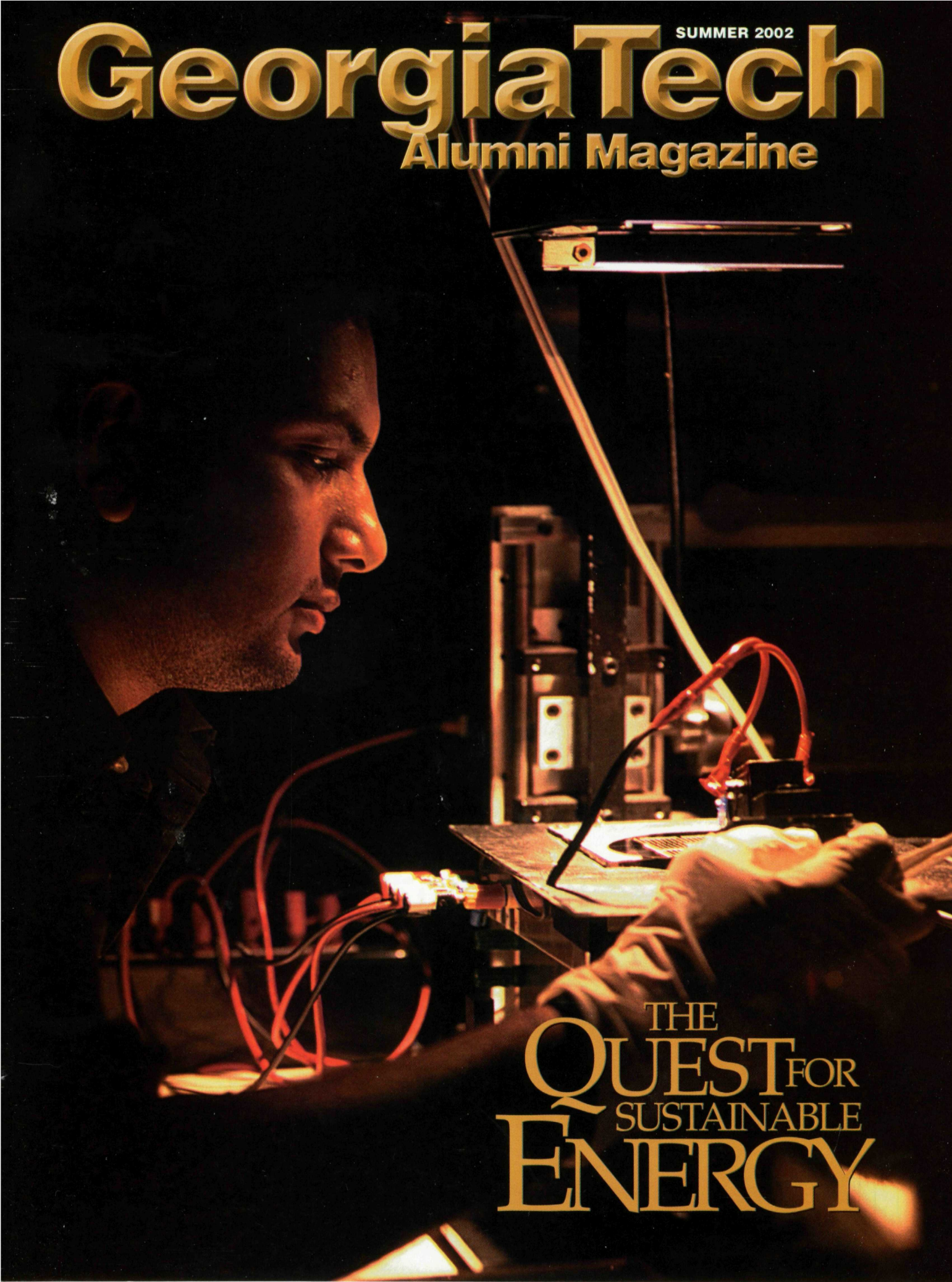


# GeorgiaTech

SUMMER 2002

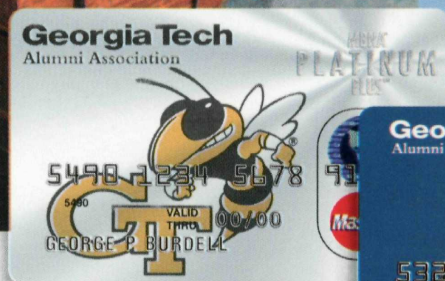
## Alumni Magazine

A man in profile, focused on his work, is shown in a dimly lit laboratory. He is working on a circuit board with various wires connected to it. A desk lamp provides a warm, focused light on his work area. The background is dark, with some mechanical equipment visible.

THE  
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## Louis C. Bodenheimer, IM 1941 (1920 – 2000)

- Atlanta native and Boys High graduate.
- Member of Phi Epsilon Pi, Associate Editor of the Blue Print, and Vice President of Skull and Key.
- Army Air Corps pilot during World War II.
- Entire career with Montag, Inc., and subsequent companies. Retired from international sales of school and office supplies with The Mead Corporation, with accounts throughout Europe and the Middle East.
- Lifelong skier and tennis player.
- Resided in New York City; Stockton, New Jersey; Klosters, Switzerland; and West Palm Beach, Florida.

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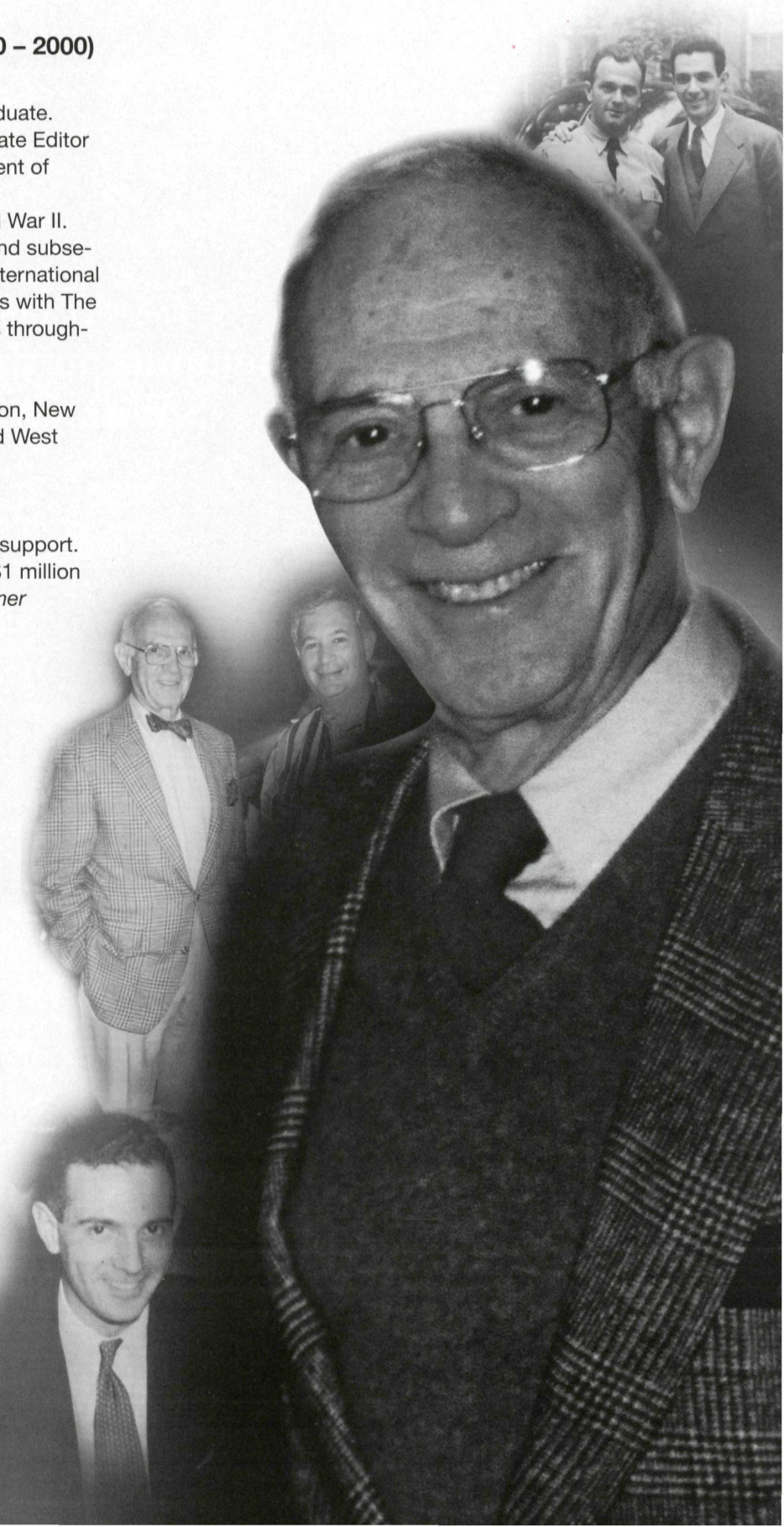
- 49 consecutive years of Roll Call support.
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**Louis Bodenheimer** was the quintessential gentleman, remembered for his quick wit and offbeat sense of humor. Long after his southern drawl had faded, Louis identified himself as an Atlantan—and a Georgia Tech graduate. Shortly before his death, he disclosed his bequest to Tech and designated it to support President's Scholars, students selected for their leadership and academic excellence.


**Louis C. Bodenheimer** is one of 75 Founders' Council members who have made bequests or life income gifts of at least \$1 million to support Georgia Tech's future.

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Summer 2002

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— Photo by Rachel LaCour Niesen;  
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**Jeff Colburn**

(404) 894-9279

E-mail: [jeffrey.colburn@alumni.gatech.edu](mailto:jeffrey.colburn@alumni.gatech.edu)

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## PRESENTING THE GEORGIA TECH CLUB.

The Georgia Tech Alumni and Athletic Associations, along with University Clubs by Melrose, proudly announce the development of the Georgia Tech Club. This exclusive club and community will cater to the recreational, educational, residential and social needs of Georgia Tech alumni and supporters.

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## Internet Voting Enables Unscrupulous Problem

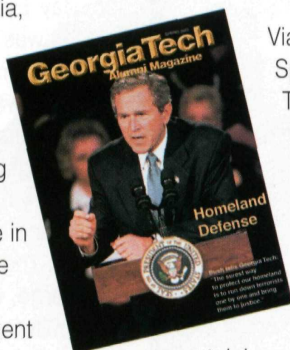
Your article on Internet voting in the Spring 2002 issue failed to mention a problem that is not likely to be solved by technology. That is the problem of how to keep voters who do not vote in person from being intimidated by those who would improperly influence their votes.

Here in Virginia, voters who cannot read or write (or cannot otherwise mark a ballot or operate a voting machine) may receive assistance in voting from anyone except the voter's employer or an agent of that employer, or an officer or an agent of the voter's union. Voting in a public polling place limits opportunities for abuse of this rule.

Internet voting would enable unscrupulous employers or union officials to exercise undue influence by demanding that their employees or members of their union vote on company or union computers. Election officials are aware of ongoing efforts to influence voters by other than legiti-

mate means. Widespread voting in other than public places would only increase opportunities for these illegitimate activities.

Edward A. O'Neal, IE 58  
Chairman, Norfolk  
Electoral Board  
Norfolk, Va.



## Veto Convenience

Your article "Voting Via the Net" in the Spring 2002 GEORGIA TECH ALUMNI MAGAZINE states that "elections one day may be more convenient and more accurate." While providing greater accuracy is most certainly a good thing, I cannot say the same for providing more convenience.

I may be alone in my opinion, but I feel that uninformed voters who will vote only if it is more convenient may be doing themselves and others a disservice by voting on issues or candidates they know little about.

This was also on the minds of our founding fathers when they chose not to allow individuals (who may not know the candidates well enough) to vote

directly for president, but rather cast their votes for someone (who is local within the state, but knows about the issues and candidates) to represent them in casting their presidential ballots in the Electoral College.

Convenience just makes elections even more of a popularity contest and deals less with the issues and the competency of the candidates to perform in office.

Todd A. Wheeler, ESM 87  
Charlotte, N.C.

**Continued on page 8**

## We Want to Hear From You

The ALUMNI MAGAZINE welcomes letters. Address all correspondence to: Georgia Tech Alumni Publications  
190 North Ave., NW  
Atlanta, GA 30313,  
Fax (404) 894-5113.  
E-mail: editor@alumni.gatech.edu

(Please include full name, city and telephone number.)



## Energy Quest



Steven Ambrose's "Nothing Like It In the World," the story of the building of the transcontinental railroad in the 1860s, is fascinating. When you realize how far we've come, you appreciate how fast we're moving right now.

One of the most complex issues that we face is energy — how we get it, how we use it, how we distribute it. Our dependence on fossil fuels is problematic. For one, we will ultimately run out. Second, we are far too dependent on foreign supplies. Add in the aging infrastructures and the politics of it all and you appreciate the challenges ahead.

In this issue, you will find fascinating articles that explore this critical resource. There's reason to feel good about the possibilities. From new photovoltaic advances to bioenergy research to plasma arc technology to the awesome potential of hydrogen fuel cells, there are lots of incredible possibilities. The research and commercialization of new technologies will make the difference in our future. And that's where Tech steps in. Many of our alumni, faculty and students are engaged in this noble pursuit.

Our golf team finished second in the NCAA championship. It was an incredible season for coach Bruce Heppler and his band of links warriors. Congratulations to them all and, of course, to Troy Matteson for winning the individual NCAA championship.

Speaking of golf, you'll find an article about The Georgia Tech Club that we're developing. A joint licensing arrangement between the Athletic and Alumni Associations and the Melrose Co. has been signed to begin the effort. The Georgia Tech Club will be a place for our golf team to call home as well as many alumni and friends. The course and the facilities will be absolutely first class — something we all expect.

*Joe Irwin*

Joseph P. Irwin  
Vice President and Executive Director  
Georgia Tech Alumni Association



## Photos Captured History

The photos and article concerning the Atlantic Steel site (Spring 2002) refreshed many good memories of the company and the part it played in our family. I am thankful some of the history was captured by the photographer. My father was employed by the company from about 1919 to 1960.

The effects of the Great Depression in 1929-30 still linger even though my age at the time was only 5 or 6 years old.

Daddy (Jacob Storm, who attended Georgia Tech night school) was among the few who were selected to retain employment, even though his salary was greatly reduced. He assured the family that we would survive somehow. Soon aunts, uncles, cousins, Grandmother and Granddaddy came to live at our home.

My father's generosity and his employment at "Dixiesteel" allowed all of us to survive during those hard times. The company also allotted acreage to employees for gardening. Our one and a half acres helped tremendously. Hobos riding the cars on the nearby railroad found our house was a good source for food. Having six to 10 men eating lunch on our front steps was not an uncommon sight.

Some happier thoughts pertain to the company baseball team and games played against the rival Buford Shoe Factory and pig roasting at the company picnics. There would be an occasional visit with my father to see open-hearth furnaces, ingots, soaking pits, rolling mills, and rod-and-nail manufacturing. The photo of a refractory structure resembling an Irish castle could be a soaking-pit furnace used to heat ingots.

May the example set by Atlantic Steel and its employees inspire others to the same level of courage and compassion during the difficult times ahead.

Jack Storm, IE 48  
Avon Park, Fla.

## Thanks for the Memories

Your article in the Spring 2002 issue of the GEORGIA TECH ALUMNI MAGAZINE, "Still Life in Steel," featuring photography by Ruth Dusseault touched my "nostalgia button."

It made me wish that I were among those Georgia Tech architecture students who share in Ms. Dusseault's enthusiasm for photographs of bygone things. I have personal mem-

ories of Atlantic Steel, having been employed there for a short period in 1944 between high school graduation and entry into the Navy.

Those were difficult times. Gene Talmadge was governor of Georgia and running for re-election. Someone had written "vote for Gene" in chalk on the potbellied stove in the locker room.

It was wartime and everything produced at Atlantic Steel was essential to the war effort.

The working hours were very long, usually 12 hours per day. Even though the money was good, there was practically no leisure time.

This was my first "real job" — difficult, important and rewarding. My coworkers were very helpful to me, a green and sometimes clumsy worker. The buildings were very large, very hot, very dirty and quite noisy — so full of memories.

It has been said that we think in pictures. My memories of Atlantic Steel are "in my mind's eye" and that is truly in pictures. If only one could "print out" those pictures. Thank goodness we have artists and architects who can bring those memories to life.

Thanks to Ruth Dusseault

for photographically capturing some remnants of historic Atlantic Steel and to the GEORGIA TECH ALUMNI MAGAZINE for such a special article preserving a bit of history for us.

Bomar A. Olds Jr., Text 51  
Cornelia, Ga.

## Obscure Designation

The GEORGIA TECH ALUMNI MAGAZINE says in answer to a letter about obscure degree designations that "MT" is a degree in Motor Transport. That's good to know but what do you study to get one? I am sure it is not a degree in truck driving.

Jerry Abbott, CE 55  
Birmingham, Ala.

*Yikes! It seems that MT is one of the degree abbreviations carried in our Alumni Directory that is not active anymore — and hasn't been since 1918. Motor Transport was a World War I course for personnel stationed at Camp Gordon, a training operation for 550 Army draftees. That's about as obscure a degree designation as we expect to run across. But, if we encounter a Georgia Tech alum with such a degree, we plan to do a feature article about him.*



Ruth Dusseault





....Be there.



Homecoming Weekend 2002

Looking for a way to catch up with old friends, make new connections and have fun all in one evening? The Georgia Tech Alumni Association has the answer. . . **Buzz Bash**. We invite you and your family, the Georgia Tech family, to a night filled with fun, food and festivities during Homecoming Weekend - Friday, October 25, 2002. *Be there!*

Georgia Tech



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## Tech Completes Investigation into **Academic Misconduct**

The investigations are complete on 186 Georgia Tech students suspected of academic honor code violations for plagiarism on computer science homework assignments in the fall semester. Overall, less than 1 percent of the total homework assignments were involved.

The Dean of Students office says 32 students were exonerated and 154 students were charged with a violation of the honor code. Of those charged, 136 students acknowledged misconduct and accepted sanctions, which ranged from a zero on the homework assignment to the suspension of one student. The most common sanction was a drop of one letter grade for a final grade.

Eighteen students requested a hearing before the Student Honor Committee.

In the wake of the unusually high volume of charges for one semester, the Institute formed two task forces: one to review the honor code system and another to review the two introductory courses in which the students were enrolled.

The task forces' two most notable recommendations are that collaboration, with attribution, be allowed on homework assignments in the two introductory computer science courses, and that the Office of the Dean of Students should receive additional resources to investigate and process allegations of academic misconduct. Both recommendations will be implemented immediately.

"This incident has caused the Georgia Tech community to look closely at the way we teach and the way we hold each other accountable for our actions," says Bob McMath, vice provost for Undergraduate Studies. "Because of the serious and thoughtful efforts of many people, I believe that we are coming out of this experience a stronger and better university."

The investigations revealed that the plagiarism discovered was not done in an organized fashion. Rather, it was the result of a large number of students making independent decisions to use the work of others to meet homework deadlines. There was no evidence of a group effort to defraud the system.

"The most significant statistic in all of this is that more than 1,500 students did their work as assigned for those two classes without any accusations of plagiarism," says Bob Harty, executive director of Institute Communications and Public Affairs. "It's also significant that 83 percent of those involved accepted sanctions without question. That speaks highly of the process used to identify cheating and also reflects positively on the incredible work done by our Office of the Dean of Students. They had an enormous task to fairly and efficiently investigate all of these cases," Harty says.

"On the other hand, the large numbers of students involved in plagiarism for these two classes was a warning sign that we needed to assess how the students were being taught and evaluated," he says. "The committee did an excellent job of reviewing a lot of issues with the students and faculty. Their recommendations will be followed by the administration and will, we hope, improve the quality of instruction for introductory computer science. That's the bottom line for all of this."

The most notable policy change from the task force is shifting the assessment focus from homework to quizzes and exams. These two courses will now allow collaboration with attribution on homework assignments, a subtle but important change from previous years.

The new policy, which went into effect for the summer semester, allows students to work collaboratively on homework assignments as long as they credit the sources used to complete the work. Those external sources may include other students, teaching assistants, textbooks and Web sites.

"There are logical arguments for both approaches, and both are in use around the country," says James Foley, associate dean of the College of Computing and chair of one of the task forces. "But we ultimately felt that learning would improve by using the homework to teach, and the quizzes and exams for the bulk of our assessment. Such an approach is consistent with Georgia Tech's overall approach to collaborative learning."

### Zegura Named **Interim Dean**

Ellen Zegura, assistant dean of facilities planning and associate professor of computing, has been named interim dean of the College of Computing. She will serve as dean while a search committee

looks for a replacement, which could be announced as early as this summer.

Last January, Peter A. Freeman, the John P. Imlay Jr. Dean of Computing, announced he was stepping down to assume a position with the National Science Foundation in Washington, D.C., as assistant director of NSF for Computer and

Information Science and Engineering. He will remain a member of the Georgia Tech faculty on assignment to NSF.

Zegura has served as assistant dean since 2000. She received a bachelor's degree in electrical engineering and both master's and doctoral degrees in computer science, all from Washington University.



## Professor's Dog Wows Letterman

Georgia Tech Professor Robert Foley and his talented toy poodle, Asa, appeared on "The Late Show with David Letterman" in a segment that aired at the end of April and was rebroadcast May 27.

These were no "stupid pet tricks." Three-year-old Asa won the Purina Dog Chow Incredible Dog Challenge Eastern Regionals agility competition in Atlanta and was chosen to show her stuff on Letterman with two other canine winners.

Asa, at only 8 pounds, is unusual because toy poodles aren't known for winning steeplechase events. Asa is the first dog Foley has ever trained and, in fact, the only dog he has ever owned. Friends had to convince him to give Asa a home. Now they're practically inseparable. Asa peers out from a mesh screen in Foley's carry-on bag, charming flight attendants



Courtesy Robert Foley

and helping get her master bumped to first class.

Foley, a professor in Industrial and Systems Engineering, uses the "clicker" method of training, which involves lots of treats. But Asa burns off the calories with all those hurdles she jumps. For "The Late Show," a steeplechase course was set up outside the Ed Sullivan Theater.

Letterman remained at his desk on stage during the broadcast.

After the show, Foley and Asa were walking up a flight of stairs inside the studio. A man coming down in a red T-shirt said "great job" as he passed.

"Thanks," said Foley. That was his and Asa's brush with Letterman himself.

## Smart Shirt Goes to Washington

It has been a good year for the Smart Shirt, the T-shirt developed at Georgia Tech that functions like a computer to let doctors monitor the vital signs of the wearer.

*Time* magazine named the shirt one of the best inventions of the year. Now the Smart Shirt is taking its place among the Smithsonian Institution's collection of important items in the history of textiles.

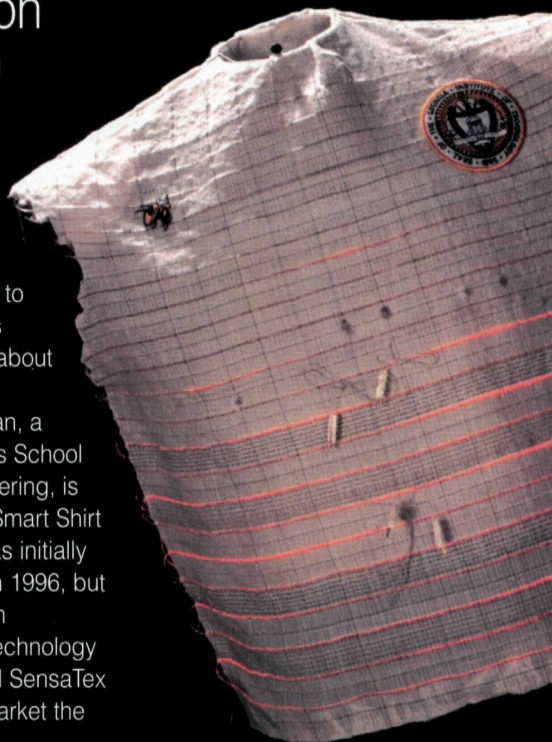
The collection, housed in the National Museum of American History, consists of about 50,000 items, dating from the 17th century to the present, and includes items relating to the art and industry of textiles, as well as textiles-related inventions.

Made of a soft, washable fabric with optical and electrical fibers woven into it, the Smart Shirt monitors the wearer's heart rate, respiration,

temperature and other vital functions. The information is relayed wirelessly to doctors or personal trainers.

Future applications include shirts to monitor babies and for military use to provide a trapped soldier's exact location and details about wounds.

Sundaresan Jayaraman, a professor in Georgia Tech's School of Textile and Fiber Engineering, is the lead developer of the Smart Shirt technology. The project was initially funded by the U.S. Navy in 1996, but the Georgia Tech Research Corporation licensed the technology in 2000 to New York-based SensaTex Inc. to manufacture and market the Smart Shirt.





## GT Motorsports Finishes **Third at Pontiac**

The Georgia Tech Motorsports team drove its race car to a third-place overall finish in Formula SAE competition at Pontiac, Mich., May 16 through 18. It was the team's best performance at the event.

The competition, sponsored by the Society of Automotive Engineers, requires college students to design, build and race an open-wheel formula race car in categories intended to challenge the students' knowledge of automotive design, performance and durability. Meets are held each year in Michigan and Birmingham, England. One hundred thirty-four collegiate teams from the United States, Canada, Mexico, Japan, Korea, Venezuela, Puerto Rico, England and Australia participated in this year's event.

The Georgia Tech team's previous best was sixth in 1994.

GT Motorsports won the overall championship last July in England and returned on July 1 to defend its crown. Faculty adviser Ken Cunefare looked forward to driving away with another victory. "This recent success sharpens the desire to attempt a repeat of our 2001 performance."

GT Motorsports driver Mark Gibbs guides the Tech car around pylons during the endurance segment of the Formula SAE competition at Pontiac, Mich.

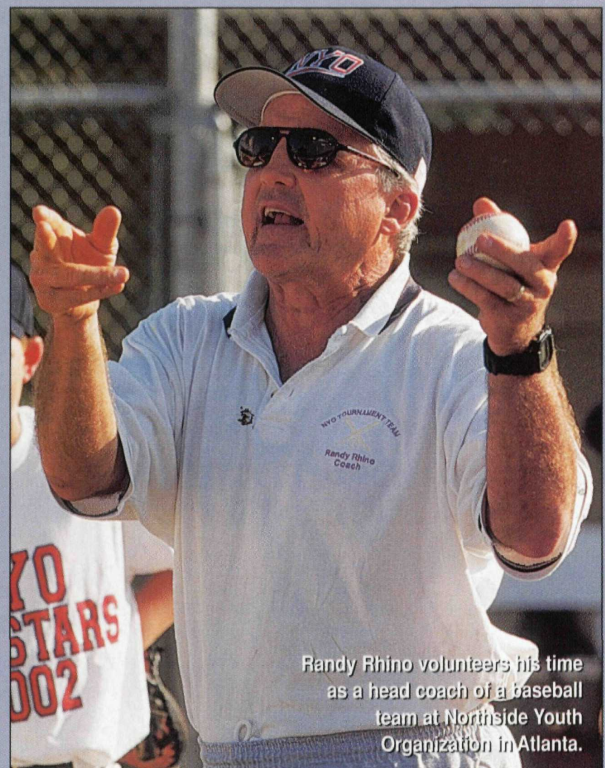


## Rhino Named to **Hall of Fame**

Randy Rhino, Georgia Tech's only three-time, first-team All-America football player, will be inducted into the College Football Hall of Fame in December.

A defensive back and return specialist from 1972-74, Rhino still holds Tech records for career punt return yardage (749) and longest punt return (96 yards for a touchdown against South Carolina in 1972). His 14 career interceptions rank second in school history. His season record of 441 punt return yards in 1972 was broken last fall by his son, senior return specialist Kelley Rhino.

Randy Rhino, an Atlanta chiropractor, is Tech's first inductee since Ray Beck entered the Hall in 1997. Other former Tech standouts in the Hall of Fame include Maxie Baughan, Bobby Davis, Bill Fincher, Buck Flowers, Joe Guyon, George Morris, Larry Morris, Peter Pund and Everett Strupper. Three Tech coaches are in the Hall of Fame — John Heisman, William Alexander and Bobby Dodd — and former Tech players George Gardner and Bobby Gaston were honored as college football officials.



Randy Rhino volunteers his time as a head coach of a baseball team at Northside Youth Organization in Atlanta.

Rachel LaCour Nielsen



# Varsity Featured as Drive-in Favorite

All Georgia Tech alums know where to go for a “nekkid dog walking” and a frosted orange. Thanks to the Food Network, so does everyone who caught “Drive-ins Unwrapped.”

The Varsity, launched by the late Tech alumnus Frank Gordy in 1928, was profiled on the show, which pulled in to famed drive-ins around the country.

The Midtown landmark was touted as the world’s largest drive-in and the restaurant that serves the most Coke in the country. Viewers even got a look at the hot dog conveyor belt developed by Gordy and black-and-white photos that were sure to bring back memories for The Varsity’s patrons from days gone by.

The Food Network often replays episodes so “Drive-ins Unwrapped” may be repeated — kinda like a return visit to the Varsity for another serving of a dog with onions.



## 75 Years Ago

Professor R.S. King, head of mechanical engineering at Tech in 1927, spent his summer vacation as a railroad engineer. Well, he didn’t actually run the train. King rode the rails of the New York Central Line conducting tonnage rating tests. J.

L. Davidson, ME 15, said although the work was “far from a bed of roses,” King adapted quickly and in no time “could speak railroad slang fluently.”



## 50 Years Ago

The median yearly income of Georgia Tech alumni was \$7,100 and 63 percent worked in engineering, according to a GEORGIA TECH ALUMNUS magazine survey published in the May-June 1952 issue. The U.S. Census Bureau reported that the median American income for 1952 was \$3,890.

## 25 Years Ago

The Atlanta Touchdown Club and Delta Air Lines created an award named for Tech’s legendary football coach, Bobby Dodd. Ironically, the first Dodd Award, presented in 1977, was given to Georgia head football coach Vince Dooley. “It was always my philosophy that you could get more out of people by building them up instead of tearing them down,” Dodd said at the event. “I think both of us act the same in victory and defeat.”





Kirk Bowman takes a self-portrait with Cuban children.

## Foreign Exchange

*Students study in Cuba as Carter makes visit*

By Neil B. McGahee

When Georgia Tech associate professor Kirk Bowman made plans a year ago to visit Cuba with 23 international affairs students, he had no idea the class would be studying there at the same time former President Jimmy Carter made his historic visit.

"It was pure serendipity," Bowman says. "We didn't know until the last minute that he would be there."

Carter, who attended Tech during the 1942-43 school year before transferring to the Naval Academy, became the first American president to visit Cuba since Calvin Coolidge in 1928.

While Carter followed a diplomatic agenda, Bowman and his students followed an academic agenda.

A Latin American studies specialist in the Sam Nunn School of International Affairs, Bowman says the trip was designed to give students a chance to study and form opinions about the island nation and its communist society.

"We look at the history of Cuba all the way back to Jose Marti's victory over colonial Spain, but we primarily study contemporary economic, social and political dynamics," he says. "There's a lot of change going on in Cuba, especially the way technology is impacting the island through e-mail and the Internet. They are indicators of openings in the society."

Bowman says Georgia Tech was issued a two-year study permit by the Treasury Department to visit Cuba, the only stipulation being that the students must follow a structured schedule that allowed no idle time.

"We spent our days visiting his-

toric and educational sites and listening to speakers discuss all aspects of Cuban society," Bowman says. "But to understand Cuba, you have to understand music, dance, food, passion and patriotism, so we devoted the nights to talking with the people."

Bowman's students visited dance halls to learn the salsa, son and rumba. They observed the rites of Santeria, Cuba's quasi-official religion, and attended a "beisbol" game.

"I wanted students to understand Cuban civil society," Bowman says. "Civil society is considered a bourgeois practice and has become almost nonexistent."

"Most organizations that are common in the United States are rarities in Cuba," he says. "That's how we met the Harlistas."

Bowman, an avid fan of Harley-Davidson motorcycles, had heard about a group of Cuban motorcyclists who rode their Harleys — the newest an early 1950s model — in seeming defiance of the government. The stu-



dents found them at an outdoor bar in the oceanside city of Miramar.

"The Harlistas have been trying to get government approval of the club's charter since the 1970s so they could have formal meetings instead of meeting at cafes and taverns," Bowman says. "But, in Cuba, it's difficult to form any kind of association because that would mean recognizing something bourgeois."



Jennifer Tucker, a sophomore in the Sam Nunn School of International Affairs, met some of the children at the Callejon de Hamel in Havana, Cuba.

Bowman says although his group never crossed paths with Carter, his presence and especially his televised speech led to frank and passionate discussions with ordinary Cubans.

"We don't understand in the United States how historic Carter's speech was," Bowman says. "But for someone who has lived in Cuba 40 or 50 years and has never heard someone on television criticizing the regime, it

was a remarkable experience."

The Tech students watched the speech in a hotel in the small town of Trinidad. Afterward they discussed the speech with the hotel staff who had also stopped to watch.

"These folks were very committed, fervent supporters of the revolution," he says. "Sometimes we forget that while there are certainly dissidents, there is a very strong core of support

for the Castro regime that comes about through all sorts of propaganda and socialization, and some real benefits that have accrued, particularly to the minorities and the poorer sector of society whose life is marginally better than before the revolution. That's true especially in health care, housing and education. They are fervent supporters."

Bowman says the more the students "peeled back the layers of the onion," the more surprised they were.

"Cuba is a contradiction wrapped around an enigma," Bowman says. "The more you probe, the more confused you actually can become. You don't know who is being cautious about what they say.

Even the dissidents who detest Fidel Castro and communism also detest the U.S. embargo and policies like the Helms-Burton law. They criticize the U.S. because the only person on the island who benefits from the current administration's policies is Fidel Castro. It gives him a ready-made excuse for anything that goes wrong — any failure can be blamed on the United States."

## Living on Mars

Jan Osburg, MS AE 96, spent most of April living on Mars.

Well, next thing to it. Osburg was a crew member for the Mars Desert Research Station, a habitat analog located in southwestern Utah. From April 7 to 21, he performed research on human factors and life support system issues and filled the position of crew medic.

An aerospace engineer and lecturer at the Space Systems Institute in Stuttgart, Germany, Osburg was selected to participate in the experiment by the Mars Society. In addition to his master's from Tech, Osburg has a master's in aerospace engineering from the University of Stuttgart. He is earning a PhD in Space Systems Design and plans to relocate permanently to the United States.

The purpose of the Mars Desert Research Station and its sister station, Flashline Mars Arctic Research Station, located on Devon Island in the High Arctic, is to gather the operational experience to make the first actual human expeditions to Mars a success.

Crew members must follow strict mission rules aimed at making the operation of the station as similar to a real Martian surface habitat as possible. Before leaving the habitation module to perform extravehicular activities, crew members must don spacesuits and exit through an air lock.

Communication with the outside world is routed through a mission support center, which is staffed by Mars Society volunteers.



## Troy Matteson wins NCAA golf championship

Junior Troy Matteson shot a 4-under-par 67, including four birdies, to become the first Georgia Tech player to win the NCAA Individual Golf Championship. Matteson's total of 8-under-par 276 tied with teammate Matt Weibring (2000) and former Jacket player Matt Kuchar (1998) for the second-lowest 72-hole NCAA total in school history.

Matteson is Tech's first national champion since the NCAA began sanctioning tournament play, but he is the third Tech player to win a national collegiate championship, joining Watts Gunn in 1927 and Charlie Yates in 1934.

Five Yellow Jackets were named to the Golf Coaches Association of America/PING All-America teams, while head coach Bruce Heppler was named GCAA National Coach of the Year.

Matteson was selected for the first team, senior Kris Mikkelsen was named to the second team and senior Weibring garnered third-team honors. Freshmen Chan Wonglukiet and Nick Thompson were named honorable mention All-Americans.

"To have five guys play at an All-America level for an entire year is a great honor," Heppler says.

The golf team, ranked No. 1 in the country, lost the national championship to the University of Minnesota. Tech led the first three days of the four-day tournament played at Ohio State's par-71, 7,222-yard course, but the Gophers surged on the final day. Tech shot a 1-over-par 285 in the final round, but Minnesota shot a 2-under 278, winning by four strokes.

The second-place finish marks the fourth top-five finish for Tech in the last five years and the third runner-up finish. **GT**

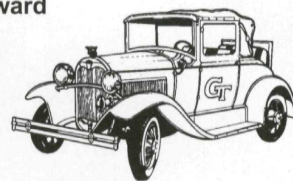
### ALUMNI, FACULTY and STAFF INVITED TO NOMINATE 2002-2003 GRIFFIN AWARD CANDIDATES

The Alumni Association is currently seeking candidates for the 2002-2003 Dean Griffin Community Service Award.

Nominations should capture the full extent of the nominee's community service activities. A committee of alumni will select the recipient on the basis of his or her community service activities, such as service in a long term volunteer capacity, the impact on the quality of life of others, demonstrated leadership and creative ability to deal with societal problems proactively, and setting an example for others to follow.

Nomination forms are available upon request by writing:

**Dean Griffin Community Service Award  
Georgia Tech Alumni Association  
190 North Avenue  
Atlanta, GA 30313**



Or log on to: [www.gtalumni.org](http://www.gtalumni.org)

For further information call Anna Ivey at 404-894-7085 or 1-800-GTALUMS or email [anna.ivey@alumni.gatech.edu](mailto:anna.ivey@alumni.gatech.edu)

**The deadline for nominations is September 6, 2002.**

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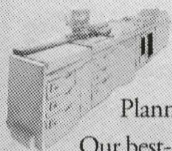
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# Georgia Tech Club

*Exclusive Residential Community,  
Golf Team Home Course Planned*





## By John Dunn

**T**he Georgia Tech Club, a 600-acre planned residential community built around an 18-hole golf course that would be home to the Yellow Jacket golf team, is planned for development next fall.

In addition to the golf course, the \$66 million planned community includes a tennis center and a lifestyle center complete with spa and fitness facility. The community will be developed in north Fulton and Cherokee counties.

The Georgia Tech Alumni Association and the Athletic Association have jointly agreed to licensing agreements with University Clubs by Melrose, a wholly owned subsidiary of The Melrose Co., of Hilton Head Island, S.C., a privately held developer of prestige golf communities.

Joseph P. Irwin, vice president and executive director of the Alumni Association, says, "We're putting our name on a

club that we can call our own. It's one of those unique opportunities that will benefit the school and its alumni.

"The Georgia Tech Club will be a high-end, private community developed by a company that has established itself as a model for excellence," Irwin says.

The company built Indigo Run, a 1,800-acre planned community on Hilton Head Island that has two Jack Nicklaus-designed golf courses, and Aspen-Glenn, a 900-acre planned community with a Nicklaus-designed golf course in Carbondale, Colo., among others around the United States.

"Any time you are satisfied or you're standing still in our world today, you're moving backward. We need this to continue to make our golf program an even better program," says Athletics Director Dave Braine. "This is a situation that will not only help our golf program, but it will help the whole Georgia Tech community."

The Georgia Tech Club has initiated a drive for 100



founding members at \$60,000 each, and is sending out letters, promotional material and a video to alumni.

Homes in The Georgia Tech Club start at about \$500,000. Community plans call for 206 homes on lots costing about \$240,000 each and another 25 exclusive, fully furnished four-bedroom founders' cottages estimated at \$750,000 each.

The homes will be situated around the golf course and its 30-acre driving range and practice area. Melrose Co. estimates the gated community will sell out in four years.

The Alumni Association and Athletic Association will receive 5 percent of membership sales and 10 percent gross operating revenue. This royalty fee is projected to generate more than \$1 million a year at sellout.

Golf course architect Rees Jones of Montclair, N.J., designed the golf course and joined with Tech golf coach Bruce Heppler in designing the practice facility. Atlanta architect Niles Bolton, Arch 68, president of Niles Bolton Associates, designed the country club and cottages.

Former U.S. Open and Wimbledon champion Stan Smith designed the tennis facility, and Johnson and Johnson Health Care Systems is designer of the lifestyle center.

"That quadrant of northern Atlanta from Interstate 75 all the way over to Interstate 85 and 40 miles north is one of the most desirable areas to live in the Greater Atlanta area," says Ed Spears, president of the University Clubs. "It has been on a growth curve for the past 15 years that we find very attractive and desirable."

Because it has aligned itself with Georgia Tech, Spears says, the Melrose Co. has made its development unique. "There can only be one Georgia Tech Club and home of the Georgia Tech golf team," he says.



Spears says The Georgia Tech Club will benefit alumni and Tech in a number of ways:

- It will provide alumni and friends a place to reunite and congregate for academic, cultural and athletic events.
- The learning and conference facilities developed in partnership with IBM will be an excellent venue for guest lecturers, continuing education and member-sponsored meetings.
- The golf course and state-of-the-art practice facilities will be available to the Georgia Tech golf team on a priority basis.
- Alumni and athletes will be able to enjoy a championship golf course designed to host significant amateur and collegiate events.
- The Georgia Tech Club will provide financial support for alumni and athletic programs through royalties on all memberships and operating revenues. **GT**

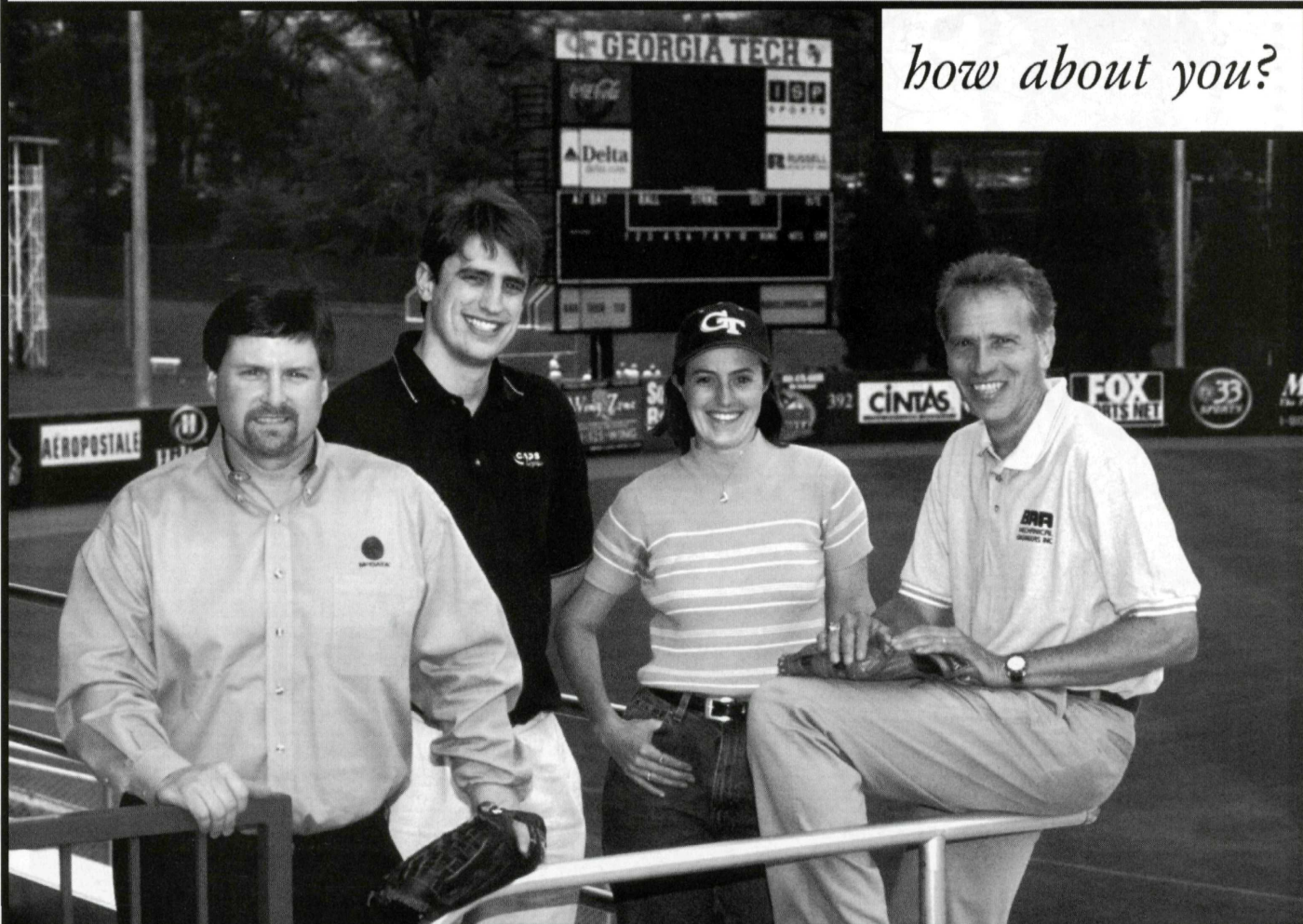




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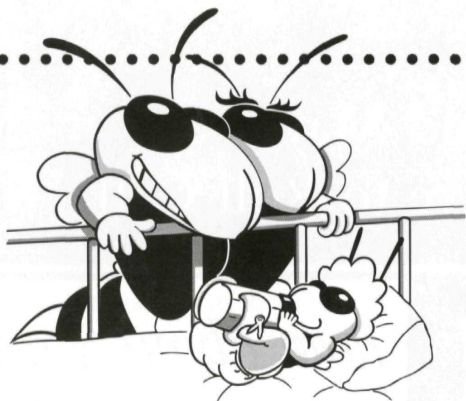
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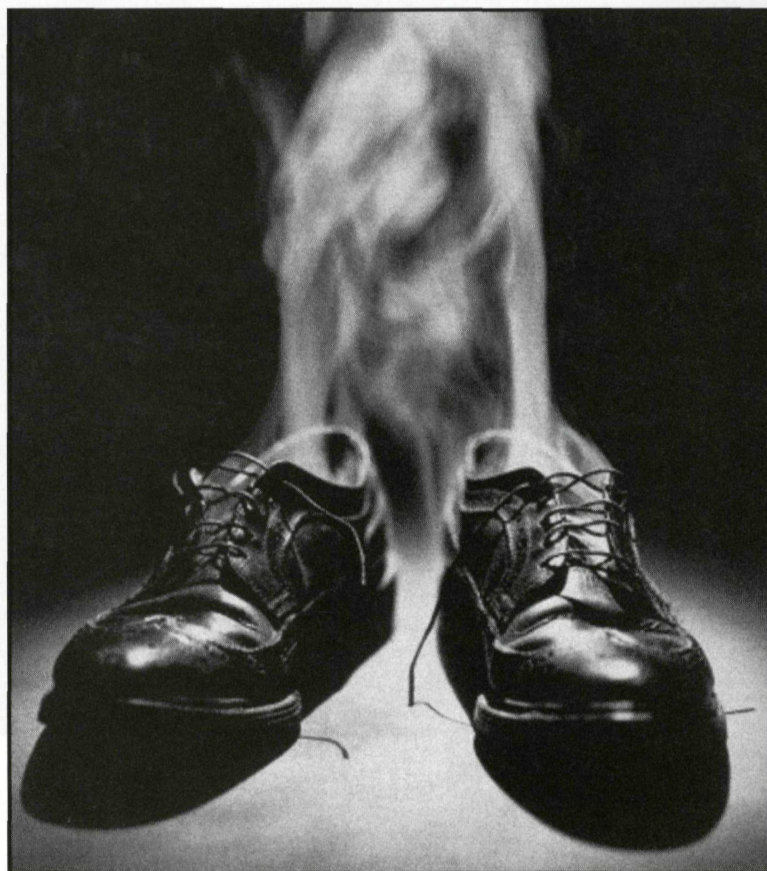
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The hallmark of classic taste, these pictures feature the Tech Tower in an antiqued wood frame. Two lines of personalization available for the Ink Picture only. Size: approximately 10" x 12"



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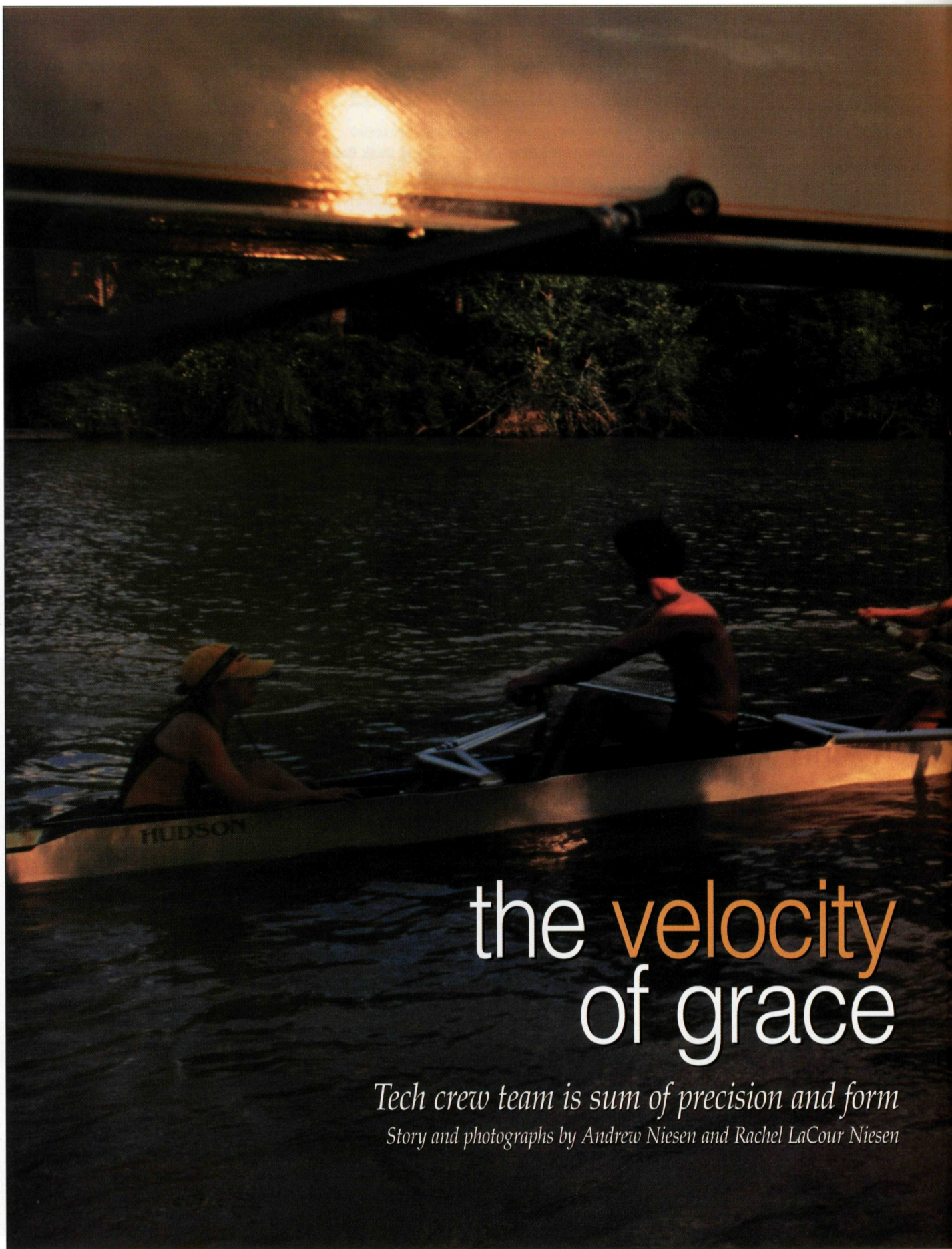
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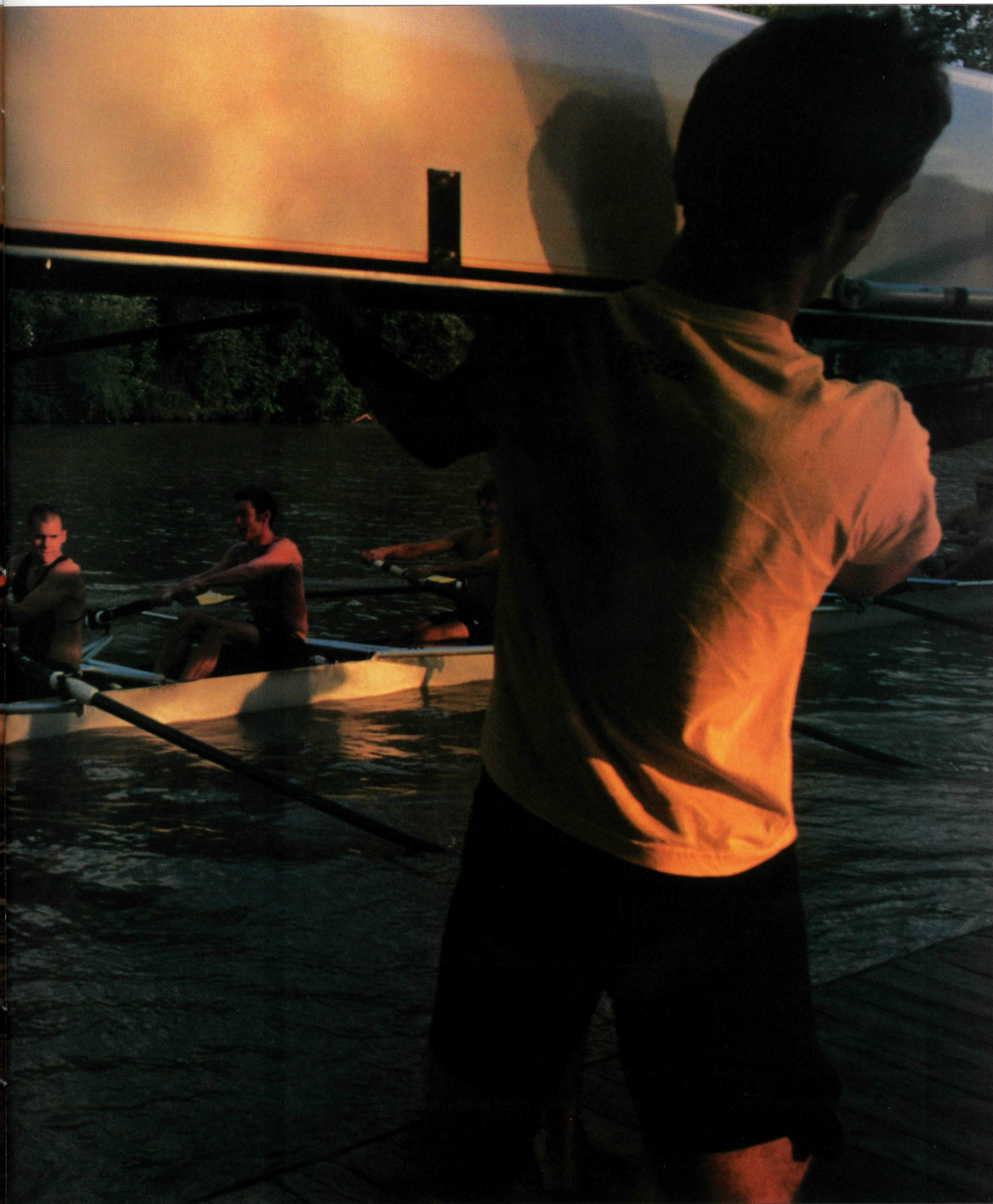


# the velocity of grace

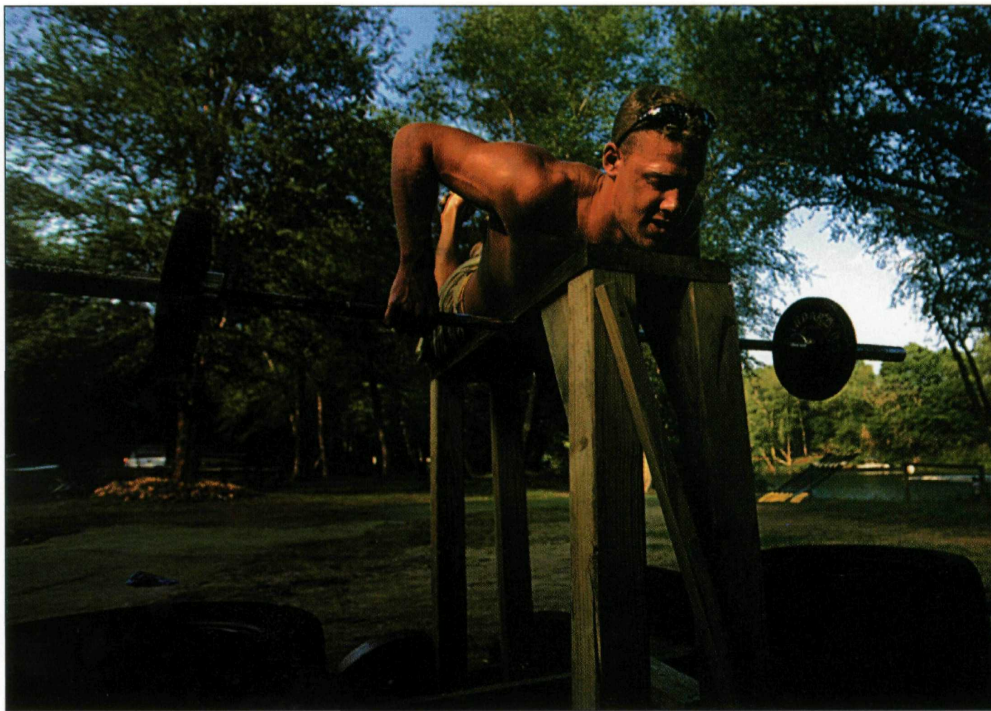
*Tech crew team is sum of precision and form*

*Story and photographs by Andrew Niesen and Rachel LaCour Niesen*





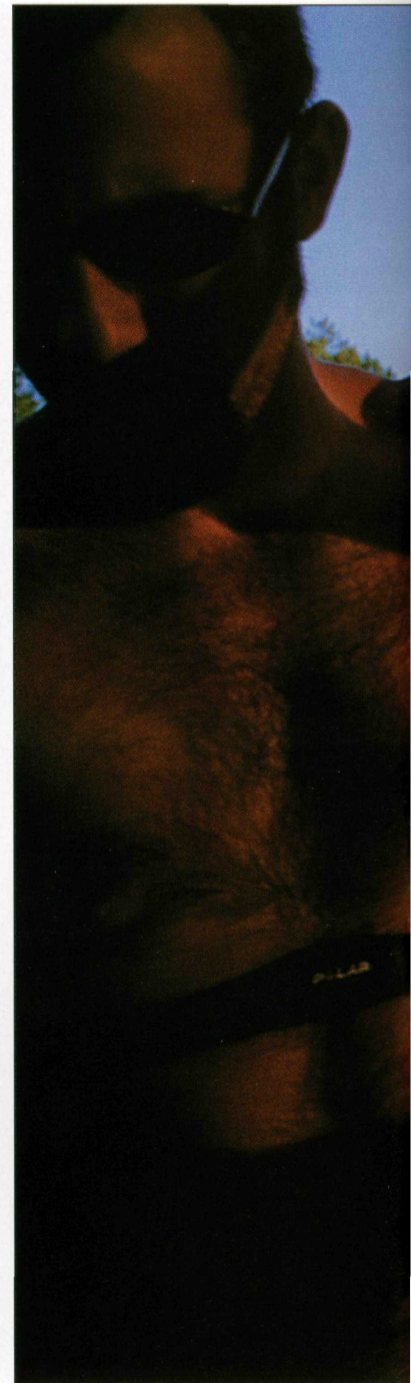




Above, Jordan Smith performs bench pulls to strengthen his arms and assist the finish of his stroke.

Right, Bart DeBacker stretches before practice to prevent injury.

Far right, Sims Acuff, center, prepares to lock his oar to the boat.



CREW IS THE ULTIMATE TEAM SPORT. It is the sum of grace and strength, requiring both subtle finesse and raw power. To achieve a state of balance, rowers must have a unique blend of mental fortitude and muscular endurance. When balance is achieved, and the boat glides elegantly across the water, something extraordinary happens. Nine individuals fuse into a single, efficient unit.

Rowers learn quickly that greatness is only achieved by working together. There is tremendous energy focused on a common goal, and that energy transforms each boat into something greater than its individual rowers.

Both on and off the water, each rower must exhibit unwavering dedication to the sport. Hours of weight training, physical conditioning and boat maintenance bolster the camaraderie of a crew. While each rower must strive toward individual goals, it is the unity of a crew that ultimately determines its success.





*"Tech crew is a growing program and one of the most successful programs in the South. We are looking for rowers who strive for personal excellence. The team motto we've adopted is 'Plan to win, prepare to win, expect to win.'"*

*— head coach Rob Canavan*

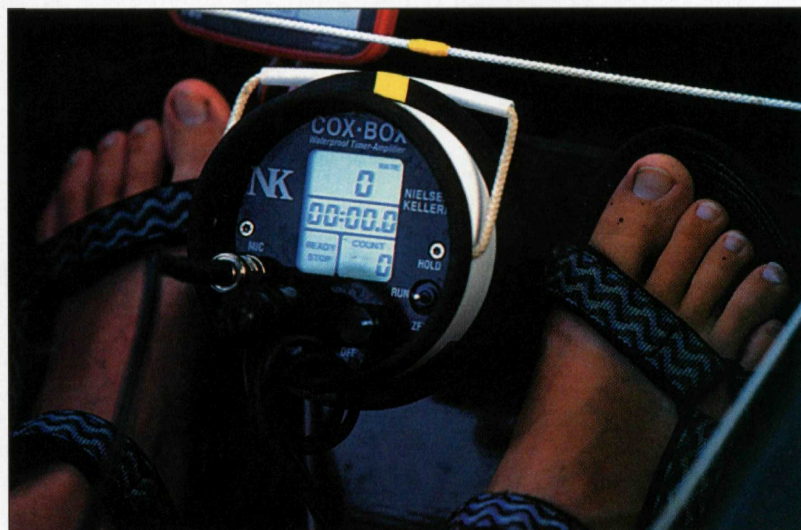
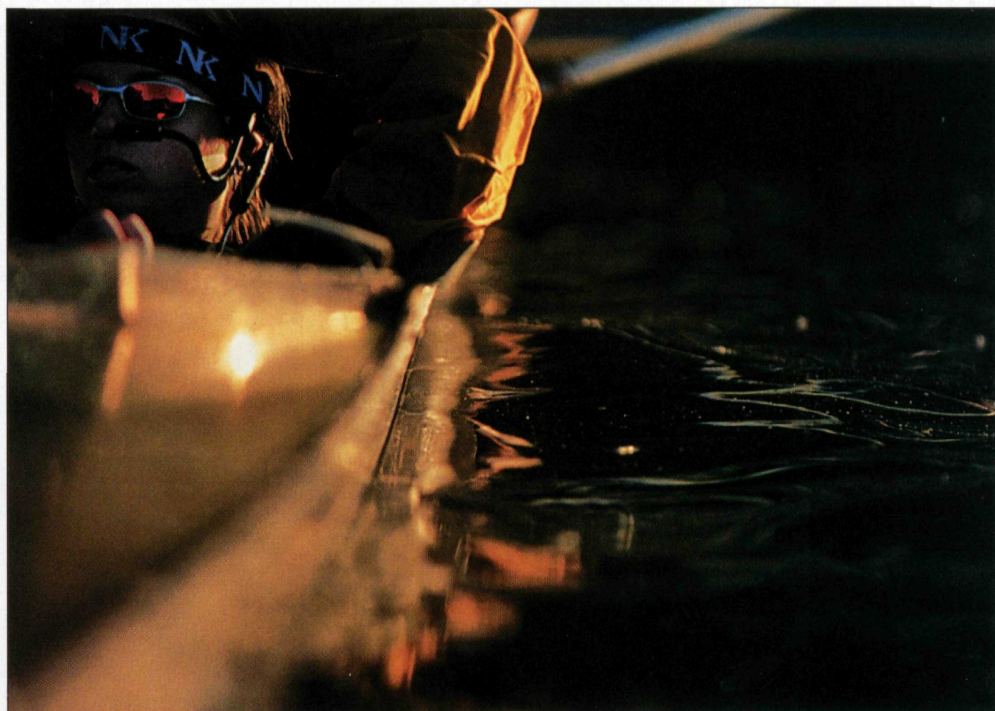
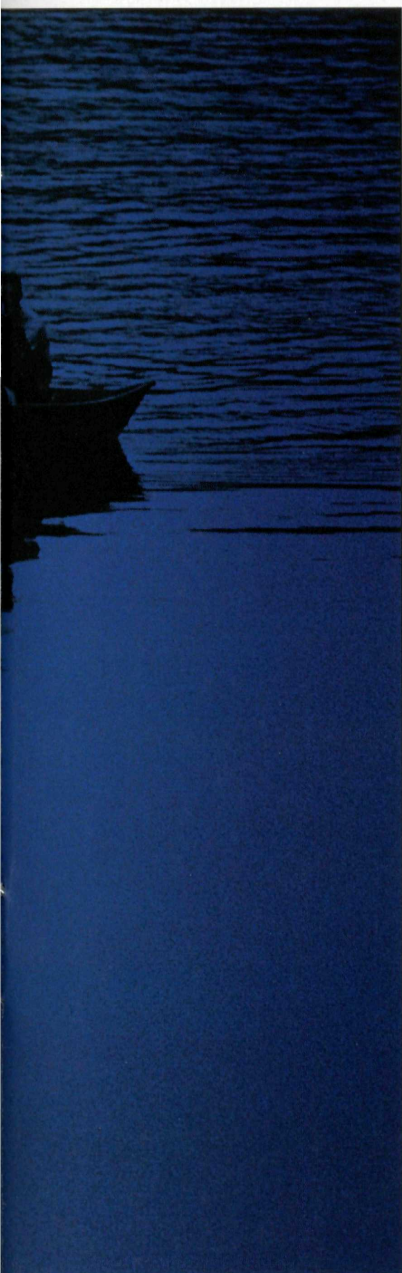




*"Tech's blade design represents the dualism found in rowing and in life. The altered yin-yang symbol represents the grace of crew and its demand for synchronization and for technique, while also requiring raw muscle to win."*

*— assistant coach Jim "Slim" Price*

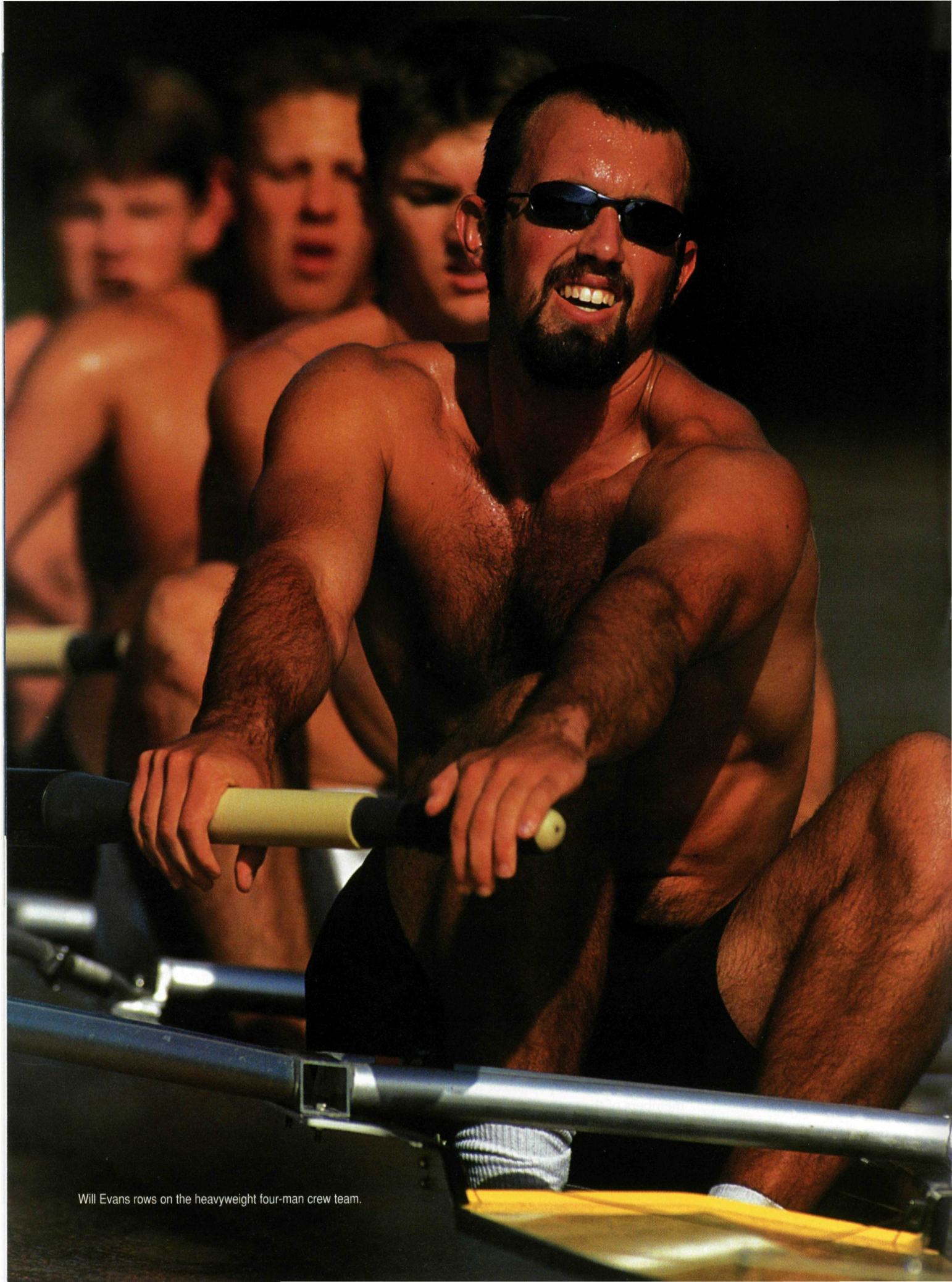




**S**WOOSH, THUMP. SWOOSH, THUMP. In the predawn hours, the Chattahoochee River is bathed in deep blue light. The rhythmic swooshing of oars slices the silence hovering over the glassy water. Rising before the sun, Tech rowers demonstrate their dedication during rigorous morning practices, *left*.

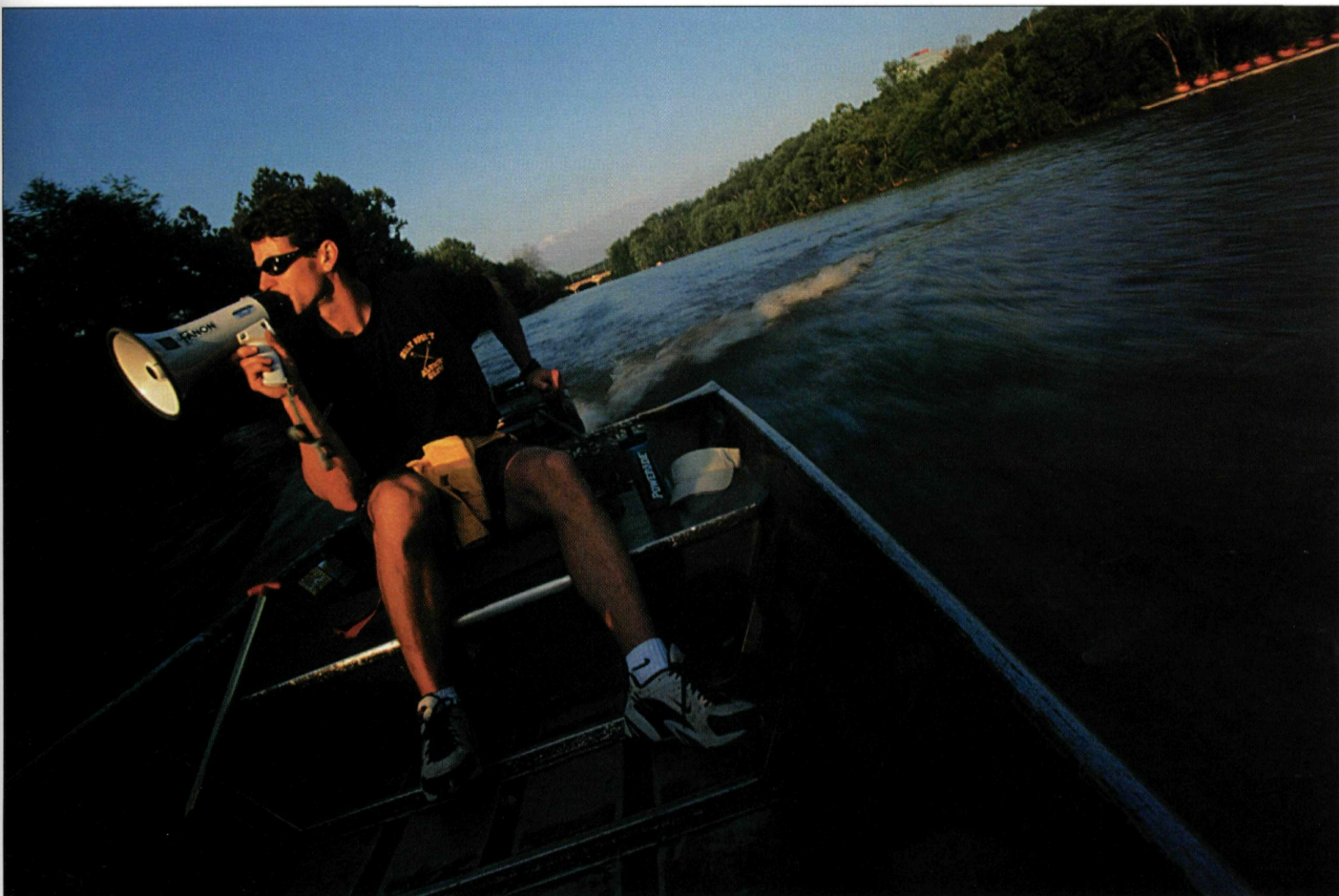
Varsity crew team coxswain Jenn Baum, *top*, guides her rowers along the river. Coxswains (pronounced “cox-sons”) are invaluable team members because they are responsible for steering and commanding the crew. Additionally, they act as tacticians and relay the coach’s instructions to the crew. Weighing 120 pounds or less, coxswains are the smallest and lightest members of the team. They sit low in the boat, nearest the water. A typical boat, referred to as a shell, is approximately 60 feet long and carries eight rowers plus a coxswain. A small round box, known as a “cox box,” *above*, displays the stroke rating and amplifies the coxswain’s voice.





Will Evans rows on the heavyweight four-man crew team.





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"Accelerate! Accelerate! Push! Push!" Rob Canavan's deep voice reverberates around the shells.

A U.S. Olympic Festival gold medalist, Canavan, *above*, became head coach at Tech in 1995. Pushing rowers to excel is Canavan's passion; he spends hours on the water fine-tuning their movements.

Each rower's movement is critical to the synchronicity of the crew. As the oars catch the water and the drive begins, rowers' muscles strain and relax, propelling the boat toward its goal. Chasing the crew in a johnboat equipped with an outboard motor, Canavan can barely keep up with their pace.

The slender shells skim across the surface of the water, creating what famed American shellbuilder George Pocock called "a symphony of motion."

The Georgia Tech crew team was formed in 1986 and is currently the largest club sport at Tech. As a student-run club sport, with no scholarship athletes or Athletic Association funding, the team is a grassroots effort.

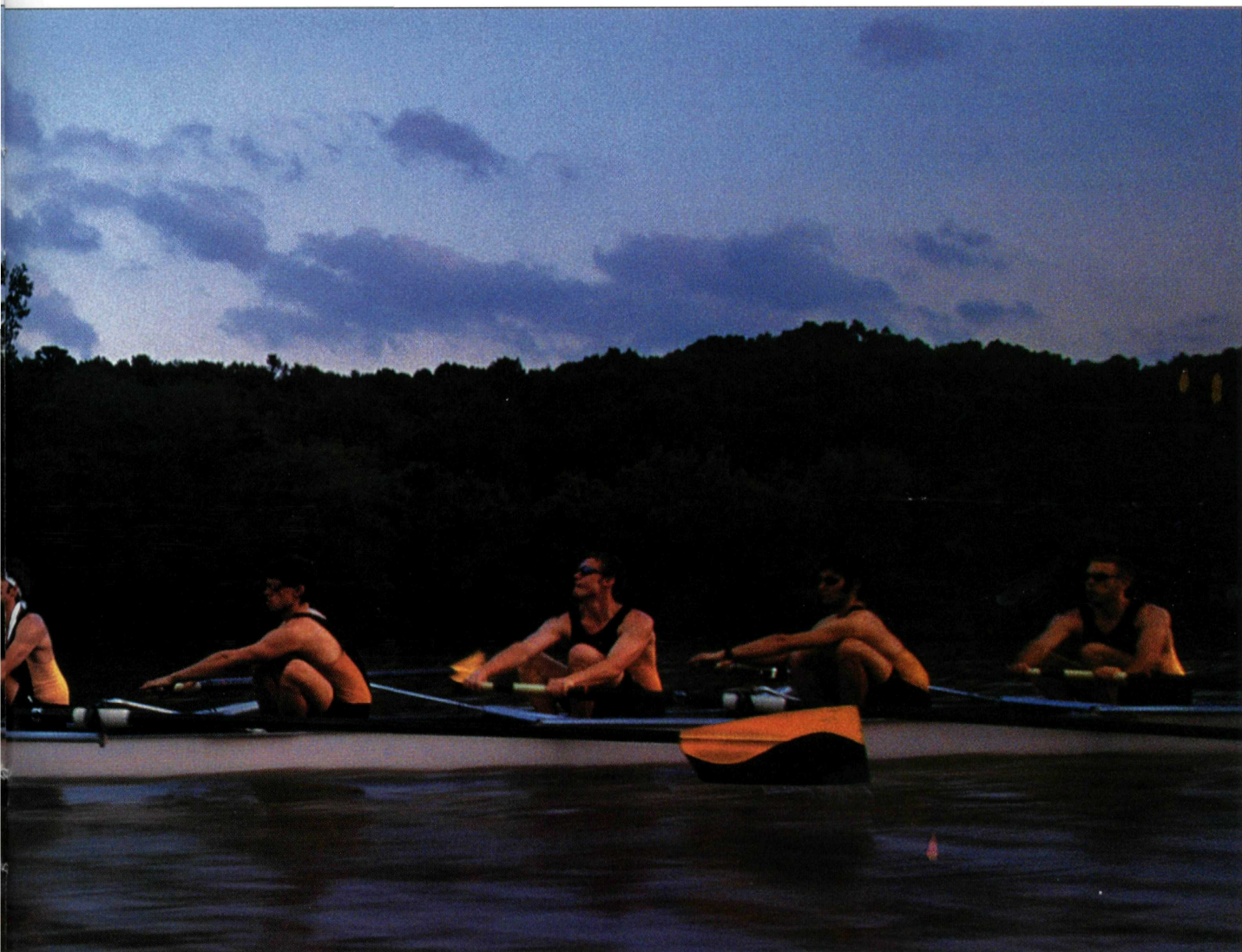
In a sport typically dominated by Ivy League powerhouses such as Princeton and Yale, Tech has performed remarkably well. Both the men's and women's lightweight eight crews finished fifth at the 2002 Dad Vail Regatta in Philadelphia, the largest collegiate regatta in the world. In 2001, the team competed in its first Intercollegiate Rowing Association national finals on the Copper River in Pennsauken, N.J. Sweeping past Ivy League stalwarts Brown, Pennsylvania and Yale, the men's varsity four finished fourth in the finals against California, Princeton, Minnesota, Cornell and Wisconsin.





Lisa Hoffer finishes a stroke during practice.





*"A high school coach once told me, 'When a person is motivated, nobody can take away her power to move forward. And when that motivation comes from inside a person's heart, they become unbeatable.' I've kept it with me ever since."*

*— Liz Henry, coxswain*

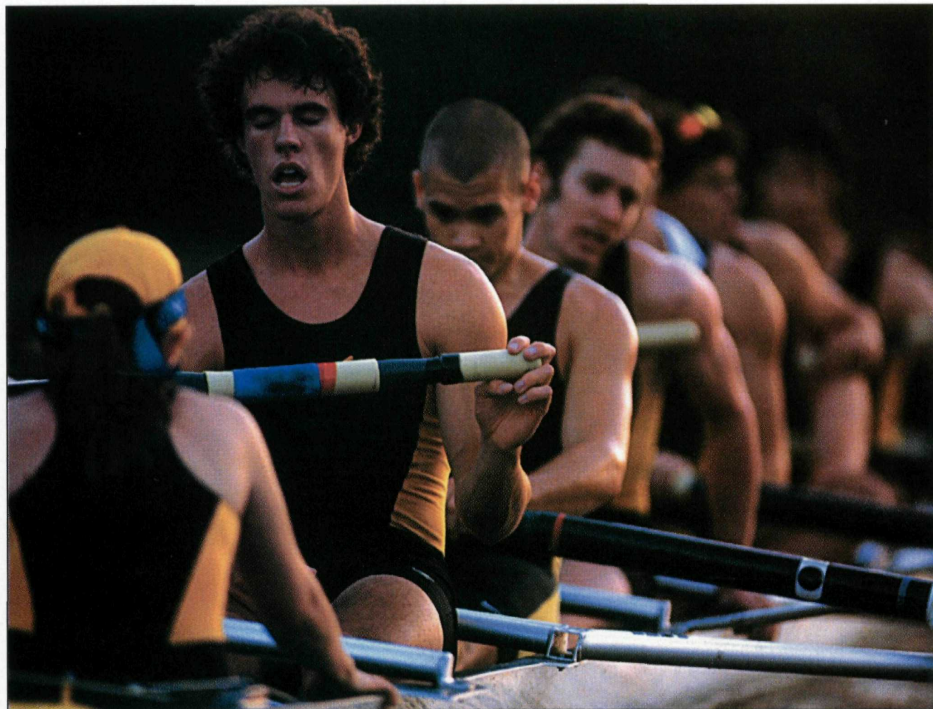
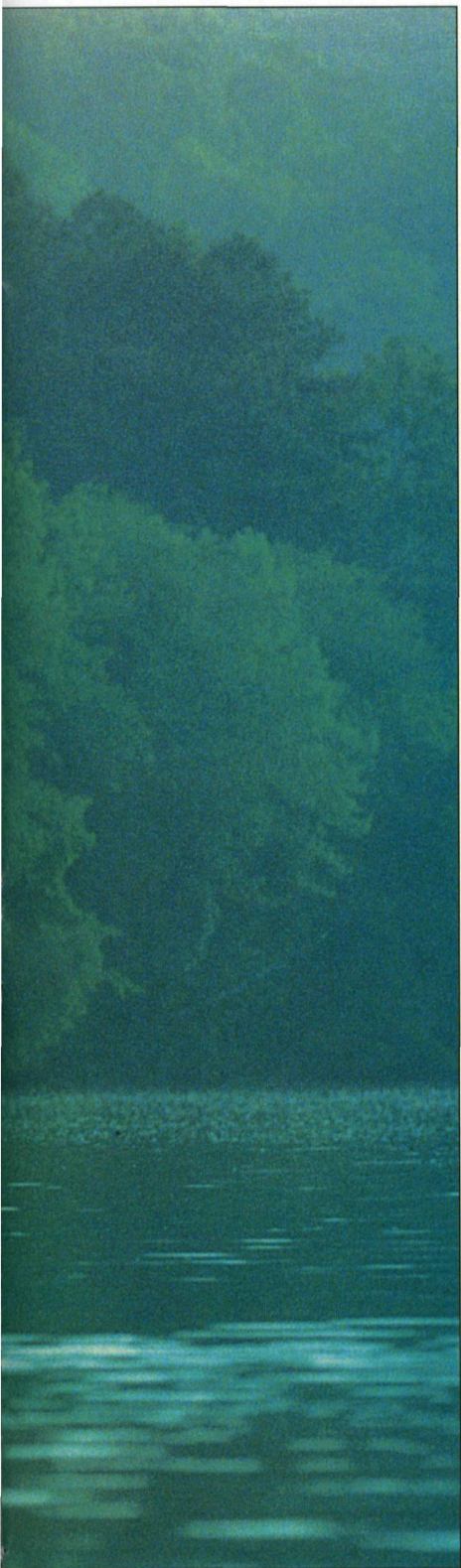




*"Rowing requires every muscle in your body. At the end of practice, everything hurts.  
But the great feeling of accomplishment outweighs the pain."*

*— rower Heidi Schafer*





Exhausted after a "power 10," Bob Baxley and his teammates pant for breath.

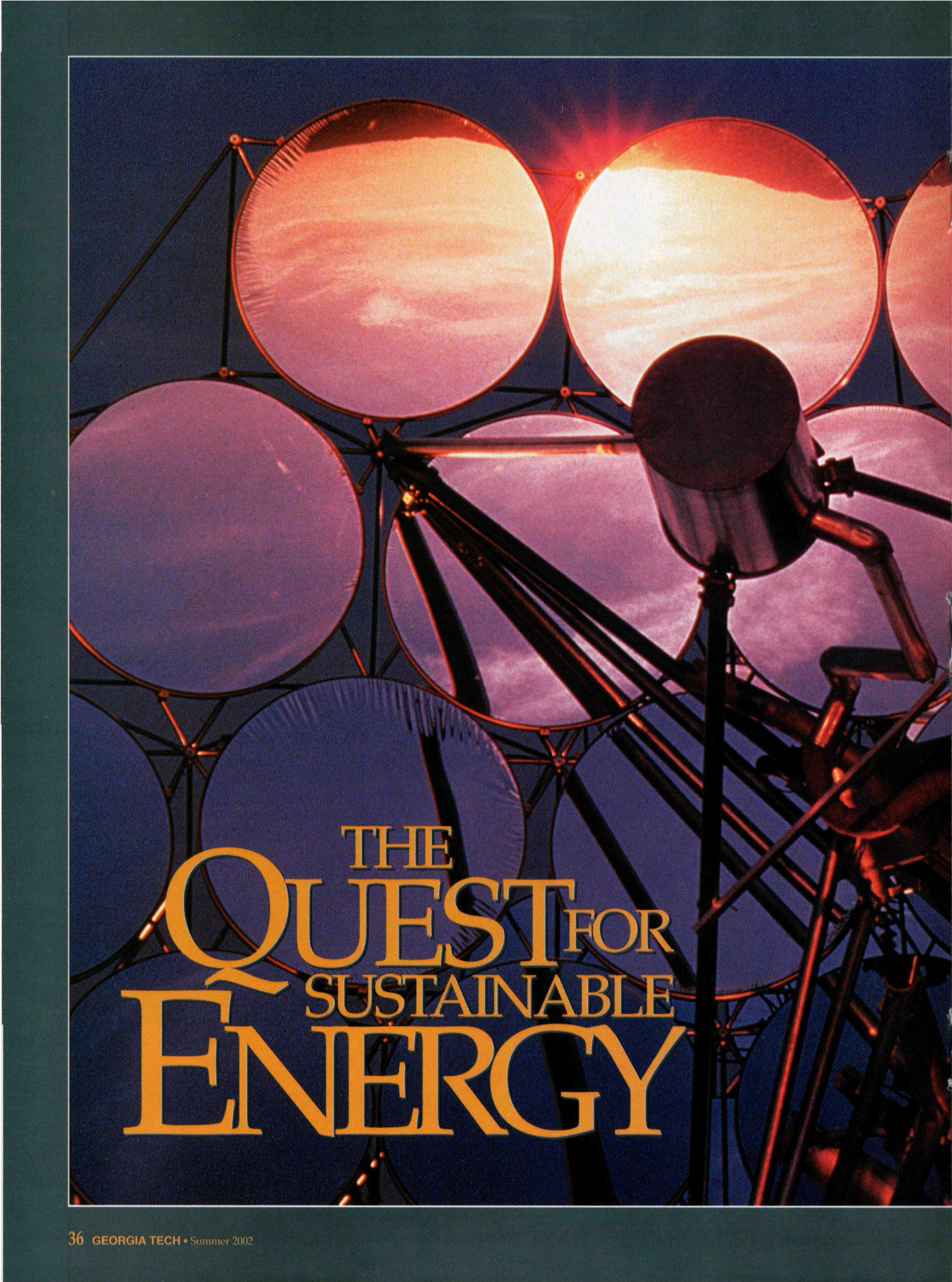
**D**USK SETTLES, CASTING MUTED EVENING LIGHT over tired muscles. At Canavan's request, the crew rows steady-state back to the dock. A deep sense of satisfaction sets in. Rowers know they are part of something special. Something strong.

"Rowing requires every muscle in your body. At the end of practice, everything hurts," says rower Heidi Schafer. "But the payoff is definitely worth the pain. The great feeling of accomplishment outweighs the pain, especially because you're part of a team. All eight rowers are in it together; everyone is depending on you, and you are depending on them too."

In a single, sweeping motion, the team lifts the boat from the Chattahoochee. Like a millipede, the boat and crew head for the boat-house. The shell is returned gently to its rack, and the individual team members scatter to keep up with homework and exams.

The next morning they will each wake before dawn.  
And do it again. **GT**





# THE QUEST FOR SUSTAINABLE ENERGY









# RENEWABLE ENERGY

*Richard Truly directs strategy for a new system of energy*

By Gary Goettling

**M**y candle burns at both ends; It will not last the night; But ah, my foes, and oh, my friends — It gives a lovely light!"

Although Edna St. Vincent Millay was writing about herself in 1920, her famous verse aptly describes U.S. energy consumption in 2002. No one appreciates the analogy more than Richard Truly, AE 59, director of the National Renewable Energy Laboratory in Golden, Colo.

"We are increasingly depleting our storehouse of fossil fuels, we are increasingly reliant on vulnerable infrastructures, and we are increasingly adding wastes into our environment," says the retired Navy vice admiral and former astronaut. "Though we may have little choice in the very short term, we are nonetheless creating debts for future generations. I have concluded that our current 'business-as-usual' approach could be appropriately labeled 'borrowing from the future.'"

Truly joined NREL in 1997 following five years as director of the Georgia Tech Research Institute. Previously, he

served as director of NASA for President George Bush.

As a Naval aviator and test pilot, the Mississippi native captured public attention in 1977 when he piloted the Enterprise Space Shuttle approach and landing tests. Four years later he made aviation history again aboard Columbia as pilot of the first shuttle to be reflown into space. He later commanded the first night launch and landing aboard Challenger, and in 1986 was named to head the investigation of the Challenger accident. In 1989, Truly concluded a 30-year military career to become the first astronaut to head NASA.

One of the Department of Energy's national laboratories, NREL is the country's premier facility for the research, development and deployment of energy from the sun, wind and plant life. NREL is operated by the Midwest Research Institute, of which Truly also serves as executive vice president, the Battelle Memorial Institute and Bechtel Corp.

The national lab sponsors research and maintains ongoing relationships with several universities, notably Georgia Tech's Center for Excellence in Photovoltaics Research and Education. The center's mission is to improve the fundamental understanding of the science and technology of advanced



crystalline-silicon photovoltaic devices, fabricate high-efficiency solar cells, provide training and enrich the educational experiences of students in this field, and give the United States a competitive edge by providing guidelines for achieving cost-effective and high-efficiency solar devices.

Truly says NREL's goal of building a "sustainable-energy future" requires a long-term strategy encompassing diversification, renewable energy and energy efficiency.

It is an approach that will lead to a new system of energy resources that will be "affordable, flexible and reliable enough to meet the changing needs of a diverse population of energy consumers in a predictable manner," Truly says. "It will be as secure as possible from disruptions from acts of terrorists and nature. It will be safe and environmentally clean enough that it does not overtax Earth's ability to handle wastes. It will be extremely energy-efficient in production and use."

But the real prerequisite for success, Truly adds, is that "it must support human activities at a standard of living equal or better than today without reducing options and incurring debts for future generations.

"This is a tall order, but I think it is imperative that we raise the bar — now — to this level of expectation."

Energy diversification embraces a combination of fossil, nuclear and, especially, renewable fuels rather than focusing on a single new technology or power source, Truly says.

New technological developments are already beginning to facilitate diversification, he says, citing improvements in photovoltaic power generation.

"Efficiencies have steadily improved, with some technologies at 34 percent and starting to rival fossil and nuclear conversion figures," he says, adding that residential photovoltaic systems are starting to appear in the marketplace through retail outlets such as The Home Depot.

Despite their poor public image, nuclear power plants offer too much potential to be left entirely out of the mix, Truly says.

"Advanced nuclear technology concepts could lead to greatly improved nuclear plants relying more on inherent safety and offering greatly expanded power and industrial applications."

Bioenergy is a relatively untapped, indigenous renewable resource undergoing considerable research at NREL. Using the tools of modern biology such as genomics and metabolic engineering, researchers are investigating new, more efficient ways to convert biomass wastes and energy crops to useful products, Truly says.

"Biorefineries will be developed to produce biofuels, biopower and commercial chemical products — all derived from biomass rather than fossil fuels," he explains.

"Biomass energy has the potential to supplement, or displace, imported fossil fuels in many applications. These include fuels for transportation and power production, strategic fuels for military use, or as a feedstock for chemicals, fiber and other materials. Biorefineries — the direct analog of petroleum refineries — that produce multiple products are the most promising route to the creation of a new, domestic bio-based industry."

Working with industry and academia in the development of promising biorefinery concepts and technologies, NREL activities include improving the cost-effectiveness of biomass processing, using sugars from cellulose to produce fuels and chemicals through fermentation.

Additional research focuses on enhancing biomass gasification systems for use as a technology for multiproduct operations and testing the performance of biofuels in advanced engines for transportation and in turbines for power production.

Transportation accounts for roughly one-third of the energy consumed in the United States. Nearly all of this energy comes from oil, 60 percent of which arrives from overseas. Truly envisions a new generation of hybrid electric vehicles that provide the safety, comfort and performance Americans expect — all at greater efficiencies. NREL scientists also are developing cleaner fuels from both fossil fuels and home-grown renewable sources.

Going even further, Truly describes the possibility of automobiles one day actually contributing to the country's energy supply.

"Electric-drive vehicles, powered by clean-burning 'engines' such as fuel cells, could become an integral part of the power grid operation and provide valued services during the times the vehicle is parked near a building by functioning as a distributed energy resource."

Down the road, many energy experts in the Department of Energy and the NREL expect America's future may belong to hydrogen power.

Environmentally friendly, versatile and safely produced, hydrogen's numerous potential energy uses include powering nonpolluting vehicles, heating homes and offices, and fueling aircraft.

"Because it is so crosscutting, hydrogen will eventually blur the distinctions among the electric, natural gas and transportation industries, requiring an integrated strategy that avoids looking for solutions for each energy industry in isolation," Truly notes.

At the NREL, scientists are developing technologies for producing, delivering, storing and using hydrogen. And while early hydrogen production will come mostly from fossil fuels, "we are also making progress on ways to produce it from sustainable sources like biomass and solar energy," he says.

Additional efforts include vehicle system modeling and simulation as well as development of improved fuel cell components and systems. NREL also is engaged in analytic studies of the life-cycle assessment and value of different hydrogen production and use processes.

Energy demand for buildings, which is responsible for another third of the total U.S. energy consumption, could be significantly reduced by technologies such as electrochromic windows that darken or lighten to control heat gain from the sun, desiccant-based dehumidification systems that reduce cooling loads and solar cells incorporated into a building's roof and windows.

"This can be taken one step further through a whole-building design approach, bringing us closer to realizing

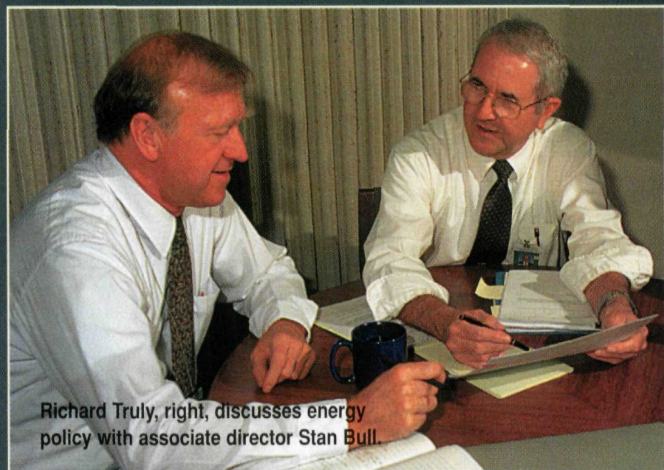


'zero-energy buildings' — buildings that actually produce all or even more energy than they use."

The final third of the energy-consumption picture is expended by industry.

"We are developing more energy-efficient ways to manufacture and recycle primary metals like aluminum and steel," Truly says. "Through combined heat and power — the use of heat for both space heating and even space cooling — we can realize further gains in fuel efficiency. The result is a significant improvement in energy efficiency and reduced environmental impacts."

The complement of diverse, renewable energy sources are what Truly calls "distributed energy systems," a decentralization of the energy supply infrastructure.



Richard Truly, right, discusses energy policy with associate director Stan Bull.

The United States relies on 3.3 million miles of oil and gas pipelines, and nearly 160,000 miles of long-distance, high-voltage electrical transmission lines from 5,000 power plants. Much of this network is 100 years old and vulnerable to disruption both by nature and by terrorists.

"California's power crisis was aggravated by the loss of two gas pipelines, not from natural disasters or terrorism, but simply from an aging infrastructure," he says. "It was further aggravated by the failure to refill storage when needed. Increasingly, the system is in a very delicate balance — a kind of 'just in time' delivery system."

Because renewable energy systems can be spread over a broad area and provide power close to the site of the user, according to Truly, they are a more secure type of infrastructure and less vulnerable to disruption either by nature or humans.

He says distributed power systems may include micro-turbines, small gas turbines, reciprocating engines, fuel cells, wind electric, solar electric, bio-electric and combined heat and power systems.

"These systems also can include a combination of renewables and fossil energy called hybrids that — with energy storage — can add tremendous flexibility to our nation's energy system. And interconnecting with other technologies in a well-designed distribution network means grid electricity can be rerouted around any damaged portion of the network and keep vital energy flowing."

NREL work in distributed energy systems includes com-

pleting a national interconnection standard and compliance test procedures for distributed energy resources.

"It is vitally important to establish a level playing field for everyone involved in this new direction," Truly says.

Other research deals with understanding the barriers to interconnection and the apportionment of costs related to distributed generation.

Truly suffers no illusions about the enormity of the task. Each American uses six times the world average for individual energy consumption each year. As a nation, that adds up to a staggering 100 quadrillion BTUs. Truly believes that shifting the basis of those BTUs to domestic, sustainable sources could take 50 years or longer.

"Our current energy system will not change quickly, and considering our utter dependence on it, should not," he says. "For example, the first oil refinery was built in 1861, and the first natural gas pipeline was built in 1870. Oil did not approach 10 percent of our energy mix until about 50 years later, and natural gas 60 years. But I believe a transition must be made, and it can be made with minimal risk — risk far lower than the risk of staying the course of our current 'borrowing from the future' condition."

Human history is defined by many such major transitions, he says. "We should expect and perhaps even welcome them by now, but change is difficult and skepticism abounds."

Truly underscores his point with a quotation from science-fiction writer Arthur C. Clarke, who once said, "People tend to overestimate what can be accomplished in the short run, but to underestimate what can be accomplished in the long run."

Truly adds, "By combining modest, well-planned investments in new technologies with enlightened public policy, we can create a flexible portfolio of options that will produce incremental changes in the near term, and paradigm shifts in the longer term. It is a low-risk transition to a sustainable-energy future. If we stay the course, it will be a future where public policy has teamed with science and engineering to pave the way for markets to embrace clean, secure and reliable technologies."

While the long-term effort Truly describes has already begun, he says its eventual success depends upon "constancy of purpose to avoid the delays and major setbacks caused by constantly changing the objectives and rules" for these research and development programs.

"We must be consistent in our R&D funding," he says, "ready to stay the course while making midcourse corrections based on achievement of goals, not on short-term political or incomplete economic considerations."

He adds, "We must actively move our solutions into the international markets of the developing countries, before they become overly dependent on the same type of rigid system we find here today."

"This transition requires scientists and engineers more than ever before," Truly says. "America's best and brightest engineering and science professionals and students must be engaged in this endeavor, just as they have for other grand challenges." **GT**



Lou Circeo, right, director of plasma research programs at the Georgia Tech Research Institute, and Bob Newsom, senior research technologist, show samples of soil the plasma arc torch has reduced to glass.



# PLASMA POWER

*Tech's torch vaporizes garbage, traps contaminated soil and produces electricity*

By Kimberly Link-Wills

Think of a plasma arc torch as a man-made continuous lightning bolt. Hotter than the surface of the sun, plasma is a tool so powerful that it can melt or vaporize contaminated soil, diseased animals, piles of garbage — and leave behind only pebbles of glass.

Plasma technology isn't new. NASA developed it in the 1960s to test heat shields' ability to withstand spacecraft re-entry into Earth's atmosphere. With temperatures exceeding 7,000 degrees Centigrade — three times hotter than fossil fuels — the plasma arc torch's potential is incredible.

It is possible to transform a landfill heaped with stinking rubbish into a glass boulder. Because all known hazardous and toxic chemical and biological agents are destroyed and reduced to their elemental components, it is possible to prevent radionuclides from leaching into the groundwater around Chernobyl and thus reduce harmful exposures to the surrounding populace. It is possible to supply electricity to our homes with gases captured from garbage, old tires and junkyard cars.

## Keeper of the Flame

Lou Circeo's hair has grayed as he has waited for the plasma arc torch to ignite wide-swept changes in the way Americans dispose of their garbage, fuel their factories and illuminate their homes.

Circeo, director of plasma research programs at the Georgia Tech Research Institute, received his undergraduate degree from West Point and his master's and PhD from Iowa State, courtesy of the Army Corps of Engineers. He studied the effects of nuclear explosions as a research associate in the Plowshare Program at Lawrence Livermore National Laboratory. He taught classes on nuclear weapons at Fort Belvoir, Va., and wrote an Army field manual on the subject. Circeo also was the project officer responsible for the design and testing of two nuclear experiments related to seismic decoupling in Nevada for the Defense Atomic Support Agency.

He moved on to become director of an Army Corps of Engineers' research lab in Champaign, Ill., where he developed underground warehouse storage concepts for nuclear weapons. Circeo, who began working with plasma technolo-





Tech's plasma torch reaches temperatures of 7,000 degrees Centigrade, hot enough to reduce nearly any form of waste into nontoxic byproducts.



gy in the early 1970s, came to Georgia Tech in 1987 as the founding director of the Construction Research Center in the College of Architecture, where he used the torch to harden and vitrify unstable soil into a rock foundation on building sites.

"You could build a World Trade Center complex on this vitrified soil," Circeo said in an *Atlanta Journal-Constitution* article at the time. "It's much better than concrete. Hell, concrete may go out of style once we're finished."

Tech launched its plasma research facility, with Circeo as its head, in 1991. It is arguably the largest university-based research program for plasma processing of waste materials in the country. In November 1997, Circeo was featured on the cover of *Civil Engineering* magazine, a publication of the American Society of Civil Engineers, and, in 1998, he was selected "Engineer of the Year in Education" by the Georgia Society of Engineers for his research activities in construction engineering and plasma technology.

Circeo reached his retirement date last year without seeing 30 years of research pay off with widespread commercial use of the torch. His retirement lasted less than 24 hours. GTRI hired him back the next day on a part-time basis. Dedicated to the plasma torch project, Circeo still puts in hours worthy of a full-time employee at the GTRI Plasma Applications Research Facility, located in the Structural Engineering and Materials Research Lab, a nondescript metal building on the outskirts of the Tech campus housing two torches, 100 and 200 kilowatts strong.

"I want to see this finally get into place," says Circeo, who holds five plasma technology patents. "It takes a long time for new technologies to catch hold. It has been frustrating. It's been 30 years."

Circeo has watched as other countries have picked up the technology. "We developed the torches, we developed the ideas, but the Japanese and the Europeans are the ones who are commercializing it," he says.

"In Japan, they're using their system for disposal of municipal solid waste and automobile shredder residue, what's left after they recycle all the metals and everything else they can. They're running out of landfill space in Japan. That's why Hitachi Metals was so interested in doing this.

"Anything they don't want is put into the hopper and it goes through a slight grinding process. Then it's squeezed into a bale that's pushed into the furnace. The only thing that comes out of there is a molten stream — no ashes, no cinders, just a molten stream. That's put into water. What they end up with, instead of a big block of hard rock, is a sand-like material. The fuel gases that come off — mainly hydrogen and carbon monoxide — are sent into a secondary combustion system. The hot gases are then mixed with water to form steam, which goes up and runs a turbine to produce electricity. After a treatment process, the gaseous emissions are essentially carbon dioxide by the time they get up in the stack," Circeo explains.

"The sand residue is mixed with cement and they stamp out these paving bricks. They get different colors and make very pretty pavements." The paving bricks — in various shapes and patterns — are being laid throughout Japan. The

Japanese are walking on what used to be their garbage and automobiles. And, best of all, nothing goes to a landfill.

"They're selling the gas. They're selling the bricks. And they're getting rid of the need for landfills," Circeo says.

He says Japan's 25-tons-per-day facility has been so successful that a 200-tons-per-day plant is in the works. He says five facilities that size could probably get rid of most of the city of Atlanta's garbage.

"Organic material like plastics or garbage is essentially gasified or pyrolyzed, which means it's melted and solidified. The gases can be converted into fuel gases if it's the right feedstock material," Circeo says.

"If you look at the energy coming into the torch and the energy coming out, you get more than four times the energy coming out as you have going in," he says as excitedly as if he only began working with plasma yesterday. "By using this technology, you're taking solid waste materials and using them as a source of renewable energy.

"Even more importantly, if you didn't turn it into electricity and you just wanted to use the fuel gas, you could use this as a heating gas, just like in your gas stove."

Circeo helped ignite the use of the torch in France as well. He melted incinerator ash at Georgia Tech for visiting city council members from Bordeaux, France, in 1993. "They went back to France, got the money and built a system to get rid of their ash. That system has been in place and operating well for about three years now."

Tech hosted what Circeo says was one of the largest plasma waste disposal technology conferences in the world in 1995. "We had something like 90 papers and people from 13 different countries here."

Reaction to plasma technology from the general population in the United States, however, hasn't exactly been glowing. "You asked me why people aren't using this," Circeo says, pointing to a newspaper headline. "This is a typical case study of how difficult it is to get new technologies introduced."

In 1998, the Lumpkin County commissioner came to the Tech lab for a plasma torch demonstration. He and a local businessman hoped to build the first U.S. commercial plasma melting facility for municipal solid waste outside Dahlonega in the north Georgia county.

Political opposition and Lumpkin County residents wary of a torch hotter than the sun and garbage being brought into their county ultimately led to the Dahlonega City Council's defeat of the proposed plasma plant.

"It got so bad they took out full-page ads in the newspapers there — 'save your home, save our county from the plasma torch,'" Circeo says.

"It got so heated they had town meetings. It actually made the *Wall Street Journal*," which quoted a Dahlonega councilman as saying, "The people who are trying to sell this are snake-oil salesmen."

Circeo put the newspaper clippings in a file and continued his work. "It takes a long time for these new technologies to get into industry. The landfill companies don't want it because it does away with landfills, so that's the last thing they want to get involved with. County commissioners don't



want to be the first county to try a new technology with high initial cost that may appear to cost more than it does to take garbage to landfills. Sometimes it only costs \$20 or \$30 a ton to take municipal wastes to landfills."

## Plasma Pitchman

Circeo pitches plasma to whomever he can, whenever he can. He introduces schoolchildren to plasma technology with classroom presentations, by hosting field trips to the research lab and through the nationally distributed *Weekly Reader*, which featured Circeo and the torch in 1998 for elementary school students and in a 1999 edition for high schoolers. When he speaks to children, Circeo gives them each a tiny encased piece of zapped garbage, reduced to a shiny black obsidian-like nugget of glass. "I pass out the little souvenirs. I want to get them interested in science, technology and plasma. I'm sure they go home and talk to their parents and friends about the technology."

Circeo powers up the torch for lawmakers, federal funding committees and the media. He hands those treated to an up-close demonstration of the plasma torch protective face shields and earplugs. An overhead catwalk allows visitors to peer down inside a barrel, where soil is transformed into a boiling liquid within minutes by the 100-kilowatt torch, only 3 inches in diameter.

The media was there when he visited Chernobyl in 1992. "We were invited because they have all this buried radioactive waste over there. It is decaying and leaching contaminants into the Dnieper River, which services the city of Kiev."

A videotaped news broadcast shows Circeo, then a dark-haired researcher, standing in front of a rusted bus exposed to radiation. "See what this research does to you?" he laughs, pointing to his gray hair.

The laughter ends abruptly as Circeo acknowledges that he could help the Russians with his plasma torch. "The radionuclides would get trapped in the vitrified glass that we create and would be immobilized and would not leach into the groundwater."

But the radiation contamination continues. A plasma torch hasn't been used in Chernobyl, probably for many reasons, including lack of money and a pile of red tape. "When we see the Russians, they still ask us. 'What's the progress?'" Circeo says.

Circeo knows what the torch can do. "We've melted the worst contaminated rocks and the worst contaminated soils we could find. We've always been able to remediate any contaminants."

Circeo says a company has expressed interest in working with Tech to create a mobile plasma torch system. "We could go to a place like the collapsed World Trade Center and this technology would rapidly melt through girders and concrete. If somebody's stuck under a concrete or steel beam, this will cut it in just a few minutes."

Like media coverage, funding has not remained steady over the years. "The problem is that our funding sources are hot and cold. We get champions. The champions retire or get reassigned, and suddenly funding priorities get shifted to other projects. We've had lean years. That's the name of the

game in technology research," shrugs Circeo.

With fears of bioterrorism heightened since Sept. 11, the plasma torch may yet draw big-dollar research support.

"We've got a couple of proposals in on how plasma can be used. One of them is to get rid of diseased animals, large quantities of them, up to several tons an hour. We can feed the carcasses into a furnace to get rid of animals contaminated with mad-cow disease. If there was a bunch of cows infected with anthrax, this would get rid of them very, very quickly and very safely," Circeo says.

"The other proposal is to decontaminate large areas that have biological contamination or chemical agent contamination because this technology will destroy anything. This is why plasma is so important. All the hazardous and toxic compounds are broken down to their basic elements. These elements recombine into simple acid gases that are easy to neutralize," he says.

"The Department of Energy is especially interested because this technology will readily remediate their most 'difficult to treat' contaminants and immobilize residual radionuclides and heavy metals in the most 'difficult to melt' soils and rocks," Circeo says. "The U.S. Navy has selected plasma as a way to get rid of shipboard wastes for their big ships because they can't throw most of it overboard anymore." A prototype system built for aircraft carriers is undergoing testing.

## Right Under Our Feet

Arguably the biggest waste issue in Georgia is created by carpet scraps, which Circeo says can be turned into fuel products. He says 400 tons of carpet waste are thrown into the Dalton/Whitfield County landfill each day.

"This carpet waste would be a beautiful way to produce fuel products, such as methanol or electricity. If you take 1 ton of garbage and you hit it with 500 kilowatt hours of plasma power, you get gas and you get the rock. You can use the rock as gravel or aggregate. The gases can be turned into electricity. From 1 ton of carpet waste, we should be able to produce up to 800 kilowatt hours of electricity."

In January, federal regulators, major carpet manufacturers and nine states — Georgia, California, Iowa, Maryland, Massachusetts, Minnesota, North Carolina, Oregon and Wisconsin — signed the National Carpet Recycling Agreement aimed at cutting landfill disposal of carpet waste by more than 40 percent over the next 10 years.

Circeo says GTRI could reap many benefits by getting involved in the carpet-waste issue. He says state interest and a partnership with the carpet industry could net a major grant to develop a prototype system for the destruction of carpet wastes and the recovery of useful energy products.

Meanwhile, Circeo will continue his campaign to educate the public that the torch is science, not science fiction. He will continue to write research proposals.

He says he's not interested in taking the business route himself.

"I'm getting too old to get involved in business. It's more important to see it developed than to get monetary rewards. Hell, I won't be around 20 years from now!" **GT**





# REVOLUTIONARY TECHNOLOGY

*Plasma processing plant will vaporize mountains of old tires into oblivion*

By Kimberly Link-Wills

**P**R. Power Co., headed by a Georgia Tech alumnus, is driving forward with plans to open the nation's first plasma arc processing plant for discarded tires within the next 18 months.

"Ultimately what we hope to accomplish is to be the first fully commercial application in the United States and prove the validity of plasma. I really believe we will open up a new industry in this country," says company president Larry Pierce, who attended Tech from 1966 to 1969, then received a building construction degree from Southern Tech in 1972 and later a master's in public administration from Georgia State.

P.R. Power also is made up of a division of Rosser International and another individual, Alan Gravitt, Phys 71, whom Pierce met when they were in the Pershing Rifles

together at Tech. "I like to deal with people I've known a long time and I can trust implicitly and know what they'll do. Alan's background has certainly been a help to us and will be more of a help as we go forward with the operation."

The partners have acquired 11 acres of land in a Jackson, Ga., industrial park in Butts County. A zoning permit was approved by the county in May. "Six months will be tied up in permitting from the Environmental Protection Division. Anything that handles tires or waste of any sort has to go through the EPD permitting process," Pierce says.

He says the Butts County site was selected because it is centrally located in the state and has easy access to rail lines, highways and a power substation. "From a technical standpoint, that's as good as it gets."

Initially, the facility will destroy 100 tons of tires per day, says Pierce, who explains that the recycling of tires has been





Alumni Alan Gravitt, left, and Larry Pierce join researcher Lou Circeo, center, to watch the plasma arc torch in action.



handled much differently until now. "What the other companies do is take the steel belts out of them and chop the tires up for mulch and playgrounds. That's a more expensive process than what we will do because dealing with those steel belts is a more difficult process. Or they burn them in incinerators, which causes problems with air quality.

"We will be using plasma arc. The tremendous heat in that enclosure breaks down the chemical bonds into hydrocarbons. The steel belts melt and will be drawn off as steel ingots in the bottom of the vessel. The hydrocarbons will break down into hydrogen and carbon monoxide. We'll run the gas through a scrubber that takes anything else out of there, a small amount of sulfur in the rubber. That will leave us with hydrogen and carbon monoxide. Either one will burn

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"The skepticism is natural when something comes along that is this good. We will be that new best-available technology. There's no reason in the world, long term, for us to ever have landfills. This should do away with landfills and be a renewable source of energy. This will be a sizable enterprise."

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as a synthetic fuel gas. By leaving the two together, we have an optimum BTU value. We will compress that gas into tanks, then use that to generate electricity in turbine generators. We will generate more than we use, so we will be a net producer of electricity. We're looking at probably 4 megawatts of electricity net generated per hour.

"The other facilities that are similar to this are not in this country," says Pierce, referring to Hitachi Metals' plasma plant that destroys automobile residue in Japan.

P.R. Power plans on having the tires shipped to its facility in bales, about 100 tires compressed into each bale. The tires will be fed into three torches that will be purchased from Westinghouse Plasma.

Pierce, who will only say that start-up costs are in the millions, expects P.R. Power to operate in the black in its first year of operation by immediately generating three revenue sources.

"At least 15 percent of the weight of a tire is steel. So for every 100 tons we put out, we'll be putting out 15 tons a day of scrap steel. Then there's the tipping fee, the fee for the destruction of the tires themselves. And the Public Utility Regulatory Policies Act says the utilities have to buy the excess electricity that we generate."

Pierce learned about plasma while teaching technology

management as an adjunct professor at Mercer University. He later was introduced to Lou Circeo, the Georgia Tech Research Institute director of plasma research, who staged a demonstration he attended about four years ago.

"The foremost plasma research facility, certainly at any university in the country, is right there at Georgia Tech," Pierce says. "They're just wonderful about sharing the information to help get this out and help get it commercialized and help make the breakthroughs."

Pierce brought members of the Georgia House Environmental Protection Committee to Circeo's lab in January. "In the past, plasma didn't fit any category the state had. Someone decided that if there are heat and tires, then it must be an incinerator. You're talking about five to 10 years to get a license for an incinerator.

"I kept saying, 'There's no burning. We're not introducing oxygen. There's no smoke coming out the top. We're breaking down these molecules with this heat source and capturing all the gases and utilizing the gases.'"

Pierce also testified before a House subcommittee and sought help from lawmakers, including Rep. Richard Royal, IE 62. "He is on the GTRI board. Having someone with some familiarity and a technical background who can understand it and help guide us through was a big help because this sounds too good to be true.

"The skepticism is natural when something comes along that is this good and will do so many things. You have to explain that, in essence, we're recapturing the energy it took to make the tire to begin with."

Pierce expects the Georgia legislation and the plasma plant to become a model for the rest of the country. "We've already stirred up a lot of interest. The more awareness we can make for the torch itself, the better it is for us because it makes it less of a mystery. And it's a big boost for Georgia Tech and Dr. Circeo."

Pierce says P.R. Power is starting with tires because everyone agrees mountains of discarded tires are an eyesore, hold water and breed mosquitoes. He says 280 million tires are discarded in this country each year.

"Down the road when people get used to it, things that are hazardous waste will be no different to this plasma torch than a banana peel. It will break it down into its molecular structure and you can do whatever you want with it then," Pierce says.

"We will be that new best-available technology. There's no reason in the world, long term, for us to ever have landfills. This should do away with landfills and be a renewable source of energy. We have in mind that this will be a sizable enterprise.

"We have 159 counties in this state. All have at least one old landfill that has been closed. Virtually all of them are leaking something into the groundwater supply. Some of them are leaking some very bad things," Pierce says.

"There's so much potential. It's hard to think of any kind of problem that plasma won't deal with. Tires were the best place to start because of their consistency as a hydrocarbon feedstock and because they currently are a burden on the environment." **GT**



# CHANGING CLIMATE

*Scientists predict global warming will last throughout this century*

**By Jane Sanders**

The impact of global warming will continue through this century, scientists agree, even if fossil fuel consumption is dramatically reduced.

Scientists predict significant increases in global temperature and sea level this century. And related changes in weather patterns are expected to affect agricultural production. Global warming is likely to have the greatest human impact in poor countries unable to adequately respond to the changes.

Professor Robert Dickinson of Georgia Tech's School of Earth and Atmospheric Sciences presented the evidence concerning the dire effects of global warming at the annual meeting of the American Association for the Advancement of Science last February in Boston. Dickinson's presentation, "Predicting Climate Change," was part of the symposium "Climate Change: Integrating Science, Economics and Policy."

A member of the National Academy of Science, Dickinson was elected to the National Academy of Engineering in February. He specializes in land-surface modeling, climate modeling, community-climate modeling and tropical deforestation. He was chosen as a member of the NAE for his "pioneering contributions to a wide range of topics in atmospheric dynamics and earth-system modeling."

"Current climate models can indicate the general nature of climate change for the next 100 to 200 years," Dickinson says. "But the effects of carbon dioxide that have been released into the atmosphere from the burning of fossil fuels last for at least 100 years. That means that any reductions in CO<sub>2</sub> that are expected to be possible over this period will not result in a cleaner atmosphere and less global warming than we see today for at least a century."

Climate models indicate temperature increases of 3 to more than 10 degrees Fahrenheit in this century and a sea level rise of 6 inches to nearly 3 feet.

The burning of fossil fuels emits greenhouse gases, such as CO<sub>2</sub>, into the atmosphere. These gases contribute to global warming, and the temperature increase expands the oceans and causes ice sheets to melt, in turn increasing sea level.

Despite differences in climate model projections and the limitations of the models themselves, scientists agree that significant consequences from global warming will occur in this century, Dickinson says.

"Given enough time, there may be as many winners as losers. However, many of the losers will be very unhappy, such as people who live on islands that will be put under

water," Dickinson says. "It will take a lot of time for humans to adjust their systems to these changes. The biggest problem is the speed at which global warming is occurring."

"If it were happening over 1,000 years, rather than 100 years, it would hardly be noticed. But we're talking about fairly large changes within the next generation. We're talking about people with houses on the beach having to move. The U.S. is fairly resilient, and people can move. But in Bangladesh and other low-elevation areas with few resources, there will be severe difficulties."

The world can also expect large shifts in agricultural productivity, Dickinson says. Some regions will become more productive, and others will become less so because of changing patterns in temperature and rainfall.

Overall, there will be more rainfall, but also more evaporation leading to more floods and more droughts.

Climate modelers are fairly certain of these consequences because their models have improved as their understanding has increased of the underlying physical processes of climate change.

The global temperature has increased more rapidly in the past 10 years, but the changes are more dramatic in high latitudes perhaps because of natural variability, Dickinson explains.

Some evidence also suggests that the coupling of natural temperature variability and human-caused global warming is causing an increase in El Niño weather patterns in the tropics, with consequences elsewhere.

Climate models are also limited in giving reliable regional details on global warming, Dickinson adds. For example, models cannot distinguish changes between Atlanta and New York City. The models can predict differences between high latitudes and the tropics.

Dickinson says enough data exists to develop mitigation and adaptation plans regarding greenhouse gases. Mitigation involves strategies for reducing greenhouse gases or changing other factors to compensate for them. Reductions can involve both consuming lesser amounts of fossil fuels and also finding ways to capture the gases and put them in places other than the atmosphere.

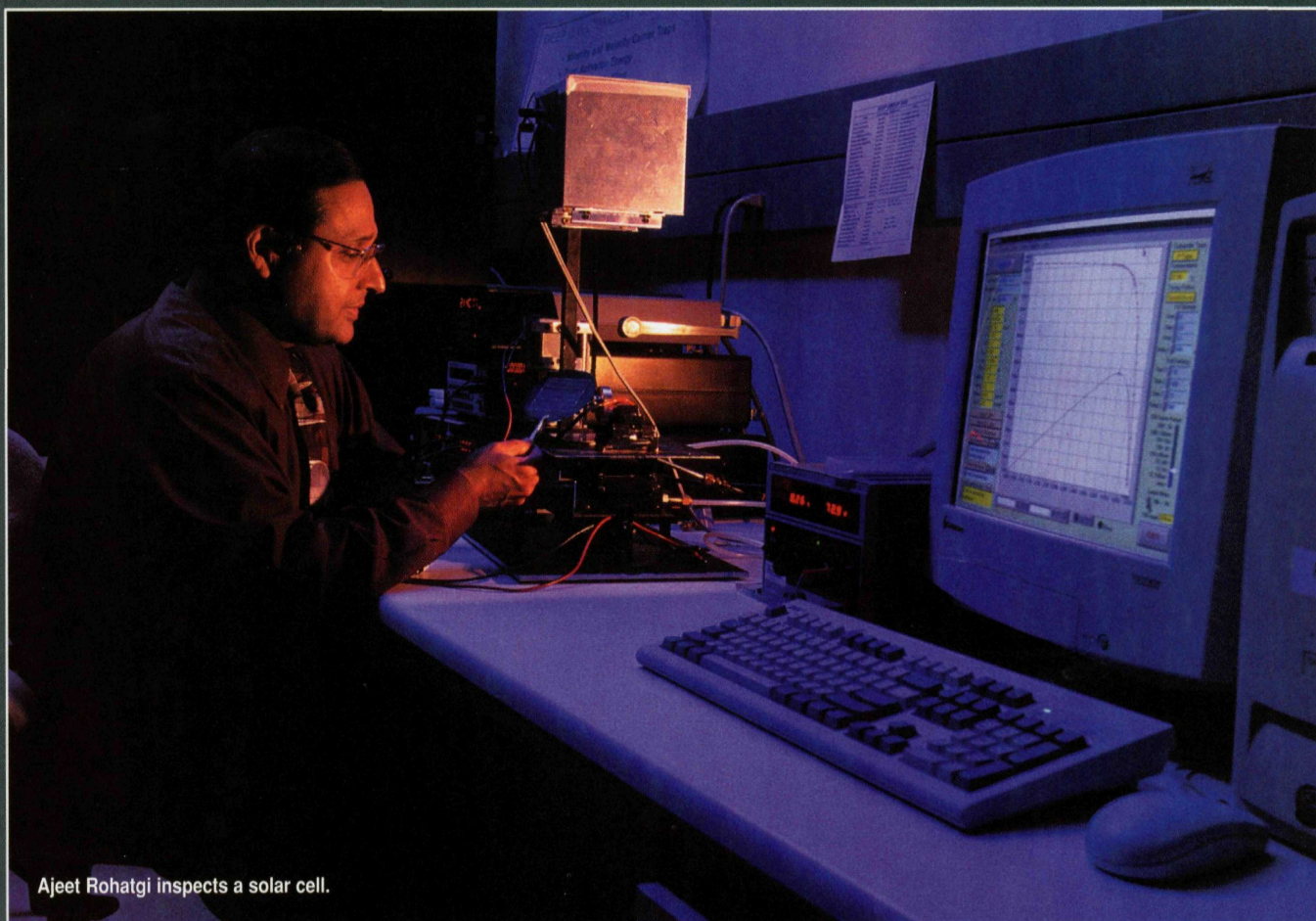
"The only way to stop the increase of carbon dioxide in the atmosphere is to reduce CO<sub>2</sub> emissions to 20 to 30 percent of today's levels," Dickinson says.

"This may require a similar reduction in the consumption of fossil fuels. I believe we will eventually achieve that goal, but it will probably take 100 years. That means reductions in automobile emissions and carbon dioxide released from coal-powered electric power generation and other industrial activities.

"We have to move our energy systems to forms other than fossil fuels. And when I say we, I don't just mean the United States. The U.S. is the biggest user of fossil fuels, but China and India are likely to surpass the U.S. in the next 50 years, and China may surpass the U.S. in the next decade."

Jane Sanders is editor of Research Horizons, a publication of the Georgia Tech Research Institute. **GT**





Ajeet Rohatgi inspects a solar cell.

# POWER OF THE SUN

*Georgia Tech's Center of Excellence works to energize solar power*

By Maria M. Lameiras

A swath of solar panels stretching from Georgia Tech to Macon could provide all of the electrical power needed in the entire United States.

It is a startling declaration that Ajeet Rohatgi, director of the University Center of Excellence for Photovoltaic Research at Georgia Tech, makes with complete confidence.

"If you make the panels more efficient, that area shrinks. You may not want to do it this way because then you have to transmit the energy, but smaller systems in different parts of the country could provide all the power we need," Rohatgi says.

Solar energy has the potential to revolutionize the world, he says.

"There are about 2 billion people in this world who have little or no access to electricity. Photovoltaics is a great way to provide them with electricity. This technology could increase the standard of living for so many. If there is a sharp increase in the need for power, all you do is add a few more panels — you don't have to build another nuclear or fossil fuel plant."

The secret to unleashing the potential of solar energy

will come in marketing the technology and reducing its cost.

"Photovoltaics is something many people can't comprehend. Solar electricity is a better word for it. We need to make systems that somebody can take home like a refrigerator or an air-conditioning unit," Rohatgi says. "You put it in the house and it starts taking care of the electrical generation. You don't need to know what these PV panels are doing, or what the converter is all about. We need to package it so you can call Sears or Home Depot and they come install kilowatts of PV like an air conditioner in your house. When you buy an air conditioner, you don't worry about how it works. It is just a box that does its job."

Solar modules are beginning to show up in do-it-yourself stores, he says. The solar energy industry is working toward public education, but Rohatgi believes it would help if the education also came from a noncommercial source.

"It is such a great technology for producing electricity directly from sunlight at the point of use without the need of a transmission/distribution system. You don't have to have a central power station and transmission lines. It is an ideal technology for distributed generation, which will become more and more important in the future," he says.



Since the early days of solar power research, the cost of energy produced by solar panels dropped from \$100 per watt to \$3 to \$4 per watt, but Rohatgi says for solar power to compete with fossil fuels, the price needs to drop by two to four times.

Research into using lower cost materials and faster processes to create higher-efficiency solar cells, as well as "new and clever applications," are reducing costs, Rohatgi says. New interest in the research is being driven by increased interest in usable solar technology in Europe and Asia and, in the United States, by the pressing need for new energy resources, as evidenced by the power shortages experienced in California.

"The market in California is very hot these days. Photovoltaics is becoming a very interesting choice for back-up systems in case of an emergency shortage of electricity. Once you have experienced these shortages, you are more sensitive to the need for alternatives," Rohatgi says.

In a sweeping "road map" for the future of solar-electric power in the United States, dozens of researchers and industry experts have laid out a goal to meet 10 percent of the country's peak generation capacity by the year 2030, a goal that will require usage of photovoltaics to grow by 25 percent per year, Rohatgi says.

Photovoltaics has experienced 30 percent to 35 percent growth per year for the past five years, so 25 percent growth projections are reasonable.

"If that growth continues, the projection is that photovoltaics may become 10 percent of the entire U.S. energy production. By 2020, the projection is that 15 percent of the added energy that is needed every year will begin to come from photovoltaics," Rohatgi says.

"There is huge optimism that, in the next decade or two, the cost can be reduced by another factor of two to four and it will then come down to what we are hoping for, approximately \$1 a watt for photovoltaic modules and \$1.50 to \$3 a watt for photovoltaic systems," Rohatgi says. "If we can get there, we are talking about electricity at 6 cents per kilowatt hour, which is roughly what you get from fossil fuels.

"If cost came down to \$3 a watt for systems by 2010, it will become very cost-effective for a lot of applications, including what is called peak shaving," he says, referring to the practice of drawing electrical power from an alternate source when the demands for electricity are at their highest.

"Around noontime we pay a lot more for electricity. If the cost of photovoltaics comes down by a factor of two from where we are now, it will become very attractive for peak shaving and there is a huge market for that. In those peak hours, we pay as high as 12 to 15 cents per kilowatt hour for electricity. Photovoltaics produces maximum energy when the cost of electricity is maximum, so it is an ideal candidate to produce electricity for less at the time when electricity is most expensive."

The challenge comes in bringing the cost of the modules and systems down. Rohatgi says there are several ways to approach the problem.

"The first is by economy of scales. If we can find new markets and more applications for photovoltaics, the cost will

come down. There is a learning curve that says every time you increase the cumulative photovoltaic capacity by a factor of 10, the cost comes down by about a factor of two."

Along those lines is use of building-integrated photovoltaic systems, an alternative that is growing in popularity in European countries and in Japan.

"The idea here is, instead of putting photovoltaics in modules on the roofs of new buildings, you make the roof with photovoltaic modules," Rohatgi says. "Not only do you eliminate the cost of building materials and installation, but you also are generating electricity out of the structure, reducing the overall cost of PV."

The most effective way of reducing the cost of photovoltaics, however, is by making low-cost, high-efficiency solar

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"My vision is to make solar cells like pizzas. Take a wafer or a substrate, put some toppings or layers on it, put it into an oven and in a half hour or so out comes the cell."

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cells, which is the emphasis of Tech's center.

The photovoltaics lab has been in place at Tech since 1985 and in 1992 was the first facility in the United States to receive a University Center of Excellence designation from the Department of Energy. The center was renewed in 2000 and extends through 2005.

Since its beginning, the center's main focus has been to "develop low-cost, high-efficiency solar cells that are manufacturable," Rohatgi says. To achieve that, the center has two key missions.

"One is to advance the science and technology of photovoltaic devices through fundamental research. The second, and more important, goal is to reduce the cost of photovoltaics through applied research," he says. "If solar panels are twice as efficient, you only need half the amount of materials to produce the same power. Making the materials and the panels are where the majority of the cost of photovoltaics is — the glass, the frame, the semiconductors — all of these costs come down as the cells become more and more efficient."

The center's two main research thrusts are on using cheaper materials in the cells and developing faster, more economical processes to fabricate them without sacrificing efficiency.

"The focus of our program is crystalline silicon, but crystalline silicon comes in different forms — ribbon silicon, cast silicon and single-crystal silicon. Ribbon is the cheapest, cast is in between and single crystal is the most expensive.

"We are putting a lot of our efforts in trying to make high-efficiency solar cells on ribbon and cast silicon, which are defective materials. That's why they are cheap. Our goal





Ajeet Rohatgi, director of the University Center of Excellence for Photovoltaic Research at Tech, holds a solar cell.



is to understand the role of defects and find ways of reducing the negative impact of the defects. They may be present, but they should not hurt the cell performance," Rohatgi says.

By combining materials and design research with process research, Rohatgi hopes to create a "complete technology" that can be put into widespread use.

"My vision is to make solar cells like pizzas. We used to make great cells 10 years ago, they were 22 percent efficient, but it took us two weeks to make them. They were not manufacturable. My thought was that maybe we should go to the other extreme and just be like a pizza shop. Take a wafer or a substrate, put some toppings or layers on it, put it into an oven and in a half hour or so out comes the cell," he says. "We are working with the concept. This is still a dream, but it is the right direction. If we want to reduce cost, making a cell should be as simple as making a pizza."

Right now, the center makes manufacturable cells that are 15 percent to 16 percent efficient in a matter of about two hours using rapid thermal processing.

"In the next few years, we should be able to get it down to a half hour or so, but it will be very challenging. We want a very high-efficiency cell using cheaper materials and a faster, more cost-effective process and all this has to happen simultaneously to have a great impact," Rohatgi says.

"Every process that we incorporate in cell research is designed to improve the material or device quality as a bonus. Our goal is to fabricate 18- to 20-percent efficient manufacturable cells in an hour or less. Right now, in industry, cells are about 12- to 14-percent efficient and they take from four to six hours per run. If we can reduce the time by a factor of two to four and increase the efficiency to 18 percent, we can have a significant impact on reducing the costs.

"Our computer modeling shows you can get to that level using low-cost materials, but the bad news is there is no silver bullet. There is not one thing you can do to get there. You have to develop multiple low-cost technologies, each contributing a little bit to the battle. This is what makes this task very challenging."

Funding of solar cell research in the United States, however, has been flat in recent years.

"Europe and Japan are going gangbusters with their funding and we are suffering," Rohatgi says. "In terms of the technology edge, we still have the technology edge, but if we don't do something about it, we could lose that."

The Tech center has helped create new cell designs and process technologies to help the PV industry. Tech has contributed to the success of many PV companies, including Ebara Solar, ASE America, GT Solar, Evergreen Solar and AstroPower.

In 1996, for the Summer Olympic Games in Atlanta, the U.S. Department of Energy, Georgia Power and Tech showcased what was then the largest rooftop grid-connected photovoltaic system in the world on top of the Georgia Tech Aquatic Center.

To date the system has generated more than 2 billion watt hours of electrical energy and still provides 30 percent of the electrical energy required by the building, or 400 megawatt hours of electrical energy per year.

That same amount of energy is sufficient to power 50 to 70 homes — a whole subdivision — for a year, Rohatgi says.

"That 400 megawatt hours translates into saving approximately 400 tons of carbon dioxide that would be released into the atmosphere each year by fossil fuels," he says. "We have online monitoring of the system and we download the data every day. We have a system to analyze the information and we have computer models to compare what it is producing to what has been predicted. This is helping us try to understand and improve the models and to develop new ideas of how to increase the performance and reliability of PV systems."

Rohatgi believes government subsidies would boost solar energy use by consumers, and it is something that is being done in other countries.

"People would like to have an energy source that is environmentally clean and they are willing to pay more money for it, but the government policies need to be more conducive toward using sustainable technology," Rohatgi says.

Additional funding for solar cell research is necessary to "keep some of our superstars in PV."

"Some of our very good students whom we produce at Georgia Tech can find better jobs quicker in the integrated circuits industry," Rohatgi says. "We need to make this field more attractive so we can keep our best students and make sure we continue to have enough sharp individuals working in photovoltaics."

Although Tech's center is competing in research areas against much larger research facilities, Rohatgi says the quality of the equipment and the research facility at Tech allows the center to keep its technological edge.

"In Europe, you have places like the Fraunhofer Institute (for Solar Energy Systems in Freiburg, Germany) and the University of Konstanz (in Konstanz, Germany), organizations where there are 30 to 100 researchers working on silicon technology. We are very small in comparison."

When the program started in 1985, "all we had was a little lab where we could do materials research." Now the center has six full-time staff, 10 doctoral students and three faculty members and its research has expanded from materials to devices and systems.

"To do something like this, you have to have state-of-the-art materials characterization facilities, computer modeling facilities, cell fabrication facilities. We have them all here."

The center has three different cell fabrication lines — conventional furnace processing, rapid thermal processing and belt line processing — which Rohatgi says is unique for a university.

"Because we have them all here in our center, we can mix and match and try different things to create a new technology," he says. "This is what makes it so much fun for us to do research here because whatever we want to do, we have the ability to do it all."

"I would like to see Georgia Tech develop a complete technology for low-cost, high-efficiency cells which is decisively superior to what is out there, and which can make PV the most attractive, cost-effective and environmentally clean energy option for the 21st century." **GT**





# ENERGY MARVEL

*Sun, wind, earth still provide power for Mojave Desert Visitor Center*

By John Dunn

The 20-year-old visitor center at California's Antelope Valley Poppy Reserve is long, low and deceptively unremarkable in appearance. But the facility, built on the western reaches of the Mojave Desert, is an ingenious energy marvel.

Resembling a Navajo hogan, the home typical of half a dozen Native American tribes who lived in the region, the 2,100-square-foot center requires neither an air conditioner nor furnace, although desert temperatures vacillate from 110 degrees in the summer to below freezing in the winter.

The visitor center was designed to be energy-efficient forever.

The 1,745-acre Antelope Valley Poppy Reserve, located 15 miles west of Lancaster, is one of seven Mojave Desert parks run by the California Department of Parks and Recreation and was established to protect native wildflowers, particularly the California poppy, the state flower.

Robert D. Colyer, Arch 73, and his partner and wife, S. Pearl Freeman, principal architects of the Colyer Freeman

Group of San Francisco, designed the building in 1980 as the country was coming out of the energy crisis of the late 1970s. Dedicated in 1982 and nestled in the Antelope buttes, the center incorporated the most advanced energy-efficiency technology of its day.

After graduating from Tech, Colyer worked for a couple of Atlanta architectural firms, including Thompson, Ventulett, Stainback & Associates, before leaving for California in 1976 "to pursue my interest in environmentally conscious architecture and design."

Colyer and Freeman won the California Passive Solar Design Competition in the late 1970s and, shortly afterward, the state parks and recreation department hired them to design the Antelope Valley Visitor Center.

"We were inspired by some of the responses that indigenous people had to their own climate — the Navajo hogans, the cliff dwellings at Mesa Verde, all of which existed in a similar environment to the Antelope Valley," Colyer says.

Antelope Valley is a high desert, about 3,000 feet above sea level, and experiences a wide range of temperatures.

"The state wanted the center to demonstrate a state-of-



the-art energy-efficient design," Colyer says. "Because of the beautiful environment — it is really a state park reserve for the California poppy — we decided to make the building as unassuming and as modest as possible so park visitors would be presented with the rolling hills and the views to the mountains."

The center faces south and is literally carved out of the rolling landscape, its back and sides built snugly into the hillside for insulation. The roof is covered with two feet of earth.

Construction is similar to the way indigenous people

nice-looking old wind-electric generator with an old wooden spruce propeller. And it's still working," Colyer says. "Essentially, it just operates out there by itself."

During the past 20 years, wind-electric generation has grown tremendously in California, Colyer says.

The generator also powers a small pump that provides well water for the facility's use. It's an autonomous building that makes money for the state, he says.

Instead of air-conditioning, Colyer used a method based on an ancient Persian technique to cool the facility. Persian architects channeled the desert wind into deep wells, where it was naturally cooled and humidified before being redirected into living quarters.

Colyer says the visitor center uses an "earth tube," a 3-foot diameter metal pipe perched like a periscope on a hill above and behind the visitor center. The pipe is buried 10 feet into the ground, where the temperature remains 70 degrees and, during the night, hot air escapes the building through a convection tower on one end, drawing cool air into the building through the underground earth tube.

Heating is supplied 100 percent by passive solar features.

Using a computer program developed by the Berkeley Solar Group, Colyer says they developed original applications for energy simulation programs that enabled them to predict the building's thermal performance. "It was an interesting time because we were all engaged in research and experimentation," he says.

The advances in creating computer programs since 1980 have been huge, he says. "The sophistication of analysis has advanced to the point you can model very complex buildings with multiple zones," he says.

But, he says, the advances in solar energy have been disappointing.

"Over the past 20 years, there is a period where I believe we forgot what we had learned in that fairly innovative time," he says. "But in the past seven to eight years, we've begun to re-explore those concepts of energy-efficiency and broaden them to what is now referred to as sustainable design.

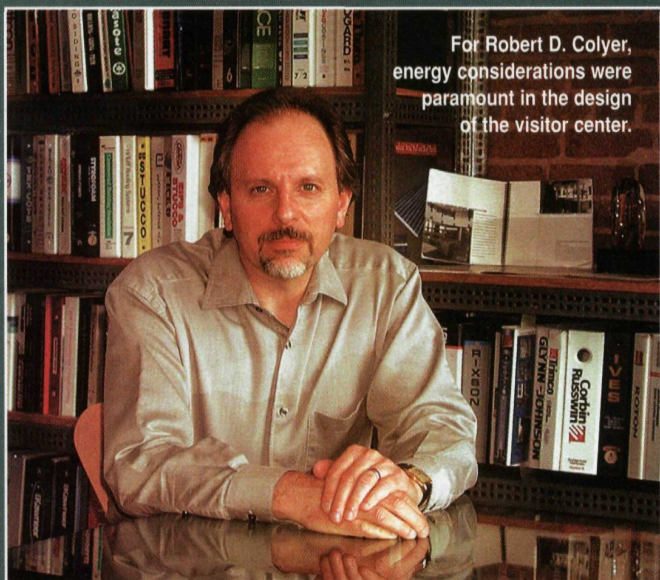
"What is encouraging to me as an architect is the comprehensive nature of sustainable design. It's the whole array of environmental impact from water use to site drainage to even encouraging development of existing urban centers as opposed to suburban sprawl."

Sustainable design is one thrust of the Colyer Freeman Group, he says. The other is science and medical research buildings. The firm specializes in the design of programmatically and technically complex buildings and interior spaces. The Colyer Freeman Group was the sustainability architect for the University Center at California State University Monterey Bay.

"I think the Georgia Tech education was ideally suited for what I have experienced in the profession," Colyer says.

After 20 years, the visitor center is still an energy-efficient showcase for the California parks and recreation department that comes with a bonus — during an era of energy shortages, it draws a check from the power company for the excess energy it generates. **GT**

Courtesy of Colyer Freeman Group



For Robert D. Colyer, energy considerations were paramount in the design of the visitor center.

would have built in the area, Colyer says. "They would actually dig down a foot or two into the earth and then cover a roof — a light wood structure covered with earth to moderate the temperatures."

Energy considerations were paramount in building the center, he says.

"Because the visitor center is in a fairly remote site, there was no power directly available," Colyer says. "We were asked to include a wind-electric generator to generate electricity for the building. We had originally developed a battery storage system for electricity, but as we developed the design, we realized that it is much more efficient to simply generate electricity when the wind was blowing and sell it back to the power company.

"There was legislation in the 1970s that required the power companies to buy back electricity from alternative energy generators, and that included wind-electric. So we were able to have the power company extend an underground power line to the building and through use of an inverter, we actually sold power back to the power company. And the center gets a check every month."

The center's wind-electric generator tapped into an established technology.

"We used what seemed at the time to be kind of an antique wind-electric generator called the Jacobs wind-electric generator that was apparently widely used throughout the Midwest starting back in the 1920s," Colyer says. "It's a





## CALIFORNIA'S ENERGY CHIEF

By Gary Libman

Civil engineering classes at Georgia Tech burrowed into S. David Freeman's psyche. The 1948 graduate still awakens to nightmares about his classroom struggles.

"I still wake up in the middle of the night occasionally sweating, remembering all those labs and hard work," says the 76-year-old Freeman, the man now known as California's energy czar. "I really wasn't all that good at civil engineering courses so it was a struggle for me to graduate. I made A's in a lot of courses, but when we got into differential equations and things like that, I really labored."

Despite languishing in engineering courses, Freeman has played a key role in shaping national energy policy, aided by lessons he learned in class.

"The lessons of knowing the details, and the thoroughness, and working over the drafting table really shaped my life," Freeman says. "I've had a lot of respect for not dealing with matters in a superficial or emotional way. You've got to do some digging."

"There's nothing like spending a few months over a drafting table drawing a turbine foundation, or the basement floor of a large steam power plant, to tell you that if

you don't get it right, the damn thing is going to fall down," says Freeman. "Maybe not literally, but that's true of everything in life."

Applying that principle, Freeman, who wears a trademark Stetson hat, earned appointments on the staffs of Presidents Lyndon B. Johnson and Richard M. Nixon. He later served as an energy adviser to President Jimmy Carter and headed the Tennessee Valley Authority, the New York Power Authority and the Los Angeles Department of Water and Power.

During California's energy crisis in the spring and summer of 2000, Freeman was head of the Los Angeles Department of Water and Power. He is credited with keeping "the lights on and the rates low" for the city's 3.8 million residents as well as rescuing the municipal utility from bankruptcy.

In May 2001, Gov. Gray Davis picked Freeman as his chief energy adviser and charged him to "lead the fight against California's energy crisis." Last August, Davis named Freeman to head California's new Consumer Power and Conservation Financing Authority.

Freeman says the new agency was necessary because California made "a decision to relieve the utilities of the obligation to build power plants. And when the price is



low, private companies just don't build power plants. Every market is cyclical and a complete free market in electricity just doesn't work. When you have shortages, you have blackouts and price spikes and society just can't tolerate that for electricity, which is the lifeblood of our civilization."

Freeman is trying to preserve the flow of that lifeblood in California by "building power plants and conserving. It's fundamental that you have to add supply and use the electricity efficiently, and it's really not much more complicated than that. We're balancing our energy budget and creating a surplus. So when some of those 30-year-old power plants break down on a hot day, we can still keep the power flowing. We've got our fingers crossed."

Freeman says these steps are necessary as California overcomes the effects of the deregulation plan it passed in 1996. Freeman helped shape the experiment with deregulation as an appointee of former Gov. Pete Wilson, but has since called it a mistake.

"This deregulation plan in California turned out to be a big scheme," he says. "We're moving back toward companies that own power plants selling real electricity to consumers. These fellas like Enron that just had a big phone book and didn't own power plants and were just schemers trying to buy low and sell high — we need to get them out of the electric-power business."

His proposals for California are matched by his vision of a clear solution to the nation's energy problems.

"Our biggest problem is imported oil," he says. "We need to get off of it. I'm beginning to write a book about hydrogen. We've got to move to a hydrogen economy in which we use electrolysis to break our water into hydrogen and oxygen and use the hydrogen as the ideal fuel. If we do that, we can continue to use the internal combustion engine. People can have their SUVs."

"Because when you burn hydrogen to run a car or a truck, what do you get? You get water. You have no pollution. It might take us 20 years to get there, but we have to start yesterday."

"We can't deal with terrorist nations if we have to depend on their oil to go to work."

Freeman adds that renewable energy sources must play a big role in energy policies throughout the world.

"It's the way we have to go more and more, not just in California, but throughout the entire planet. We've been through the age of wood and then went through the age of coal. We tried nuclear and it didn't work out. We're in the age of petroleum now and that's going to be replaced with a solar-hydrogen economy that's just barely beginning."

"People who lived through the blackouts [in California] are now looking for a more reliable source of energy. They're looking at decentralized power plants, fuel cells and solar panels. Also I think the events of 9/11 emphasized how vulnerable our long-distance transmissions lines are. I think we're going to be looking to more decentralized sources of energy that are less vulnerable

and more secure."

Another element that will play "an immense role" in future energy decisions, Freeman says, is conservation. "It saved the day in California last summer. Everybody predicted blackouts every other day and we didn't have any because people conserved. I think that's going to become permanent — not just through turning the lights off, but through greater efficiency. All these machines that use electricity are going to give you the same service through fewer kilowatt hours."

Freeman adds that until California's energy problem is solved, the Federal Energy Regulation Commission must continue price controls.

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"We've got to move to a hydrogen economy in which we use electrolysis to break our water into hydrogen and oxygen and use the hydrogen as the ideal fuel."

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"Until enough plants are built that we have a surplus, they have an absolute legal duty to impose price controls," Freeman says. "The issue is whether they'll continue to keep the controls they have in place when they are scheduled to expire September 30 for some reason that's beyond my comprehension."

Although Freeman came to the energy crisis with a national reputation and a lifetime of experience in the energy field, not everyone agrees that his presence is necessary.

"The difficulty in California," says Robert Michaels, professor of economics at California State University Fullerton in Orange County, "is that about 18 different state agencies have a hand in energy policy, and in a lot of ways he's the new kid on the block. His is the newest of these agencies. Developments in the market may have overtaken it. It may not have a function anymore."

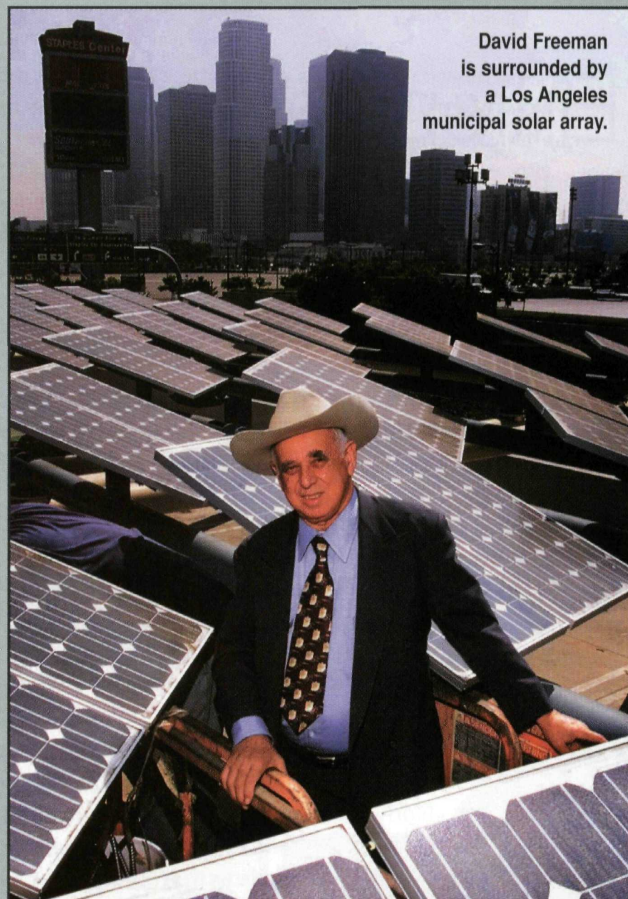
Michaels, a consultant for power producers and marketers, says the developments include "the falling of electricity prices in the market in the West, the construction of new generators in response to profit opportunities and the decrease in demand with rising prices."

"Essentially, that agency has no reason to exist if the investment is adequate in energy and conservation."

Freeman has been thinking about energy questions for a long time. He became interested in the subject more than six decades ago as a boy in Chattanooga.

"I grew up in the Tennessee Valley," he says. "I remember as a young kid my dad taking me up on the roof of his haberdashery business in downtown





David Freeman is surrounded by a Los Angeles municipal solar array.

Chattanooga. I saw Franklin Roosevelt in an open car when he came to dedicate the Chickamauga Dam. If you grew up in the Tennessee Valley, TVA was a big deal."

Freeman attended Chattanooga High School, where he earned A's in algebra and was advised to become an engineer. To pursue that goal, he chose Georgia Tech.

"I made A's in algebra in high school so they thought I should be an engineer," he says. "It was not very sophisticated vocational guidance. But I think I chose Tech because of the glamour of it all, living in Atlanta, and because I had some friends from Chattanooga attending the school."

Freeman enrolled in the summer of 1943, but left after his freshman year to serve in the Merchant Marines during World War II. "I made three trips across the north Atlantic on T2 tankers carrying 100-octane gasoline to the Air Force."

After the war he returned to Tech with battle-worn but determined veterans matriculating "before integration and before women. There were a bunch of veterans and everyone was in a hurry to run through school and get out and work. We were poorly shaved, wore T-shirts, and most students had slide rules. I lived off of chocolate-covered doughnuts I would grab before the first class."

Freeman says Tech students studied hard and played hard.

"The caliber of the class was very high in that you

had people of experience, a lot having just come back from the war. These were serious people doing serious work. The word I would use to describe it is g-r-i-n-d."

The hard work paid off after graduation when Freeman achieved his goal, which was to work for the TVA. He toiled six years as an engineer before attending the University of Tennessee law school, where he graduated in 1956.

Later he went to work for the chairman of the Federal Power Commission and in 1967, President Lyndon Johnson made Freeman the nation's first coordinator of energy policy.

Freeman was ready to leave his job in 1968 when Republican Richard Nixon was elected, but the new administration asked him to stay.

"When Nixon came in," Freeman says, "the president of Cal Tech, Lee DuBridge, was his science adviser. I said, 'I'm on my way out. I'm a Democrat.' He said, 'I talked to the president and we want to do these energy studies. We think they're important. We want you to stay.'"

Freeman stayed on until he received a broad hint from the late John Ehrlichman, Nixon's top domestic affairs adviser who later served 18 months in prison on a Watergate conspiracy conviction.

"He said, 'I think you ought to get out of here,'" Freeman says. "'We're just going 100 percent political. If the Democrats win [the presidency], you can come back.' I had no idea about Watergate, but I got the heck out of there. That was best tip I ever got."

Freeman became a staff member of the U.S. Senate and in the mid-1970s he helped shape the first laws requiring car makers to build vehicles with better gas mileage and statutes requiring labels on appliances that tell how much energy the machines use.

"A seminal 1974 study that he directed for the Ford Foundation," the *Los Angeles Times* reports, "set the tone for America's energy policies for years to come."

The study came to the attention of President Carter, who named Freeman head of the TVA, where he stopped construction on eight power plants.

The appointment to head the TVA, Freeman says, "was more than I could have ever wished for. As a Tech graduate and native of Chattanooga, I was the first Tennessee native to ever be named to that position."

Heading TVA, he says, led to "one huge ego trip" in 1980, when he was asked to speak at Georgia Tech.

"The day got more and more crowded," he says. "I had to meet with the governor of North Carolina at one of the dams in western North Carolina. Only way I could get to Georgia Tech to make that speaking engagement that evening was by helicopter."

"You can imagine the kind of feelings I had when we came flying down Peachtree Street in this damn helicopter and landed on the football field — a guy who had barely graduated. That was my first trip back, and I had flashbacks of 'Are they going to give me a pop quiz today?'" **ET**



# The Accidental Entrepreneur

*From reformatting old movies to creating animated fly-arounds for Donald Trump, architecture graduate Kevin Christopher puts his creative talents to work*

By Maria M. Lameiras

When Kevin Christopher didn't land a traditional architecture job after graduating in 1992, he fell back on a skill he had picked up by chance at Georgia Tech.

"Around 1990, I was working for the computer lab and they had a bunch of software tools that were new to the College of Architecture. The research engineer who was in charge of the lab, Anatoliusz Lesniewski, basically turned it over to me and said, 'Here, have fun.' I read books and manuals and visited different places that sold software and I learned how it all worked."

Christopher mastered those first DOS versions of 3D Studio and AutoCAD.

After applying for architecture jobs and dropping off resumes, Christopher set up two computers in his house in Atlanta and began doing computer-animated visualizations of high-end residential projects for a few clients.

"Within six months of graduating I was set up working out of my house. Architects or designers would provide me with floor plans and elevations and then I would do a 3-D model," he says. "We would do visualizations so the client could understand exactly what the architect was drawing. I hoped I'd be able to communicate: 'This is what the architect was talking about.' Within a year I realized I could probably make a business out of this little hobby that I had."

That hobby would eventually grow into AGI Studios, what Christopher calls "this little acorn that became this big tree with all of these branches." The firm now has handled everything from a fly-around for a \$600 million Donald

Trump development in Miami to the conversion of old films into DVD format.

Christopher came up with a plan to keep well ahead of the learning curve. He began teaching classes for DrafTech Systems Inc., the company that distributed the software he used for his projects.

"I started teaching the software I worked on so I could make sure I was ahead of everyone else, who had to wait for the software to come out then learn about it. Teaching gave me a six- to eight-month head start on everyone else," says Christopher, who also taught for two years at the Art Institute of Atlanta.

"I was meeting people and doing seminars and I just got more and more clients," he says.

"Everything just sort of fell in line. There wasn't a grand scheme. It just started as a way to make some money until I could find a job. Then it became a job. After that it was, 'Well, let's make sure we can stay ahead of the curve on everything in the software industry.'"

By October 1993, Christopher had moved AGI into an office and hired a Tech student as a part-time employee. He also

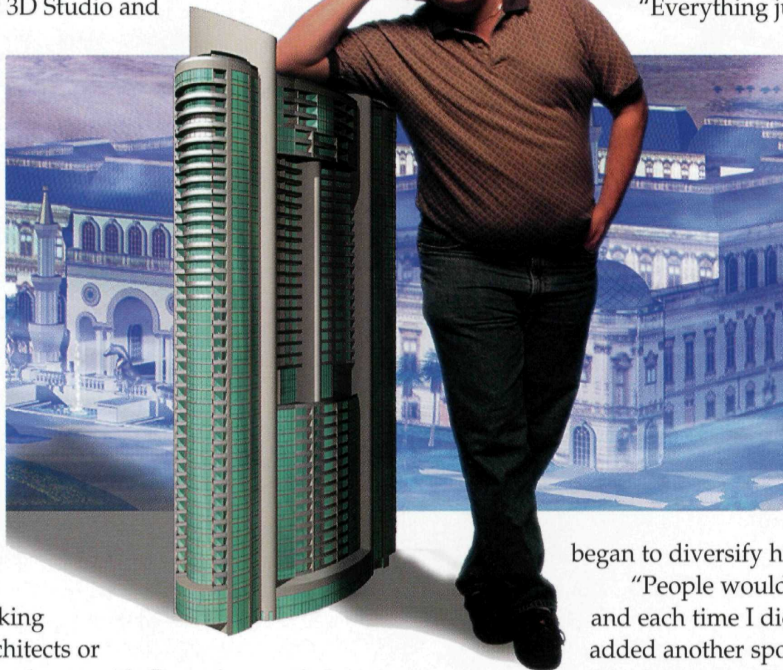
began to diversify his business.

"People would recommend me for projects and each time I did something different, it added another spoke to the wheel," he says.

"You have to be diverse in this industry. You can't just count on architectural visualizations because that is going to go up and down as the building cycle goes up and down."

AGI has grown from creating computer visualizations of buildings to editing movies and commercials to converting films and videos to DVD format, all of which encompass some form of computer animation.

"It kind of happened accidentally. We went from doing visualizations of houses to doing large industrial complexes. Then you throw into the mix things like the animation we



Richard Rivera/AGI Studios



did for the world's largest wooden roller coaster," Christopher says. "When business would back down a little bit, I would just switch gears. I produced a computer game that was done by a bunch of ex-Turner employees and, when the Web was becoming very hot, I aligned myself with a Web company and began doing animations for the Web."

As the dot-com craze began to reach its peak, Christopher says, "I realized that was not something I wanted to bet all of my marbles on," and he began pursuing more entertainment projects.

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**"Within six months of graduating I was set up working out of my house. Within a year I realized I could probably make a business out of this little hobby that I had."**

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"To do all the things we are doing, we have to have all the equipment that you have in the entertainment business. You have to be able to edit video, do video compression and put together presentations to make a whole product out of an animation," he says. "I had gained a fair amount of knowledge in the technical aspect and had done some consulting here and there for people, and that's when Cinepost asked me to move over here and do DVD and video editing for them."

Cinepost is an Atlanta company that cleans, restores, develops, designs and creates video masters from film or video for DVD, broadcast and duplication. AGI Studios moved into a shared studio with the company and began doing all of its animation and graphics.

"Cinepost brings in the clients for DVD and does the film or video transfer. Then my team actually makes the DVD — designs the graphics, does the video compression and puts the master together for the client. We handle the creative aspect," Christopher says. AGI Studios has worked on more than 200 titles, mostly older films and some animated features, including "The Fighting Sullivans" and all of Roy Rogers' films.

"A lot of it has to be restored. They bring the film in and it's in terrible shape. Cinepost transfers it, then we go in and do digital paint and cleanup on the master and the sound as much as possible, then produce the DVD."

In addition to "tons of black-and-white movies," AGI works on newer foreign films and has begun attracting a lot of business from the independent film industry.

"The huge studio movies go to places in Hollywood. We've talked to the bigger studios, but they always say they don't want to use us because we're not in L.A.," Christopher says. "So we're doing a lot of independent films that are being released and are sort of a hot commodi-

ty right now. The DVD market is really taking off, especially if you've got specialty content, extra features, a new and exciting way of presenting a DVD. That's the one big hook right now."

Meanwhile, AGI still handles large architectural computer visualization projects. This spring, Christopher's studio landed the animation project for a \$600 million Donald Trump development near Miami.

"I hired a marketing person who began digging through every periodical there is about what projects were coming up and she found an article on the Internet about the project that published a phone number. She called the phone number and Donald Trump answered the phone," Christopher says.

Evidently, the author of the Internet article put the phone number to Trump's Florida suite on the Web and when Christopher's employee called, she heard, "This is Donald."

"She was just kind of in shock. She talked to him a little bit and found out a little more about the project he had going on down there. She said he was very nice," Christopher says.

As a result of that conversation and follow-ups, Christopher flew to Miami to meet with Trump's developer.

AGI Studios recently completed the animated fly-arounds for the Trump Ocean Grande Sonesta Hotel and the adjacent Trump Royale and Trump Palace condominiums, which are being developed on the beachfront in Sunny Isles Beach just outside of Miami.

"They've been working on this project for a while because they had a complete set of construction documents they were able to send to us," Christopher says.

The information the contractor needs to build a project is the same information Christopher needs to create the model. He includes details down to the styles and colors of accent materials to be used in the buildings.

Running a business that's as old as his Tech degree is "a little strange," Christopher says, but his family and educational background prepared him to be an entrepreneur.

"In the College of Architecture at Tech, it's a little different. They want to teach you to be creative. Throw everything away, throw practicality away, and just be creative. That's why the College of Architecture is kind of out there by itself. They foster creativity and don't try to constrain themselves to a box," he says. "And almost everyone in my family has always been self-employed. We get up early in the morning, go to work and work until everything gets done. Then you go home. There wasn't a lot of 9-to-5 going on at my house."

Despite the hard work and challenge of constantly adapting and changing with the market, Christopher is glad that architects weren't hiring in 1992.

"There are lots of long hours, generally 12 to 16 hours a day, but I have fun and I don't have to wear a tie." **GT**





## Communicating Success

*Beth and Gary Sowell connect on the job and on the campus*

By Maria M. Lameiras

When Gary met Beth, it looked like the two BellSouth employees were going to get disconnected before they had the chance to connect.

Although Beth Wilkinson, IE 77, was an attractive, single Georgia Tech grad and Gary Sowell, IE 73, was an upwardly mobile young bachelor, the dating situation seemed "geographically undesirable."

Beth was working in the company's Jonesboro, Ga., office, where Gary had worked for two years before being transferred to what was then the comptroller's office at the company's headquarters in downtown Atlanta.

Colleagues were successful in connecting the two. After Beth began working in the Jonesboro office, Gary received a "scouting report" from friends and soon found an opportunity to revisit his old office.

"I walked into the office and I wasn't there for two minutes before a friend came dragging her out saying, 'This is Beth. She's single,'" Gary laughs.

But Gary, who lived in north Atlanta, thought there might be a geographical obstacle. When he had lived in Jonesboro and dated women who lived in north Atlanta, just picking up his date, dropping her off and returning home meant a 150-mile round trip.

He soon realized he and Beth had a lot in common, including Atlanta addresses. "I found out she lived off I-75 and Northside Drive and I began thinking, 'This might work out,'" Gary says.

The couple began dating in January 1978 and by August were engaged. They celebrated their 23rd

Beth Sowell, IE 77, says having a spouse who works at the same company has advantages and disadvantages. "When I am called in the middle of the night or can't make dinner because an emergency happened, he totally understands that. But the problem is, because he understands, you end up talking a lot about it and you never get away from it."

wedding anniversary in April.

Both have also forged longtime careers with BellSouth. He has been with the company 29 years and is director of information technology for the BellSouth Technology Group, responsible for all of BellSouth's financial systems including payroll, accounts payable and accounting systems. She has been with the company 25 years and is a general manager of network operations for BellSouth. Her district includes everything inside Atlanta's Interstate 285 perimeter.

Gary grew up in Savannah, Ga., a fan of the Georgia Bulldogs.

"We didn't hear a lot of stuff about Tech down in Savannah, but we heard a lot of stuff about Georgia," he says.



Because he was gifted in math and science, he skipped grades in elementary and junior high school. After he took the SAT and was preparing to apply to college, his dad told him he was going to Georgia Tech.

At 16, Gary began his freshman

he says. "I said to myself, 'Boy, one thing I'll never do is I.S. work.'" It is, of course, where he has carved out his career for the past 27 years.

"It was a very defining career move for me. I was never great at sitting down and writing new program

to school."

As a general manager of network operations, she manages the 800 workers who install, maintain, construct and engineer the telephone facilities in Atlanta, about 1 million phone lines, most of them under concrete.

She doesn't do the fieldwork, but when there are phone problems in Atlanta, Beth gets a call. She is on duty 24 hours a day in case lines are damaged and repair crews need to be dispatched. "We've had some very bad damages where our cables have been cut, knocking out thousands of lines," she says.

While she doesn't "climb the poles" like the technicians do, Beth understands what they do and she tries to demonstrate that. On occasion, she accompanies the technicians on their calls both to observe and to make herself accessible to the workers.

"Going out with technicians is valuable in a lot of ways. I'm not trying to learn their jobs, it's just being out there with people seeing you. They need to know you care about helping them and making their jobs better and being out there makes a difference," Beth says. "With that many people it's hard to communicate with everybody, so you communicate one by one."

She is surprised when she senses an employee is nervous speaking to her.

"I try not to be an intimidating person and I can't believe someone who's 5 feet 3 inches tall and blonde is intimidating," she says with a grin. "I know it's the position. I've tried to make sure people realize that I am approachable because, if I'm not, I'll never hear their concerns. They've got to feel comfortable talking to me, and many times as a result I've been privy to surprising information."

"Sometimes things that are very simple are convoluted as they get pushed down the line. I'm able to clear up a lot of misconceptions. I feel like most people in this district know I want to be there, that I care about them and the district and I think that makes a big difference."

**"I walked into the office and I wasn't there for two minutes before a friend came dragging her out saying, 'This is Beth. She's single,'" Gary laughs.**

year at Tech with a lingering loyalty to Georgia. "Freshmen came about a week ahead of everyone else and we had a freshman camp at Camp Rock Eagle," he says. The experience immediately transferred his loyalties. "It was like flipping a switch," he laughs about his sudden conversion.

Gary's social experience at Tech did not include dating. "I must have been the youngest-looking freshman in Tech history," he says. "I was younger than the girls in my class and there were only about 150 girls on campus when I started and only about 300 by the time I graduated."

After graduation, Gary elected to stay in Atlanta, accepting a job with Southern Bell as an outside plant engineer in Jonesboro. "There's not a whole lot of tie-in between industrial engineering and doing outside plant engineering at Southern Bell," he says. "The job had on-the-job training — you don't go to college to learn how to do telephone engineering. But I've always said Tech teaches you how to think and how to cope."

After two years in Jonesboro, Gary was promoted to the comptroller's department, now BellSouth's information technology organization.

"The ironic thing about it is that, when I was at Tech, I had a hard time with the one information systems course we had to take. I just couldn't get the concept of programming. I struggled with that the entire quarter and I made a D. It was the only D I made at Tech and that was the happiest day of my life when I got that D,"

code, but I did well enough and I understood how it fit back to the business aspect and I could troubleshoot problems," says Gary, who spent four years as a programmer and senior programmer before being promoted to manager in 1979. "At that point I began managing programmers and I haven't programmed a lick since 1979."

In June, Gary marked his 29th year with BellSouth and in January will celebrate his 50th birthday. He has reached retirement eligibility, but he says he's not sure what might come in the future after BellSouth.

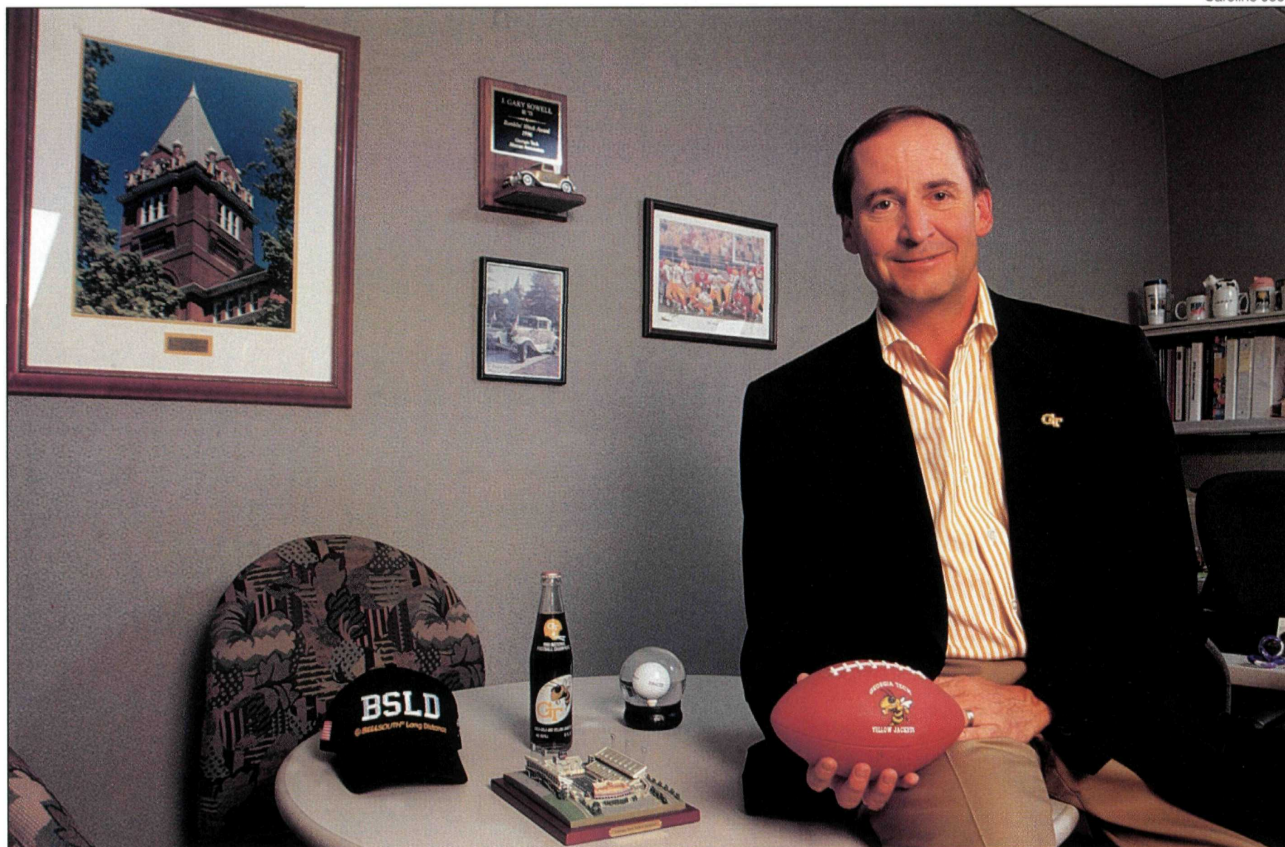
"One of the things I've always thought I'd like to do is work for Tech in some capacity," he says. "But one thing I tell people, and I would have to find out, is there are so many things I like to do I'm convinced I could keep myself perfectly busy and happy and fulfilled without ever working another day in my life."

A native of Oak Ridge, Tenn., Beth and her family lived in Atlanta for a year in 1961-62 while her father, Michael Wilkinson, a nuclear physicist, served on the Tech faculty as a physics professor.

When time came for college, both Beth and her older brother, Bill Wilkinson, IE 75, returned to Tech.

"When I graduated, there weren't many women at Tech or in engineering at that time and there was a heavy-duty focus by many companies to get women into engineering positions," she says. "I was recruited, but I knew I wanted to stay in Atlanta and I figured if I didn't find a job, I was going back





In 1995, BellSouth sent Beth back to Tech to earn her master's degree through the Institute's first executive master's of technology program, an experience she sees as invaluable.

"BellSouth is big in leadership development, but I didn't want a traditional MBA, that never appealed to me. When this program started off, it just fit perfectly. The fact that it was Tech just sealed it," she says.

That degree, combined with her experience at BellSouth, has honed her leadership style.

"I think you learn something from everyone you work with. I've had the opportunity to be in staff jobs doing support work for several company officers along the way and that's been enlightening — sometimes in a good way, sometimes in a bad way," Beth says. "You learn things about leadership style you want to emulate and you see how not to do things.

"When I started at BellSouth, there was more of a leadership style where your boss says, 'You do what I say and that's it.' That never worked

for me, it's not my style. In the last five to 10 years, that has changed. I'd much rather have people want to do something, to know and understand the goal and why they are doing it rather than just make them do it."

Both Gary and Beth Sowell continue to be actively involved with Tech and the Alumni Association. He helped found the BellSouth Georgia Tech Club, the first alumni corporate club. Beth completed a three-year term on the Alumni Association board of trustees on June 30, and Gary began a three-year term July 1.

In May, the couple signed on to serve on the board of advisers of the School of Industrial and Systems Engineering. During the Campaign for Georgia Tech, they established the Gary and Beth Sowell Endowment Fund, a fund to provide unrestricted support for the school. The couple were also honorary co-chairs for Homecoming 2001.

In 1996, Gary received the Ramblin' Wreck Volunteer of the Year Award from the Alumni Association.

Gary Sowell, IE 73, is such an enthusiastic Georgia Tech fan that he once won a contest by wearing the wrong colors. At an office Halloween costume contest several years ago, Sowell wore a red golf shirt and black trousers. When asked why he hadn't worn a costume, he said, "I'm dressed as a Georgia fan. Take a look, you'll never see it again." He won the prize — then threw the shirt away.

He was co-chair of the fund-raising committee for his 25th class reunion, had served on the Roll Call Matching Gift steering committee and as chair of several other Roll Call Leadership Circle committees. They also have been active supporters of the Alexander-Tharpe Fund.

"Being connected to Tech is very important to me," Gary says. "I've always said there is a certain kinship amongst Tech alums, that it doesn't matter where you are in this world, there is an instant bond when you meet another Tech alumnus. Also, the reputation of Tech has always been so significant and so outstanding that when you hear someone is a Tech grad, you know what they can accomplish." **GT**



# Top Innovator

*Brossette develops software that reduces hospital infections*

By Neil B. McGahee

Hospitals might be the last place you'd expect to contract an infection, but hospital-acquired infections affect 2 million patients annually in the United States, costing providers and insurers more than \$6 billion, according to the Centers for Disease Control. These infections account for 50 percent of all major hospital-related complications and are responsible for about 90,000 deaths each year, making them the fourth leading cause of death in the country behind heart disease, cancer and strokes.

Stephen Brossette, Phys 93, founder and president of MedMined Inc., in Birmingham, Ala., developed software while enrolled in the University of Alabama-Birmingham's combination MD/PhD program designed to cut the incidence of such infections by 25 percent and save a hospital \$650,000 per year.

Brossette was named one of the world's 100 Top Young Innovators by the MIT magazine *Technology Review*.

Nominees are recognized for their contributions in transforming the nature of technology in industries such as biotechnology, computing, energy, medicine, manufacturing, nanotechnology, telecommunications and transportation.

Brossette's creation, Data Mining Surveillance Service, provides an automated data-monitoring system that tracks patterns of hospital-acquired infections and antibiotic resistance in health care facilities and in the community using data-mining technology. DMSS combines artificial intelligence, statistics and database searches to allow researchers to extract information without being limited to a predefined search criteria.

Because the system isn't restrict-

ed by parameters, Brossette says it has the potential to unveil 10 times more infection patterns than conventional methods, which he compares to "looking for a needle in a haystack."

The DMSS system is a three-part service.

First, MedMined's CultureMiner database can track a "hot list" of infections gleaned from microbiology results that are automatically imported daily into the database, eliminating time-consuming manual data entry. According to CDC data, the average infection control department spends 40 percent of its time on surveillance, severely limiting time that could be spent intervening when problems arise.

The next component utilizes monthly surveys to analyze existing data and identify patterns of related infections, colonization, contamination and antibiotic resistance in patient populations, allowing health care workers to identify systematic breakdowns that can jeopardize patient safety.

Finally, antibiograms are provided that give historical data to show if the antibiotic treatment already under way is the right one, and whether another antibiotic should be used in association.

"Infection control is a huge problem for health care," Brossette says. "It's not well-known in the general public, although that's beginning to change. It's usually caused by some kind of human error and once these breakdowns are identified, they are fairly easy to correct."

"The technology I developed was part of my PhD work, but the underpinnings began at Georgia Tech," says Brossette, a native of New Orleans. "As an undergrad, I worked in artificial neural-network research with

Dr. Roger Wartell in the School of Biology. We did computational analysis of DNA melting. I got away from computational analysis during med school but came back to it for my doctoral work."

Brossette earned his medical degree in pathology, then began working on a doctorate in computer science so he could continue his epidemiological research. He and his wife, Lynda, recently celebrated their fifth anniversary and have an infant son, Nathan.

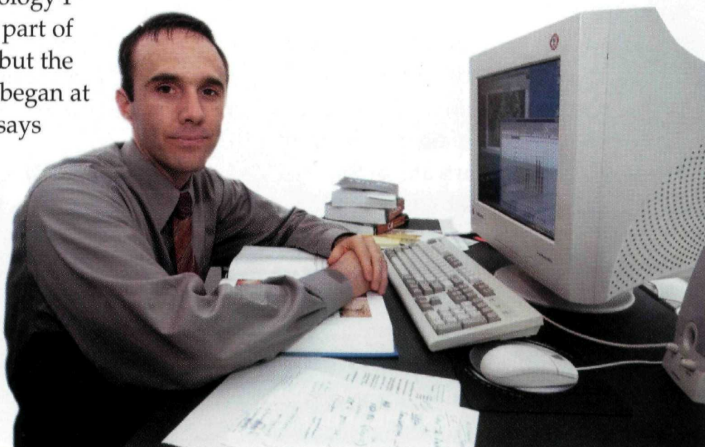
In January 2000, while Brossette finished a residency in pathology, he founded MedMined. Now in its second year, the company recently signed contracts with the Children's Hospital and Veterans Affairs Medical Center in Birmingham, Northwestern Memorial Hospital in Chicago and hospitals in Wisconsin and Hawaii.

Because his research was so successful, Brossette made a decision to leave his practice.

"The technology this company is based on has been my passion for many years," he says. "What we do allows us to affect many more patients than we could on a case-to-case basis with one patient at a time."

Brossette's ultimate goal for the company is to "change the way hospital epidemiology is done."

"We would like to see this become a standard internationally," Brossette says. "This is not just a U.S. problem. I would like to see our technology used in hospitals of all flavors, shapes and sizes." **GT**





# Opportunity Knocked

*Science policy analyst for president, Amy Flatten discovers international forum*

By Kimberly Link-Wills

**A**my Flatten says her doctorate has opened doors all the way to the President's Office of Science and Technology Policy.

As a senior policy analyst, Flatten, MS ESM 86, PhD 93, has a long list of job duties.

"I'm looking at the international aspects of individual scientific projects, as well as international collaborations with Russia and other countries. I'm also involved in analyzing how the federal government manages crosscutting scientific research in areas such as nanotechnology, and I have had an opportunity to work with the President's Council of Advisers on Science and Technology.

"The council draws from high-profile CEOs and presidents of universities in order to provide President Bush with perspectives on science and technology from academia and industry. I provide background and coordination between them and other parts of the federal government," Flatten says, pointing out that Georgia Tech President Wayne Clough chairs one of the subcommittees on which she works.

Flatten is particularly proud of the annual Global Science and Technology Week, an initiative in which she leads a team with representatives from more than 35 public and private sector organizations to boost schoolchildren's interest in science — and help them appreciate the ways science and technology improve lives and connect people across the planet.

President Bill Clinton signed the first Global Science and Technology



From her Washington, D.C., office, senior policy analyst Amy Flatten deals with both domestic and international science policy issues.

Week proclamation in 2000. The initiative also has been endorsed by President George W. Bush during his administration.

Flatten's work also has taken her outside the United States. She traveled to Australia with Clinton's science adviser, Neal Lane. "I was able to craft his speeches and his remarks on R&D policies and funding here in the United States. I actually got to be in the meeting when Dr. Lane met with John Howard, their prime minister."

In the Bush administration, Flatten helps science adviser John Marburger develop messages and positions for high-level international dialogues.

"This job has given me an opportunity to be in an international forum and participate in bilateral and multilateral negotiations on science policy. It has allowed me to help our science leaders engage with international counterparts at the highest levels," Flatten says.

While pursuing her master's degree, Flatten considered her career options.

"I thought if I stopped at a master's, I could be an engineer, but if I got a PhD in engineering, it would open doors to opportunities beyond applied engineering that I couldn't have envisioned as a graduate student," Flatten says.

"It wasn't just that Georgia Tech gave you one opportunity. It gave you every opportunity. When I was at Georgia Tech, I had the opportunity to do engineering internships in the private sector as well as teach and perform research in an academic environment. As a graduate student, I taught 20 sections of statics over the course of four years. I loved the communication challenges, the leadership challenges.

"But if I wanted to explore career options outside of the research environment as I enjoyed as a graduate student, I thought I needed my first job to give me the widest cross section



of exposure to different aspects of science and technology."

Flatten chose consulting work in Washington, D.C.

"One of the opportunities I had while I worked in the private sector was to think about how technology affected people in terms of their core values — time, convenience, access, choice — and then imagine products and services that could be offered via the Internet that addressed those values," Flatten says.

"Given that I really liked the bigger-picture aspects of how technology affected people, I thought for my next career move I would try policy."

After nearly five years in the private sector, Flatten worked in the International Affairs Office of the National Telecommunications and Information Administration in the Department of Commerce for a year and a half — until she was invited to interview for her current job in the President's Office of Science and Technology Policy.

"At the time I joined the Department of Commerce, I also had wanted to add an international component to my career. That was based on my earliest experiences at Georgia Tech. The first opportunity I had had to mix in an international environment was as a graduate student. That was enthralling to me. I wanted to incorporate those experiences into my professional experiences," Flatten says.

She also continued to pursue opportunities to teach in Washington, D.C. Flatten has taught strength of materials as a member of the faculty of Johns Hopkins Part-Time Engineering Program since 1995.

Flatten says it is a privilege to work in the Office of Science and Technology Policy. She appreciates where her PhD has led her.

"I had no idea that the PhD would open up opportunities for policy. I had no idea it would open up opportunities for international exposure or open up opportunities to say, 'Hey, how can we get kids nationwide to get excited about science?'" **GT**

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# EPPS Aviation



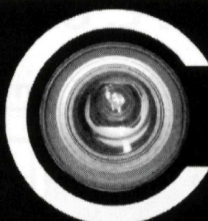
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# 2002 FOOTBALL

## READY FOR KICKOFF?



### 2002 Home Schedule:

August 31	Vanderbilt (6 p.m.)
September 21	Brigham Young
October 5	Wake Forest
October 26	Virginia (HC)
November 9	*Florida State
November 16	Duke

\*Only available in season ticket package.

(Schedule subject to change. Visit [www.ramblinwreck.com](http://www.ramblinwreck.com) for the latest.)

## Punt, Pass & Kick Competition!

Saturday, October 5, 9 a.m. at Rose Bowl Field

Open to all youth ages 8-13! The cost is \$5 per child and all participants will receive a free ticket to the GT vs. Wake Forest football game! To register, call (404) 385-0032.

**Kickoff Celebration** Friday, August 16  
at the Fox Theatre

**Fan Photo Day** Saturday, August 17  
4-6 p.m. at the George C. Griffin Track

(For more information, visit the Events page of [www.ramblinwreck.com](http://www.ramblinwreck.com).)

## 2002 Volleyball

### Home Schedule:

Sept. 6	Florida A&M	Oct. 6	FSU
	Louisville	Oct. 25	Virginia
Sept. 7	Miami (OH)	Oct. 26	Maryland
Sept. 20	Alabama	Nov. 5	Clemson
Sept. 21	FL Int'l	Nov. 15	Wake Forest
	Cornell	Nov. 16	Duke
Oct. 1	NC State	Nov. 22-24	
Oct. 5	UNC	ACC Tournament	(at O'Keefe Gym)

Yellow Jacket Volleyball games are fun for the whole family! For information on affordable season ticket packages, call 1-888-TECH-TIX.

**Season tickets still available! Call 1-888-TECH-TIX**

## Junior Jackets

The Junior Jackets Club is a great way for youth 8<sup>th</sup> grade and under to experience Tech Athletics! For more information, call (404) 385-0032.



For schedules, promotions, directions and more, visit:

**[www.ramblinwreck.com](http://www.ramblinwreck.com)**

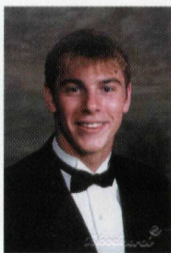




**Congratulations!**  
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This year again, corporations were invited to become sponsors of individual scholarships awarded by the participating Atlanta Area GT Clubs. Here they are with their sponsored students...



Matthew Loveless

*The Reeder  
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Caitlin Quigley



Stephanie Nadi



Jennifer Rieser

Join us for the 2002 Kickoff Celebration, Friday, August 16th at 6:30 p.m., Fox Theater. For reservations call 404-894-7085.



## The Georgia Tech Marketplace

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Upcoming Deadlines

*Tech Topics* - July 26, 2002

*Alumni Magazine* - August 30, 2002

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## Collectibles



I am a Georgia Tech Alumnus (ChE 1973) and active Scoutmaster in the Blue Ridge Council BSA with headquarters in Greenville, SC.

I need memorabilia of any kind related to the Scouting Movement in the United States and around the world to display as a means of teaching the history of Scouting to the youth of our local and regional community.

If you have any historical Scouting items please contact me as I would be interested in talking with you about either a tax-deductible donation or a cash purchase of these items.

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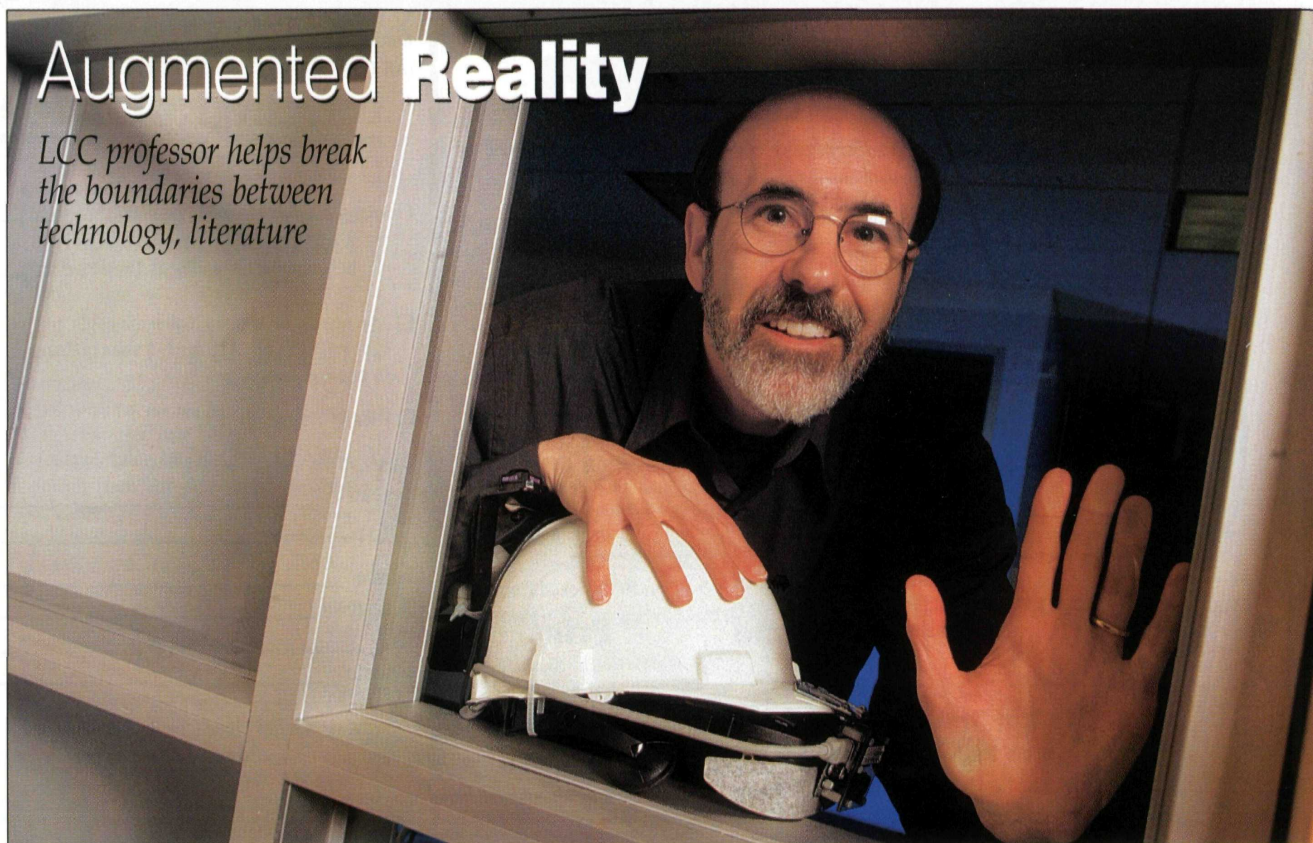
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# Augmented Reality

*LCC professor helps break the boundaries between technology, literature*



By Maria M. Lameiras

If things go Jay Bolter's way, we could be seeing ghosts. Not real ghosts, but historical figures and fictional characters inserted into our world through augmented reality technology. Like virtual reality, this technology lets a user see what's not really there, but rather than create a whole new world to interact with, augmented reality does just that — augments the world we already live in.

Bolter is a professor and holder of the James and Mary Wesley Chair for New Media Studies in the School of Literature, Communication and Culture of Georgia Tech's Ivan Allen College. His academic and research world has undergone a technological shift since he signed on as a professor in 1991.

With a bachelor's degree in Greek, a master's degree in computer science and a PhD in classics, Bolter's personal interests and experience were slightly out of sync with the thinking and research in the classics department at the University of North Carolina at Chapel Hill, where he'd earned his graduate degrees and taught courses in literature and ancient languages.

"One of the things that the transfer to Tech meant for me was the opportunity to refocus my teaching and bring it into line with my research," Bolter says. "I had been researching in the area of the impact of the computer on our culture and the uses of the computer for communication and expression. It wasn't possible in North Carolina to really bring that into the classroom."

His first book, "Turing's Man," was published in 1984 and addressed the cultural impact of the computer. "From that point, all of my research and creative efforts were in that direction," Bolter says.

"Georgia Tech was a unique place because of this department, the school of LCC and because of the Ivan Allen College, which gave me the opportunity to really think about how the humanities themselves could change in a world of new media."

When he came to Tech, Bolter says he also had the opportunity to work with his LCC colleagues to create the master's program in Information Design and Technology, the extension of the new Science, Technology and Culture undergraduate degree in the fledgling Ivan Allen College.

"I think what is innovative about our program is that it involves hands-on experience in new media design — the design of new media artifacts for the Web or for CD-ROM or DVD or for more advanced systems like interactive television, augmented reality and virtual reality," he says.

"With that, we combine courses in the history of media and the relationship of older media — television, film, photography, print — to new media and its cultural and social implications. We ask our students to consider how our culture is using and reacting to these new digital technologies. Our program is an unusual combination of historical, theoretical and practical approaches. We believe that this combination makes our students better designers because they have the enrichment that comes from cultural knowledge."



Currently, a PhD program is being developed for the department that could be offered in two to three years.

Bolter says his research has benefited from his collaboration with the Graphics, Visualization and Usability Center of the College of Computing, which he says is "particularly good at thinking about how computers can actually be used by individuals in society to solve problems."

"When I came to Tech, I had already been working on hypertext, but my work had been limited to verbal communication — words on the computer screen instead of on paper, but still words. Georgia Tech enabled me to expand my thinking to include visual modes of expression."

Through the GVV Bolter became involved with research in the graphical user interface, computer animation, virtual reality and augmented reality. "I've really begun to see how words and images come together in digital technology and in exciting new ways," he says.

In 1999, Bolter and former Tech professor Richard Grusin had their book "Remediation" published. Now Bolter is working with professor Diane Gromala, an artist and theoretician, on a book titled "Windows and Mirrors" about digital art and its impact on design.

In addition, Bolter has focused his research on augmented reality.

"Augmented reality uses the same technology as virtual reality, but in this case you see the physical world around you and the computer adds in, or augments, your view with graphics or textual information," Bolter says.

In the past, the technology has been explored as a training tool to help people do various tasks in the workplace. For example, a mechanic repairing a jet engine might wear augmented reality goggles. When the mechanic looks at the engine, the augmented reality points out which screw to remove or provides pages from the repair manual.

Working with Blair MacIntyre, a professor in the College of Computing and the GVV, Bolter has been divining how to use augmented reality to create educational or entertainment experiences for users.

"In this case, instead of repairing a jet engine, users would put on the headset and see their physical environment, but also see characters, talking figures who may tell them things about that environment or who may even interact with each other. Imagine being on a Civil War battlefield and seeing the battle going on around you. Or it could be more of an entertainment experience where it is a fictional character addressing you and telling you her story."

In a computer demonstration of the technology created by graduate student Noel Moreno, a goggled user takes the title role of "Alice in Wonderland" at the table for the tea party scene. Sitting at the table are virtual figures of the March Hare, the Dormouse and the Mad Hatter, all of whom interact with Alice based on visual and verbal cues the computer is programmed to recognize.

Bolter and his colleagues also have been working on a partnership with a museum or other historic site in the Atlanta area as a prototype test for the technology.

"We have spoken to people about creating an augmented reality experience for Auburn Avenue, the famous downtown area in Atlanta where the King Center is located," Bolter says. "That was a very lively economic and cultural center in the first half of the 20th century. Imagine you are walking down Auburn Avenue and the 'ghosts' of Auburn Avenue come and talk to you about the things that were there 50 years ago."

In an indoor environment, such as a museum, Bolter says the space could be set up with sensors that would interact with the headsets to provide the visuals for each display. Outside, the system could be rigged to the global positioning system to track a user's progress through the historic area to within 2 meters.

"There are a lot of bugs that are still being worked out. Blair and his students are working to perfect the technology so it will be inexpensive enough and simple enough for entertainment or educational uses," says Bolter. "We are hoping that, with a grant, we will be able to get a local museum or a local exhibit to be the first to test it out."

In April, Bolter was awarded the Class of 1934 Distinguished Professor Award, the first Ivan Allen College faculty member to receive the honor.

"The Distinguished Professor Award is a great honor and I am very gratified to be recognized in this way, but I think it is also a recognition of the work that we are doing in the school and the Ivan Allen College.

"I think this recognizes that the Ivan Allen College has come of age in the last 10 years as an important member of the Tech community and is contributing to the reputation that Georgia Tech enjoys nationally and internationally," Bolter says. **GT**

### The Bolter File

- **Born:** Aug. 17, 1951, in Rantoul, Ill.
- **Education:** BA, Greek, University of Toronto, Trinity College, 1973; MS, computer science, University of North Carolina at Chapel Hill, 1978; PhD, classics, University of North Carolina at Chapel Hill, 1977.
- **Honors/Achievements:** Class of 1934 Distinguished Professor Award, 2001; Lewis Mumford Award, Media Ecology Association, 2001; Fellow, Society for the Humanities, Cornell University, 1986-87; Visiting Fellow, Department of Computer Science, Yale University, 1982-83; Study Fellow, American Council of Learned Societies, 1982-83; German Academic Exchange Program (DAAD) Fellow, Universität Göttingen, 1978-79.
- **Personal:** Wife, Christine de Catanzaro, archivist of special collections at Georgia State University; son, David, 12.
- **Leisure Interests:** Travel, attending baseball games with his son.



Gregory Smith AP/WideWorld



## World Series **Bound**

A jubilant Georgia Tech baseball team celebrates its 11-5 victory over Florida Atlantic in the NCAA Super 8 Regionals at Tech's Russ Chandler Stadium on June 8 to advance to the College World Series. The Jackets, who were unheralded during the preseason, won their first Series game 11-0 over South Carolina in Omaha, Neb., the first shutout in the College World Series since 1994, when Tech shut out California State-Fullerton, 2-0. Two wins shy of the championship game, the Jackets suffered disappointing losses to Clemson and South Carolina in the double-elimination tournament, finishing the year 52-16. Coach Danny Hall put the season in perspective, "I'm very proud of what our team has accomplished this year."





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