bob Springfield.

Marie Harden

Although Marie Harden was on the EES/GTRI staff only from 1975-1986, she had an earlier stint at Georgia Tech in the 1950 time frame as secretary to Coach Bobby Dodd. A senior administrative secretary in OOD, she worked for associate directors Rudy Yobs and Jerry Carey, but Associate Director Bob Shackelford was careful to point out: "I worked for Marie."
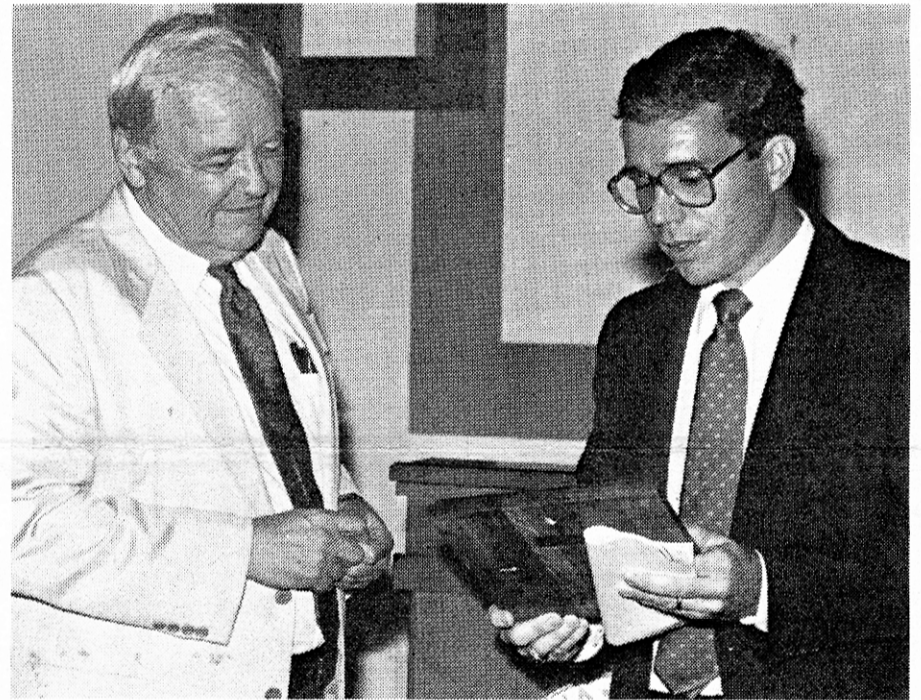
Leslie Henton

A research scientist II in EMSL's Materials Science Division, Les Henton came to Tech in 1958. He has been disabled with a muscular disease for the past two years, but enjoys raising flowers and aggressively plays the stock market, according to coworker Jan Gooch.

Ralph Lamade

Although Ralph Lamade has been at Tech only since 1979, Agricultural Technology Head Craig Wyvill praised him for his many innovative contributions. A research engineer II in EDL, Lamade was cited particularly for developing a low-cost computer system to help farmers, for his work on the Energy Integrated Dairy Farm project, and for "the finest animated sequences of a chicken hatching from an egg ever made."
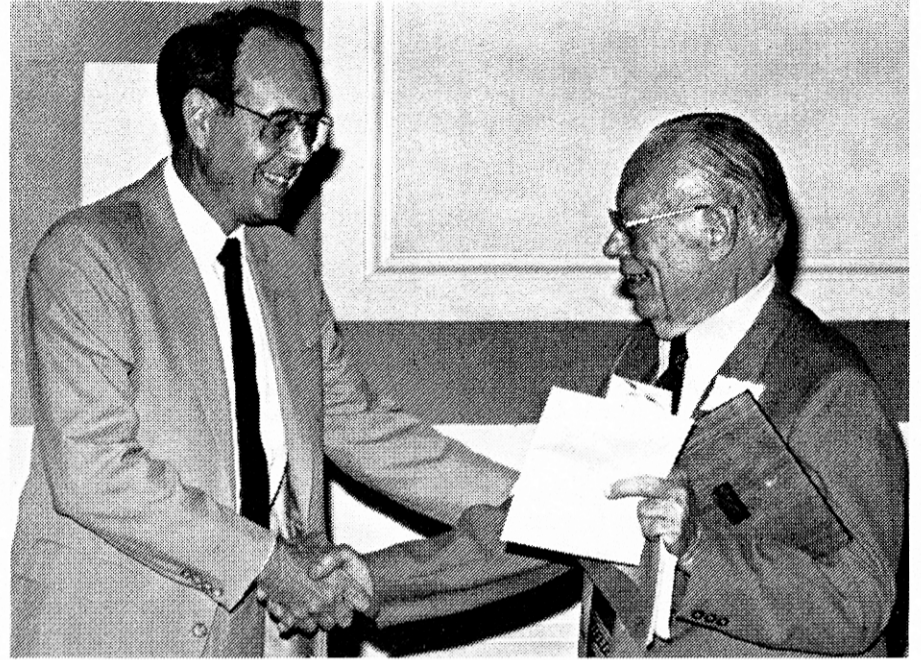
Pat O'Hare (left) conveys GTRI's best wishes to Walt Reagh on his retirement. (Photo by Charles Haynes)

Grant Curtis (left) looks on while John Adams reads the citation on his retirement plaque. (Photo by Charles Haynes)
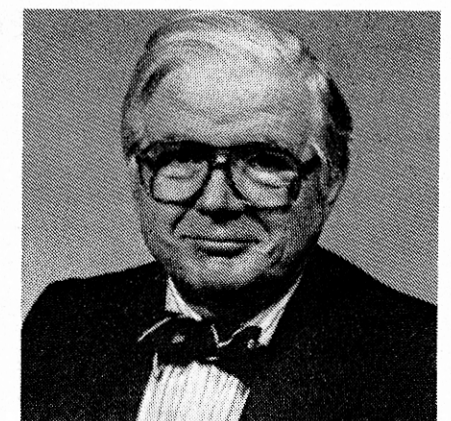

Tze Chiang

Leslie Henton

Marie Harden

Ralph Lamade

Tech Has Top Research Year

In Georgia Tech's Centennial Year, research grants and contracts received exceeded $100 million for the first time in the institution's history, the Office of the Vice President for Research has announced.

Of the $105.6 million in contracts and grants awarded to Tech in FY 1986, GTRI accounted for $75.5 million. These figures represent a whopping 40% increase over FY 1985 for both Tech as a whole and for GTRI.

Actual research **expenditures** also topped $100 million for the first time in FY 1986. GTRI's share of the $102 million spent last year was $64 million.

Vice President Tom Stelson attributes the growth in research activity primarily to two factors. "One is program development associated with the new space in the Centennial Research Building. The other is the addition of new faculty, primarily in instructional units," he says. "The most astounding aspect is that this new spurt of growth is occurring when Federal research funding is in great disarray."
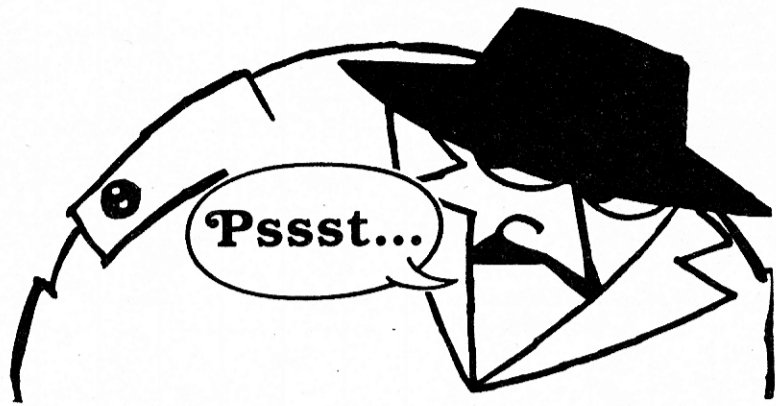
"Tie It Down, Lock It Up, or Keep It Out of Sight!"

That's the advice Frank Murphy, director of Property and Risk Management for Georgia Tech, gives on how to prevent theft of microcomputers, audiovisual equipment, and valuable scientific equipment that can be transported easily.

"Thefts from our campus buildings are more likely in the summer, when security tends to be less tight," Murphy says. He urges employees to be especially careful to lock office and building doors when no one else is around. "When you install computers and other expensive equipment, you are strongly urged to secure these items with chains or cables," he adds. For specific recommendations on securing property, contact Corp. Judy Holybee, Campus Police, ext. 2500.

Computers are an especially saleable item for thieves. Research Property Management Department (RPMD) Manager Harry Ross tells of a new IBM computer that was delivered to a campus address late one Friday afternoon. It was stored, still in its box, in a locked hall closet for installation Monday morning. But when they opened the closet on Monday the computer had disappeared! This was an especially difficult case because not only did the computer not have a Georgia Tech inventory decal, it took days to track down the serial number.

In another case, a graduate student working for GTRI brought in his own personal computer to complete a work assignment. Unfortunately, someone forgot to lock the office one night and the computer was stolen. If the student had known to notify Frank Murphy's office that he was using his private property on campus, it could have been insured by Georgia Tech.

Murphy's office (Property Control) is responsible for insuring all property at Georgia Tech. He points out that certain items that cannot be insured under the Building and Contents program may be insured under Tech's All-Risk policy. This includes state property used and kept at home for business purposes, as well as personal property of a business nature that is used on campus to satisfy job requirements. These and other regulations are spelled out in a *Risk Management Guide* prepared by Murphy. Call Property Control at ext. 4608 for details.

In addition, Property Control should be notified immediately when new equipment is delivered so it can be inventoried as soon as possible.

Murphy says the Campus Police are very efficient in getting reports on stolen property out on the state crime network. In addition, a new state ruling for the University System went into effect on July 1, requiring every campus theft to be investigated not only by the Campus Police, but also by the Georgia Bureau of Investigation.

GTRI's own Harry Ross also is available at ext. 3515 for assistance and advice. He urges people to be sure to leave a courtesy note when they borrow someone else's equipment, and he considers a Georgia Tech decal a deterrent to casual theft. "There's no sure way to stop theft," Ross says, "only ways to make it more difficult. Common sense in locking cabinets, doors, and other security measures has to be the key factor."

What Is Artificial Intelligence?

by Michael D. Furman, SEL

Sometimes described as a solution looking for a problem, artificial intelligence (AI) has gained respect as a viable tool in the quest for "intelligent" computers. Although its roots go back to the dawn of computers, the debate continues over just what deserves the label "AI."

By definition, "artificial" means "imitation" as in artificial sugar, or as defined in Webster's Ninth Collegiate, "humanly contrived." The last distinction bears a note of irony. But the word should be taken at face value—"a substitute for the real thing."

"Intelligence" is another issue entirely. Since the inception of the word, man has repeatedly changed its meaning to keep in step with his ego. Early behavioral scientists defined it as "the ability to use tools." When it was discovered that primates also used tools, scientists quickly sought a new definition. One undergraduate psychology professor said that "Intelligence is what intelligence tests test." (Read it again, it will make sense in a minute.) He must have done well on the Stanford-Binet.

No one wants to admit that a machine can out-perform him/her in a given skill or task, and yet our society is on the threshold of the "Ballad of John Henry" as it moves from brawn to brains. In the mid '60s a Russian international chess master and computer scientist made the statement that a computer could not be made that could defeat a chess master. Programs are now reaching master levels.

One objective of AI is to produce a computer that can ultimately make sensible responses to sometimes incomplete data, or to make a computer's response indistinguishable from a human's. Presently, non-AI programs tend to rely on linear algorithms whereby the data is regulated by the program. In artificial intelligence, a "heuristic" (self-educating) approach is often taken, with the data typically regulating the program.

Non-AI programs typically use what's called "divergent thinking," where the computer takes a small amount of input and generates reams of output, leaving the real decision up to the human. "Convergent thinking," however, is the process by which a large number of inputs generate a single decision or action. Such properly implemented processes are capable of generating decisions, much like humans, even when faced with unknowns.

All in all, in the next 10 to 15 years, AI will probably change the way we live much the way PC's have. However, we will still have to shop for groceries; tennis and chess will still be popular; and even our favorite restaurants will still be in vogue.

Presently though, AI is involved in various areas: natural language processing, visual and tactile sensors, and the simulation of human behavior, specifically in the area of problem solving (expert systems). The first allows a 24-hour Teller machine to take verbal commands, the second allows it to recognize you visually, and the third allows it to eat your card for a reason.
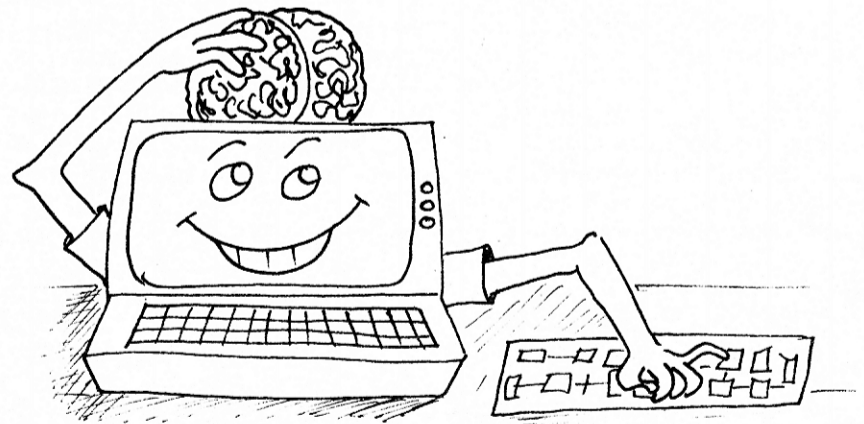

On Preparing Better Overheads

When preparing overhead transparencies, these suggestions are good to remember:
- Limit each transparency to one topic or concept.
- Restrict copy to six lines per transparency and six words to a line.
- Use type that's at least 18 points (a quarter-inch) high. Choose simple typefaces; never use ornate type. If using a typewriter, use only primary-size type.
- Choose lower-case letters for most of the material. They're more legible than all caps.
- Use tinted films to reduce lamp glare and colored markings for emphasis.
- Don't mix horizontal and vertical formats. Many experts suggest using horizontal visuals for maximum visibility.
- Respect copyright laws. Consider clip-art books for illustrations.

QUESTIONS, ANYONE? ?
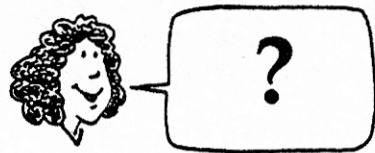
by Charles McCullough, HRD

"Last year, when summoned to jury duty, I charged those four days to an account named V-200. Now, I've been subpoenaed to testify in court about an automobile accident I witnessed. Can V-200 be used for that also?"

Absolutely! V-200 is thought of by most GTRI employees as "jury duty leave" when, in fact, it should be thought of as "court duty leave." If you are required to be in court, either as a juror or as a witness, you can legitimately charge that time to the paid absence account V-200 along with reasonable amounts of time for travel from your job to the court. What most people forget, though, is that any timesheet, biweekly or monthly, on which court duty leave is reported must be accompanied by formal documentation of your presence in court. Examples of the types of documents that must be attached to your timesheet are the original or a copy of the subpoena, a note from the clerk of the court, or a letter from an attorney involved in the court action. Without that documentation, we cannot pay you for that absence and charge it to V-200.

"I'm a member of a military reserve unit and have already charged 10 work days to military duty leave this year. I just got a set of orders for another two weeks of duty. Since a maximum of 15 days can be charged to military leave with pay during a calendar year, what do I do about the other five days?"

First of all, it is possible to charge more than 15 days to military duty leave within a calendar year. All you have to do is persuade the Governor to declare a state of emergency. Then you can charge up to 30 days. Or, you could call your commanding officer, thank him for the invitation, but insist that you can't possibly make it because you haven't got a thing to wear. Assuming the lack of success of either of those options, you'll have to resort to one of the following: either charge the extra days to V-100 (vacation) or, with the appropriate administrative approvals, you could take the time as leave without pay. Of course, if you don't have enough vacation time available, you'll have to use the leave without pay avenue. If you are a research-titled employee, exercise caution in using leave without pay anytime it's not absolutely necessary: interruptions in your employment could potentially have a negative impact on your "years of service" as calculated for promotion purposes.

(Note: If you have a subject you would like to see addressed in this column, contact Charles McCullough, ext. 3445.)

Software Review

by Pat Mathiasmeier, CRSD

RSTF is starting out its third year of operation with a new name, the CRSD Training Facility. This name is more descriptive of our status as a part of the new Computer Related Services Department (CRSD). In addition to a new name, there have been several other changes that we wanted to let you know about.

We have recently added five PC AT's and two VAXStations to the modern facilities available in the classroom. With these new systems we will be able to take advantage of the graphics capabilities of many currently available software packages. The Training Facility will be offering more classes on VAX workstations and minicomputer application programs, including specialized application courses on the VAXStation and courses on Access 204 and Model 204 database.

In an effort to streamline the operation of CRSD, the CRSD training staff has been reduced. As a result, hardware and software questions that were previously answered by the RSTF staff will be handled by the new CRSD Help Desk, which will be available this summer.

We would like to encourage you to take a more active interest in the Training Facility to help make us more responsive to your needs. First, let us know which new courses you would like to see offered. New courses will be developed to reflect demand. If interested in attending classes that are not currently offered, please call the Training Facility at 6206 or send a PROFS note to Pat Mathiasmeier.

Second, we will be distributing instructor evaluation forms in every class. Please take the time to give us your opinions. Third, please check the prerequisites for a course before you sign up. These are listed in a handout distributed by the Training Facility and are designed to group students by level in similar classes. This way we can better cover the material you are ready to learn.

As a final note, we want to thank everyone who took the time to complete the CRSD Training Survey last month. Your responses were studied and used to make decisions about the direction of the Training Facility. We're looking forward to our third year and hope that we can work together to meet your training needs.

CRSD Training Schedule

SEPTEMBER 1986

Monday	Tuesday	Wednesday	Thursday	Friday
1	2	3 BEGINNING SYMPHONY 9:00 - 4:30 CRESWELL	PROFS 4 SCHEDULING 10:00 - 12:00 DILLARD	SYMPHONY 5 GRAPHICS 9:00 - 12:00 ANDERSON
PART 1 8 WORD PERFECT 9:00 - 11:00 FURMAN BEG. DOS 1:00 - 4:30 LETT	ACCESS 204 9 9:00 - 12:00 MATHIASMEIER	SYMPHONY 10 SPREADSHEET 9:00 - 12:00 CRESWELL	BEG. PROFS 11 10:00 - 12:00 DILLARD	GENERAL 12 MARKUP LANGUAGE 9:00 - 12:00
PART 2 15 WORD PERFECT 9:00 - 11:00 FURMAN SYMPHONY DATABASE 1:30 - 4:30 CRESWELL	16 COMPUTER LITERACY 9:00 - 4:30 LETT	SYMPHONY 17 WORD PROCESS 9:00 - 12:00 CRESWELL BEGINNING WORDSTAR 1:30 - 4:30 MATHIASMEIER	ADVANCED 18 PROFS 10:00 - 12:00 DILLARD BEG. VOLKSWRITER 1:30 - 4:30 GOLDTHWAITE	19
PART 3 22 WORD PERFECT 9:00 - 11:00 FURMAN 1-2-3 MACROS 1:30 - 4:30 CRESWELL	VIDEOSHOW 23 9:00 - 12:00 GOLDTHWAITE 1-2-3 MACROS 1:30 - 4:30 CRESWELL	DISPLAY- 24 WRITE 3 9:00 - 12:00 MATHIASMEIER PART 1 INTRO TO DBASE III 1:30 - 4:30 LETT	BEG. PROFS 25 9:00 - 12:00 DILLARD BEG. DOS 1:00 - 4:30 LETT	26 PART2 INTRO TO DBASE III 1:30 - 4:30 LETT
BEGINNING 29 1-2-3 9:00 - 4:30 CRESWELL	ADV. DOS 30 1:30 - 4:30 LETT			

1986 Promotions

Congratulations to the following 36 GTRI employees, who were promoted on July 1 to:

Principal Research Engineer
Lloyd L. Lilly	SEL
James P. Montgomery	ECSL

Principal Research Scientist:
Nickolas L. Faust	EML
Paul H. Wine	EML

Senior Research Engineer:
John C. Adams, Jr.	EDL
Carol L. Aton	EDL
Robert D. Beasley	SEL
Herbert M. Harris	EML
Douglas M. Moore	EDL

Senior Research Scientist:
Fred L. Cox, III	SEL
Jeffrey L. Grover	ECSL
John W. Peifer	RAIL
Benjamin Perry, IV	RAIL
William B. Riall, Jr.	EDL

Research Associate II:
Michael D. Lowish	EDL
Carolyn B. Mahaffey	ECSL

Research Engineer II:
Jeffrey A. Aaron	ECSL
Catherine P. Addison	ECSL
Walter D. Addison, II	SEL
Eric N. Barnhart	ECSL
Peggy A. Cloninger	ECSL
Wayne D. Daley	EDL
Daniel H. Howard	SEL
Michael T. Kopp	SEL
William B. Kuhn	SEL

Mark W. Pellegrini	ECSL
Brian Keith Rainer	STL
Jacob M. Rhodes, III	ECSL
John P. Rohrbaugh	ECSL
Constantin Soulakos	EDL
Roy K. Trussell	SEL
Michael L. Witten	ECSL

Research Scientist II:
John Gilmore	EML
Janet A. Leininger	ECSL
Daniel J. Ortiz	EDL
John M. Trostel	RAIL

MEMORABLE TYPOS

Art by Jerry Webb

Collected by Ron Bohlander (EML) from the files of EML, GTRI, and Georgia Tech at large. Contributions are welcome.

- " . . . specify adverse weather in hours per year of outrage."
- "Lost Angeles"
- "indecent flux"
- "zeal-time video compression"
- "pixie resolution" in a video image
- staff meeting called on "December 13 at 1:00 a.m."
- "principle engineer"
- "imagining aperture radiometer"
- "standing wages" for standing waves
- "Tech faces touch football schedule!"
- "microwave faulty" for facility
- "compliant with," but the intention was "complaint with"
- "worse case situation"
- "Senor Research Engineer"
- "casual relationship" appeared in a text because Spellstar couldn't handle "causal relationship"
- "reasonators"—as in Fabry-Perot reasonators
- "Schotty mixers" . . . it's right in the catalog next to "klystrongs"
- " . . . which allowed the transmitter to run virtually unintended."
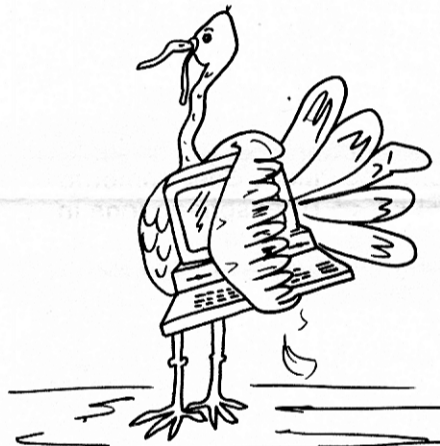

"Senor Research Engineer"

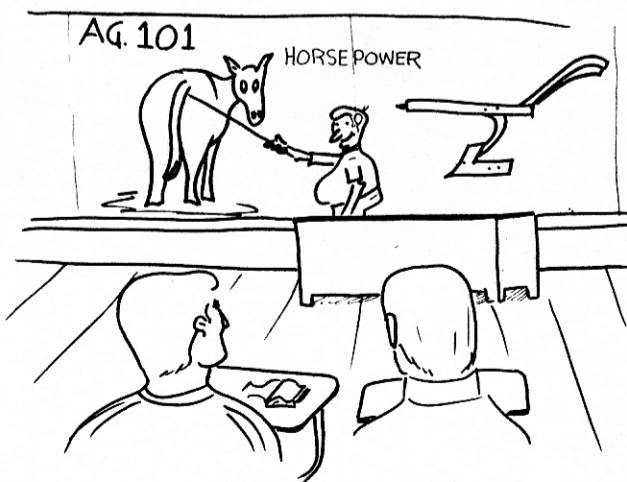"principle engineer"
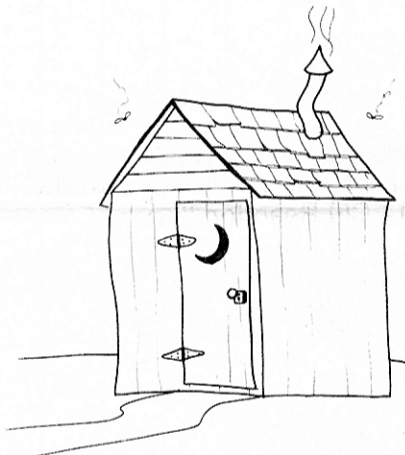
"Schotty mixer"

"turkey computer system"

enjoying a "missicle"

Tech's "College of Agriculture"
(as announced in the WHISTLE)

- " . . . is also greatfully acknowledged."
- "It is a pleasure to submit this proposal for a turkey computer system . . ."
- "The hole is greater than the sum of the parts!"
- When you have finished that Star Wars White Paper, relax with the latest in summer refreshment, a "missicle."
- "An Atlast of Infrared Spectra" . . . probably on our late deliverables list for two years running.
- The faculty were interested to learn in an issue of the WHISTLE that Tech had a "College of Agriculture." It probably was the Dean of that college who resided in "Smellville, Ga." (Did they mean "College of Architecture"?)
- There was standing room only for the talk given at the IEEE Conference on Robotics and Automation on "Position Control of a Complaint Manipulator."
- In an ad for a short course at UAH, one of the instructors is described as "world reknown." Does this mean **deja vu?**
- One of the specialties here in EML is phase locking millimeter wave sources, but now we are branching out into "phase licking an Orotron."
- There is even a lab (name and address withheld) that says it "continues to diversify its client base in the pubic and private sectors . . . "

PROFESSIONAL ACTIVITIES

ECONOMIC DEVELOPMENT LAB

Nancy Davis and **Mike Smith** won their second annual blue ribbon from the American Society of Agricultural Engineers for their Poultry Engineering Research Review, "Computers for Poultry Farmers."

John Nemeth is a certified assessor for the Occupational Safety and Health Administration's Management Skills Assessment Center Program.

At the summer meeting of the American Society of Agricultural Engineers, held in San Luis Obispo (CA) June 29-July 2, **Mike Smith** presented a paper, coauthored with **Richard Steele, Jr.**, entitled "Low-Cost Solar Attics for Broiler Growout Houses." **Chuck Ross** delivered two papers at the same meeting: "Ammonia Sensing in Broiler House Environments," coauthored by **Wayne Daley**, and "Impact of Utility Interaction on Agricultural Cogeneration," coauthored by **James Walsh.** Ross also served on three technical committees: Food Waste Management, Broiler Housing, and Agricultural Waste Management and Utilization.

Associate Lab Director **Richard Combes,** standing in for **Lanny Feorene,** chaired a technical session, presented the latter's paper ("The Management of Technological Innovation and Change"), and participated in a panel discussion as the U.S. representative to the 1st International Congress on Industrial Engineering and Management, June 11-13, in Paris, France.

Bill Whitworth led a workshop on "Components of an Effective Industrial Training Program" at the Georgia Textile Manufacturers Association's annual seminar for personnel managers at Hilton Head (SC) June 18-21.

Chuck Ross lectured on "Cogeneration: What Is It?" at the Georgia Energy Technology Institute for Teachers, held at Georgia Southern University June 26.

In early July, **Tze Chiang** returned from China, where he conferred extensively with economists, industrial managers, and government officials about economic development issues and opportunities.

Marilyn Black made a presentation on "Survey Analysis of Office Smoking Areas versus Chamber Studies" at the American Industrial Hygiene Association national meeting in Dallas in May.

Charlene Bayer spoke on "TD/GC/MS in Indoor Air Quality Analysis" at the Atlanta Chromatography Discussion Group annual meeting in June.

At the Environmental Protection Agency Air Toxics Symposium in May in Raleigh (NC), **Marilyn Black** spoke on "Sources of Formaldehyde and Other Volatile Organics" and **Charlene Bayer** spoke on "Passive Smoking: Survey Analysis versus Climatic Chamber Studies." They both were invited panel speakers in June at an indoor air quality workshop sponsored by the Building Owners and Manufacturers Association in Chicago.

ELECTROMAGNETICS LAB

The April 20 issue of the *Journal of Geophysical Research* featured an article by **Fred Eisele** and **Earl McDaniel** entitled "Mass Spectrometric Study of Tropospheric Ions in the Northeastern and Southwestern United States."

At the XVII Informal Conference on Photochemistry held in Boulder (CO) June 22-26, members of the Physical Sciences Division made the following presentations: **Tony Hynes** gave a paper entitled "Direct Kinetic and Mechanistic Studies of OH Reactions with Reduced Sulfur Compounds under Atmospheric Conditions"; **Mike Nicovich** presented "Pulsed Laser Photolysis Studies of Radical-Radical Reaction Kinetics: The O + ClO Reaction" in a poster session; **Ray Wells** presented CH_3SH Photolysis at 248nm. H Atom Yield and Rate Constant for the $H + CH_3SH$ Reaction" in a poster session; **R. L. Mauldin** presented "Kinetics and Spectroscopy of the NO_3 Radical in Aqueous Nitric Acid Solution"

At a recent meeting of the Meridian (MS) Chamber of Commerce, Wendi Dodd discusses assistance that the Southeastern Procurement Counseling Center at EDL provides businesses that desire to compete for federal contracts.

in a poster session; and **Paul Wine** chaired a session on "Optical Methods in Combustion Diagnostics and Atmospheric Measurements." Wine also presented "Critical Review of O + ClO Kinetic Data" to the Chemical Manufacturers Association meeting June 27.

At the 9th International Symposium on Gas Kinetics in Bordeaux, France, July 20-25, **Paul Wine, Mike Nicovich,** and **Tony Hynes,** along with former GTRI researcher A. R. Ravishankara and his NOAA colleagues, presented a paper, "Kinetics and Mechanism of Atmospheric CS_2 Oxidation." Wine, Nicovich and Ravishankara also presented "Pulsed Laser Photolysis Study of the O + ClO Reaction."

Billy Livesay presented tutorials on "Micromechanics of Microcircuit Materials" at the IEEE International Reliability Physics Symposium in Anaheim (CA) April 1-2. He gave a paper, "Environment-Induced Effects on Electronic Material Durability," to the IES Annual Technical Meeting in Dallas on May 7. At the IES Conference on Environmental Testing and Production Screening in Baltimore June 18-19, he held tutorials on "Damage Theory Related to Thermal and Mechanical Stresses in Electronic Materials" and "Failure Models Simulated by Environmental Stress Screening (ESS) of Electronic Materials."

At the URSI Commission F Symposium on Wave Propagation: Remote Sensing and Communications," held in Durham (NH) July 28-August 1, **Ron Bohlander** presented a paper, "Spectral Density and Distributions of Intensity and Phase of MMW Signals Propagated through Rain, Fog and Snow," and **Ed Patterson** presented "Correlation of the Attenuation of Millimeter Wave Signals with Rain Rate." Coauthors were **Bob McMillan** and **Randy Mandock.**

ENERGY & MATERIALS SCIENCES LAB

David Asbell presented a paper entitled "Alignment and Performance Measurement Techniques for Space Station Parabolic Dish Concentrators" at the annual Conference of the American Solar Energy Society in Boulder (CO), June 11-14.

Bo Hendrix participated in the ASHRAE Annual Meeting in Portland (OR) on June 22-25, reviewing results of research on open-door infiltration in refrigerated warehouses.

Kathryn Logan presented an invited paper, "Use of the Thermite Reaction to Generate Sub-Micron Particles," at the CRDEC Scientific Conference on Obscuration and Aerosol Research June 23-27 at Aberdeen Proving Ground (MD).

Tudor Thomas and **Rosemarie Szostak** organized five sessions on Molecular Sieves and Zeolites at the 60th Colloid and Surface Science Symposium held at Georgia Tech June 15-18. Szostak presented a paper, coauthored with Thomas, entitled "Metallosilicates with the Sodalite Structure: Synthesis and Physical Properties."

RADAR & INSTRUMENTATION LAB

Gene Greneker presented an invited paper at the 27th Annual Meeting of the Institute of Nuclear Materials Management held in New Orleans. The paper, entitled "Planning a Radar System for Protection from the Airborne Threat," was coauthored with **Mel McGee.**

SYSTEMS ENGINEERING LAB

Dean Spencer and **Tom Miller** contributed an article on the test and evaluation of electronic warfare equipment to the *International Countermeasures Handbook for 1986-87.*

PERSONAL NOTES

EDL: Congratulations to ex-bachelors **Kevin Downes, Kevin Kamperman,** and **Mark Demyanek.**

Susan and **Jim Mann** have a new son, James Benton, and Pat and **Mike Brown** are proud parents of a baby boy, Andrew Lee.

Our sympathy to **Lincoln Bates,** who recently lost his father.

EML: Ivy Pinion of the Huntsville office and his wife Donna welcomed Amanda Shea on June 28. Susan and **Jim Larsen** are proud parents of a girl, Nicole Alexandra, born June 27.

June weddings included **John Cotton** to Patricia Hart, **Cindy Creager** to Paul Horsley, and **Dan Campbell** to Candice McCloskey.

ECSL: Janice and **Bob Utterback** have a new daughter, Victoria. Three employees recently added baby sons to their families: **Dave Millard** and his wife Sally welcomed David Paul; **Vergil Daughtery** and his wife Beth welcomed Vergil (Gil) III; and **Scott Wearn** and his wife Sue welcomed Charles Alexander (Alex). Congratulations!

Condolences to **Philip Kennedy** on the recent loss of his father, Durmot Patrick Kennedy of Dublin, Ireland.

FMD: Congratulations to **Gerald "Doc" Hill, Jr.** and his wife Carol on the birth of Wesley Brad on May 16. Grandparents are **Brenda** and **Gerald Hill, Sr.** (EML).

Best wishes to **Wilbur Steward,** who is recovering at home from injuries sustained in an automobile accident.

RAIL: Mike Tuley and his new wife, Terry, spent their honeymoon in California.

RSD: Al Becker is recuperating at home from recent hip surgery, and will return in mid-September.

STL: Virginia Jory's daughter, Victoria Jory Dennard, a civil engineering student, is the recipient of the of the $750 scholarship awarded by the Georgia Tech Women's Forum for the 1986-87 school year.

SEL: Our sympathy to **Pat Toomey,** whose father died suddenly June 21.

Robot Born in Mahaffey Basement

Sometimes the most satisfying part of a scientist's profession is on the extracurricular side. Like helping a young future scientist, for instance.

ECSL computer scientist Jim Mahaffey agreed to advise high school sophomore Derek Walker Thomas on his science fair project and the results were spectacular. Derek, who is the son of SEL Technical Information Center librarian Deborah Thomas, won top prizes in the National NAACP Afro-Academic, Cultural, Technological and Scientific Olympics in Baltimore. Not only did he win $1,000 cash as first prize in computer science, he also won a $5,000 scholar-

ship to the college of his choice for having the best overall project. In addition, Digital Equipment Corporation is awarding him an $8,500 computer.

What was Derek's prize-winning project? He designed and built an automatic remote control "rover" robot in Jim's basement workshop. "Derek had ideas but no way to implement them," Jim says. "I made my shop available, advised him on equipment to buy, and helped where he needed special tools and expertise."

The hatbox-sized robot is motorized and runs on three wheels. It responds by radio remote control to programmed

computer commands.

"I feel good about the whole thing," Jim says. "All the kid needed was someone to take an interest in his project and get him started."

Jim points out that this is only one of many honors Derek has won. He is one of six Atlanta public school students participating in a three-year summer program at Phillips Academy in Andover, Massachusetts, and he was accepted in the Governor's Honor Program in Mathematics this year.

Derek's mother says he wants to study electrical engineering at Georgia Tech or M.I.T. Maybe by investing those
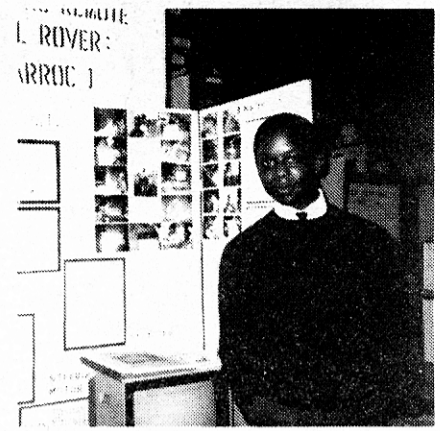
Derek Walker Thomas, son of SEL's Deborah Thomas, stands in front of the display panels detailing how he designed and built a computer-guided robot that won a top national prize.

four or five weekends of time in Derek and his robot, Jim was grooming a potential research engineer . . . perhaps for GTRI.

PERSONNEL NEWS

ECONOMIC DEVELOPMENT LAB

James Seals is a new research engineer with the Gainesville Regional Office.

Ken Maddox, head of International Programs, resigned June 30.

Maureen Fellows of the Savannah Regional Office recently resigned and moved to New York.

ELECTRONICS & COMPUTER SYSTEMS LAB

Jacqueline Berry, formerly of EDL, has joined the Computer Technology and Applications Division (CTAD) as administrative secretary. **Beverly Cooks** is the division's new senior secretary.

John Owen has rejoined CTAD as a senior research scientist. He will work primarily on the U.S. Postal Service research program.

Welcome to **Charles W. Albert,** an electronics specialist in the Electromagnetic Effectiveness Division (EMED). A former employee of Wegener Communications in Norcross, he has approximately 20 years of experience with systems design, material planning, and digital and analog repair.

EMED also welcomes **Francis (Skip) Gross,** senior research engineer. He has a PhD from Ohio State University, with BSEE and MSEE degrees from the University of Florida. Dr. Gross comes to Tech from Florida State University, where he was an assistant professor. He will work in the areas of electromagnetic analysis, materials metrology, antenna measurements and RCS measurements.

John E. Tehan, Jr., is a new RE II in EMED. He has BSEE and MSEE degrees from Ohio State University. He comes to Tech from TRW/MEAD in San Diego (CA), and has additional

experience at Ohio State and Wright Patterson Air Force Base.

Congratulations to **Pam Knight, Scott Bailey,** and **Don Wyman** on their recent graduation from Georgia Tech.

ECSL welcomes **Scott Lobdell** to the Electromagnetic Compatibility Division (EMCD). Lobdell recently received a BSEE from the Lawrence Institute of Technology and was employed by Barfield and Associates of Ypsilanti (MI). He will be working in electronic design and testing as an RE I.

EMCD also welcomes **Brian Farris** to its professional staff as an RE I. Farris, who recently received his BEE from Georgia Tech, has been a co-op student in ECD for four years, and has already contributed significantly to research programs within the division.

Congratulations to **Norberto Ezquerra** for his recent appointment as adjunct assistant professor of radiology with the Emory University School of Medicine.

Welcome to **Leonard Abbey,** a technical writer currently assigned to the Office of the Lab Director.

RADAR & INSTRUMENTATION LAB

Eric Sjoberg, an SRE who began working for RAIL in 1975, converted to hourly in 1984 to devote more time to pursuing his veterinarian degree. Now he has returned to RAIL full time again.

Mike Watt, who worked for RAIL as a GRA for a short time in 1985, is now a full-time RE I with a BS degree in computer engineering and an MS degree in EE from Clemson and Georgia Tech, respectively.

New co-ops are **Fred Bertrand, Joe Branham,** and **Devin Seely.** All are pursuing EE degrees at Georgia Tech.

Willem Nieuwenhuis from Holland has joined RAIL for the summer on an international student exchange program.

SERVICE DEPARTMENTS

Computer Related Services: Welcome to **Chris Holmes,** research technician I. **Charles Dickson** has moved to the Hill to be assistant registrar.

Human Resources: Terry Martin has transferred to the Alumni Office. **Gus Galvez** has resigned.

Instrumentation & Calibration: Tom Moore has been promoted to electronics specialist.

SYSTEMS & TECHNIQUES LAB

New employees in the S Program Office are RS II **Mary Ann Adams,** RS I **Jackie McGill,** RE II **Caroline J. Cranfill,** word processor operator **Rachel Brennan,** and student assistants **Debra Woolf** and **James K. Park.**

The Defense Electronics Division welcomes two RE II's: **Richard S. Smith** and **Dinal Andreasen.**

Joining the Microwave Systems Division were RE II **Paul G. Elliot,** RT I **J. Mark Hudgens,** clerk III **Lynette Miller,** and student assistants **Mark D. Fischer, Sheri Walker,** and **Renee Dominey.**

Francis Reems is a new technical assistant in the Design Services Group.

John Stapleton has resigned.

SYSTEMS ENGINEERING LAB

Cheryl Barnett was named SEL Employee of the Month in May for her contribution to the overall success of the Annual Electronic Warfare Program Review.

John Timar has finished his law degree at Georgia State University, passed the bar exam, and on June 20 was sworn in as an attorney.

Adrienne Harrington returned to the Defense Systems Division June 20 after a two-year stint at Rockwell. She previously worked with DSD from 1979 to 1984. She has a BA in mathematics from Randolph-Macon and an ME in systems engineering from the University of Virginia.

Michael Oliver is a new technical assistant in DSD. New co-ops are ESM student **Reginald Fortson** and EE student **Kirsten Britt.**

EE student **Lisa Phillips** is a new co-op in the Countermeasures Development Division.

Joining OOD as a clerk is **Michael Jones.**