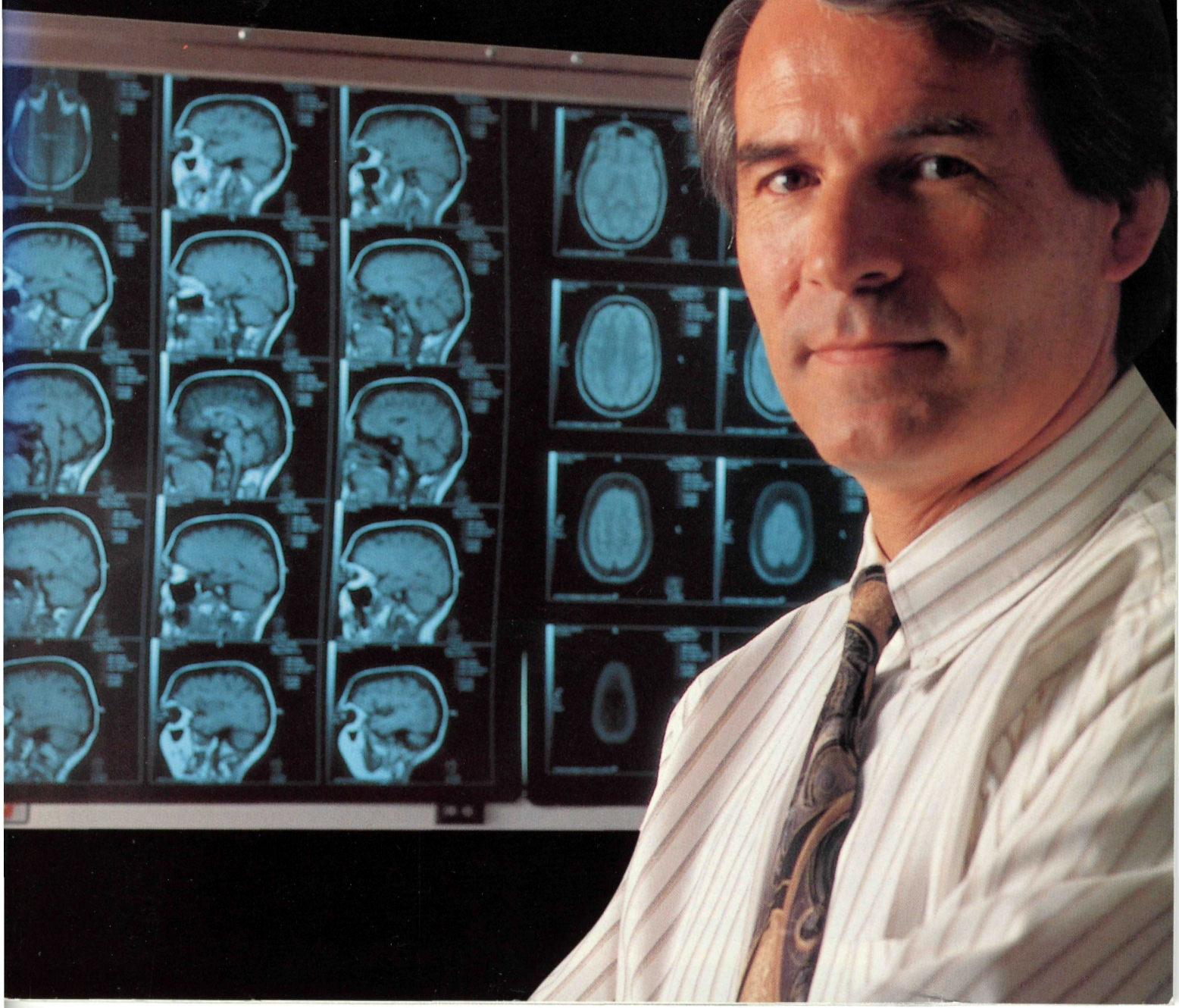
Georgia Tech Alumni Magazine

Summer 1999

Capturing Thoughts

- Rebuilding the **Biltmore**
- Newton's **Principia**



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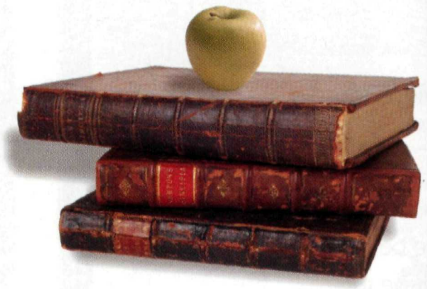
By Gary Goettling



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By Gary Goettling

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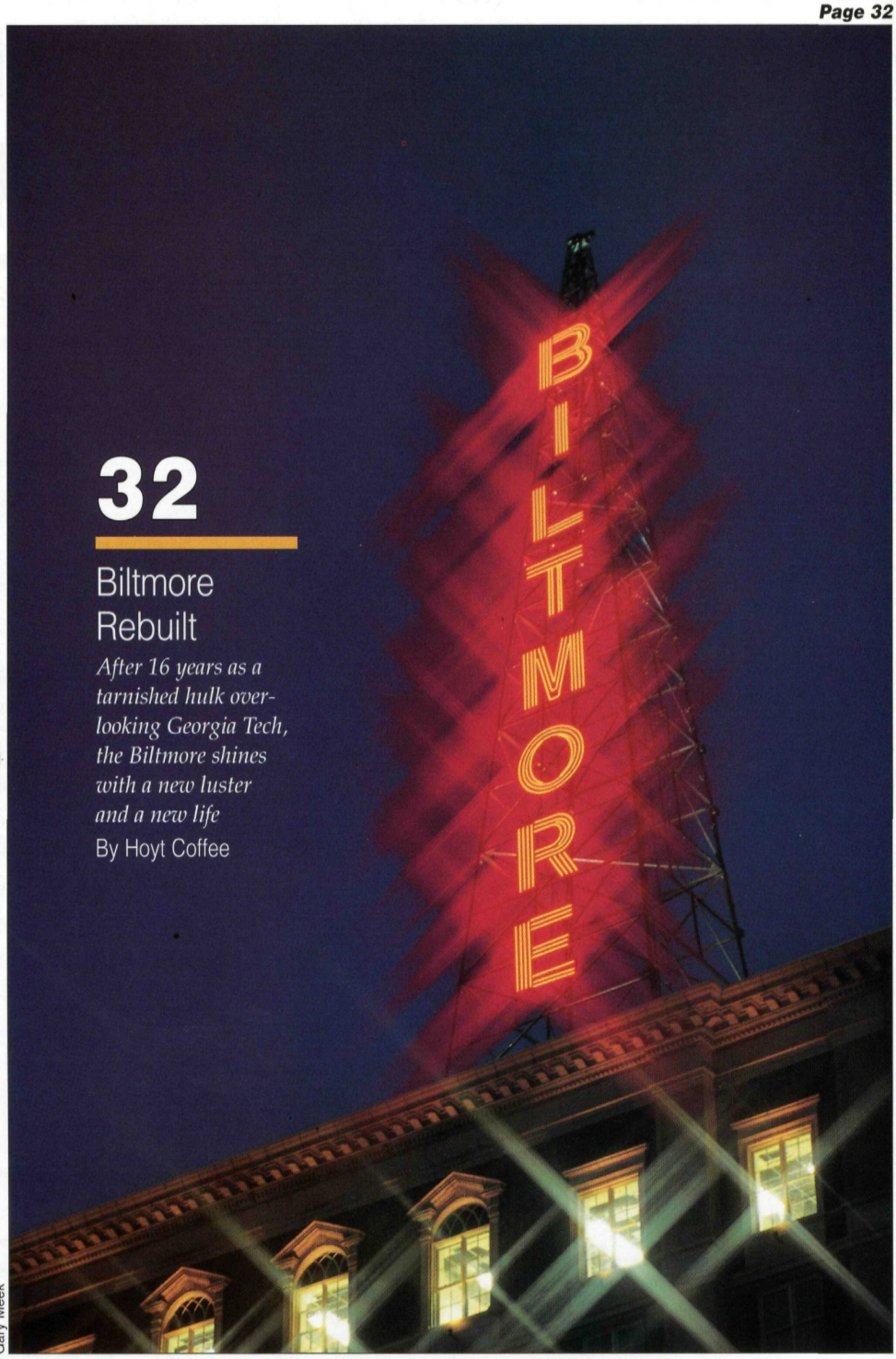

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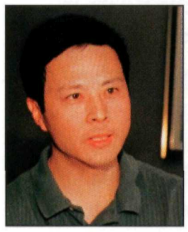

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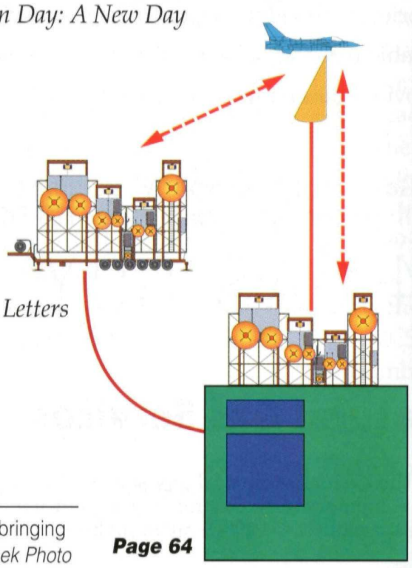

Cover: Dr. Philip Kennedy's research is bringing hope to victims of paralysis. —*Gary Meek Photo*

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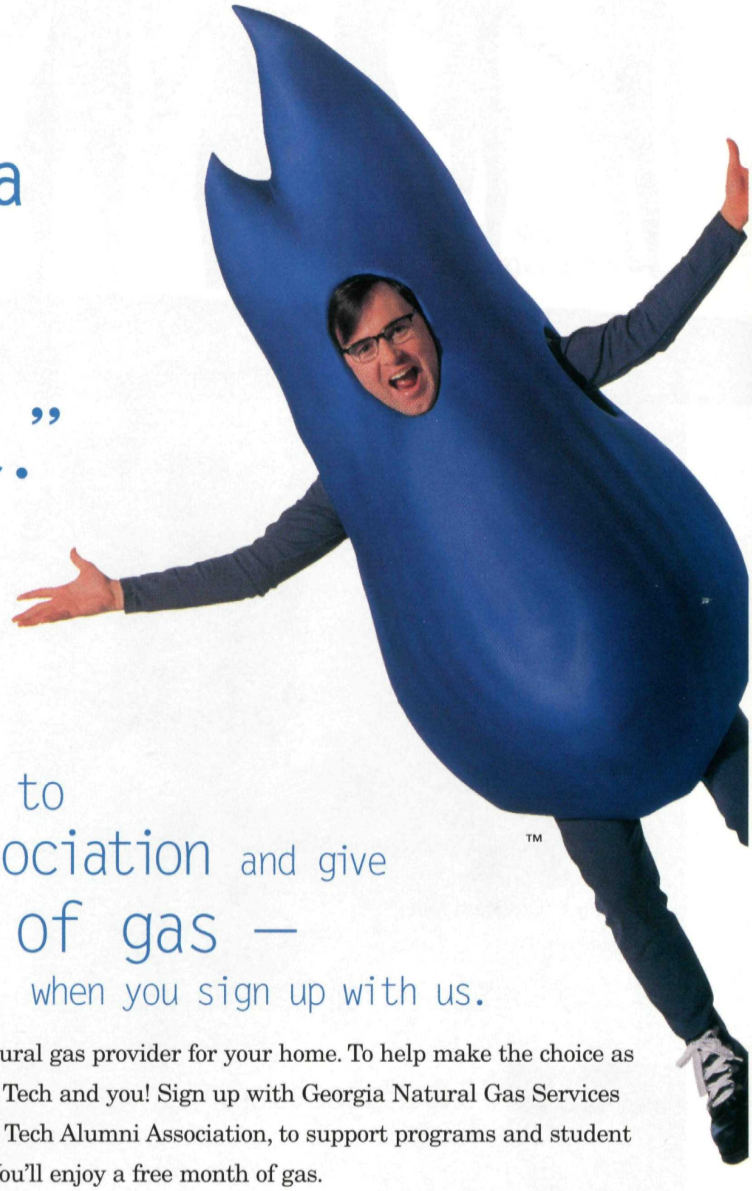

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Greenwich **Time**: **2001**

Like Myrick Hilsman (Feedback, Spring 1999), I am disappointed with all the incorrect statements about the coming millennium. However, Mr. Hilsman's is one of those incorrect. His analogy of counting one's age and counting the century is contradictory.

Using his reasoning, in order for Dec. 31, 1999, to begin the 2,000th year, the calendar would have had to start with the year 0; however we all know there was no year 0.

Let me quote one line from the Royal Greenwich Observatory Information: Leaflet No. 52: "It is thus clear that the start of the new millennium will be 1 Jan. 2001."

You can read the rest of the explanation at http://www.ast.cam.ac.uk/pubinfo/leaflets/2000/2000.html

Please put this issue to rest with a definitive statement to the uninformed that the new millennium starts Jan. 1, 2001. A great technical institution such as ours can accept no other position.

Robert W. Brown,
Phys '74
Peachtree City, Ga.

False Premise

I'm surprised that you printed the feedback letter without comment. The widely-held view that Jan. 1, 2000, should be considered the beginning of the third millennium is disarmingly simple reasoning, until you realize that it is based on a false premise: that the first year of the modern calendar (i.e. year 1 A.D.) equates to the first (i.e., 0th) year of one's life.

Unwittingly, the writer has provided an excellent example of why the exact timing of the arrival of the next millennium can be so confusing.

Dan Colestock
EE '79
Smyrna, GA

Millennium **Mathematics**

Your 20th birthday is the start of your 21st year. However, the Christian calendar begins with the birth of Christ. When Christ was 1 year old in the year "0001," he celebrated his first birthday. His birth was in the year "0000." The day after the first year is 1-1-0002.

By the same reasoning, the 20th century and the 2nd millennium end after 2,000 years. The day after the 2000th year is 1-1-2001 and starts the 21st century and the 3rd millennium.

We have a year and 6 months to begin the 21st century and the 3rd millennium.

Robert M. Lupo, IE' 49
Titusville, Fla.

Not Too **Simple**

Myrick Hilsman gives his reasoning that the third millennium indeed starts Jan. 1, 2000. He states, "It's a simple problem in logical mathematics."

Yes, it's simple, but like many classes I took at Tech, simple problems often lead to simple errors. There was no year zero in the Christian calendar, thus on Jan. 1, 2000, only 1999 years will have passed.

Stephen Mencik,
ICS '81
Gambrills, Md.

Millennium **Dilemma**

There is mass confusion between the year 2000 and the new millennium. I believe many people are getting the end of the millennium and the Y2K computer problem intertwined.

The Y2K computer problem is related to the dating system for the computer programs and could be just as severe for year 01, 02, etc., if not corrected for year 00. This problem is basically a problem at the beginning of the year 2000 whereas the end of the present millennium will occur at the end of the year 2000. A millennium is defined by Webster as being 1,000 years with any starting point; however, in our calendar system it is normally accepted that the calendar

WELL, NOW WE KNOW WHERE FARNSWORTH HAS BEEN FOR THE PAST YEAR.

millennium is the period starting in year one and progressing through *completion* of the 1000th year.

The key word is completion.

I am reminded of D.M. "Doc" Smith, who was a great professor and a Georgia Tech legend in the Mathematics Department. He always gave quizzes of 10 problems with each problem counting 10 points on your grade. One of our classmates had used logical thinking on one of the problems, worked many of the steps correctly but ended with an irrational and incorrect answer.

He confronted "Doc" Smith, stating that he had done all the steps correctly, until the answer so he should get part credit. "Doc" Smith, agreed to give him part credit—he took the "1" and gave the student what was left!

Using the age example, consider a newborn child. From birth the child is in his/her first year of life, but the parents do not consider the child to be 1 year old. When asked the age during the first year the parents will give the age in days, weeks or months until the first year is completed and then and only then is the child considered 1 year old.

For another example, we look at loans made to a borrower. If a schedule is set for 100 payments, no lender will consider the repayment complete at the 99th payment but only after the completion of the 100th payment.

So it is with the calendar millennium. In the slice of the time continuum at the completion of the year 1999 and start of the year 2000, we enter the 2,000th year, which will be completed at the end of the year and the beginning of the year 2001—and the new millennium.

Charles Byrd, ChE '48
Tulsa, Okla.

Millennium Countdown

In the Christian calendar there is no year zero. Because there is no zero, the first year A.D. ended at the end of the year 1 A.D.; the first century A.D. ended at the end of the year 100 A.D., and the first millennium A.D. ended at the end of the year 1000 A.D.

Thus the second millennium A.D. will end at the end of the year 2000 A.D., and the third millennium A.D. will begin Jan. 1, 2001.

Using the example of your 20th birthday—if you were born in 1981 A.D., your 20th birthday would occur in 2001 A.D., not in 2000.

Frank Sorensen, EE '82
Leonardtown, Md.

Front-Wheel Engineering

I always enjoy the *Georgia Tech Alumni Magazine*. The content and appearance are excellent.

In the article, "Engine Engineer," about Randy Thayer, the statement, "the 1966 Toronado was the first mass-produced front-wheel-drive vehicle" obviously refers to General Motors all the way. It should have said "the first GM front-wheel-drive vehicle" since Auto Union (back then the car was called DKW, now it's the Audi, division of Volkswagon), Citroen in France, and others have been mass producing front-wheel-drive cars for decades.

I feel some sectors of the U.S. car manufacturing establishment are still quite closed-minded about what happens out in the big, wide world, and that is probably one reason why so many of us are driving European and Japanese cars today.

Some sectors of the U.S. car industry have come a long way, but there is always something to learn from others.

Diego Schaefer, TE '70, MS TE '71
Duluth, Ga.

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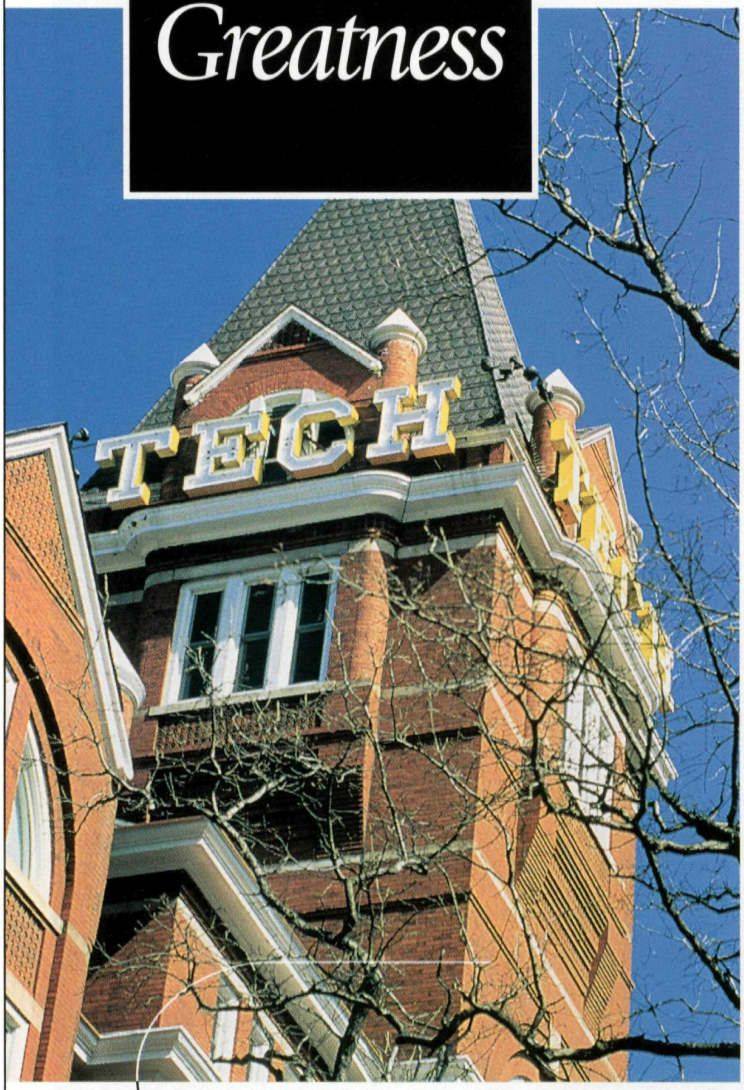

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Feedback

Starting the **Calendar**

Regarding the letter, "Starting the Millennium": Considering "birthdays" is exactly the wrong analogy to use. In birthdays, we start out at zero and reach 1 after one year. We started our calendar at the year 1, not zero. So the third millennium will start 1/1/2001. It is a matter of logic, and Tech grads should be able to handle it.

Robert Persons,
Phys '64
Waynesville, N.C.

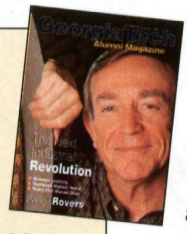
The White House Millennium Council has set the Millennium Clock. You can check it out at http://www.whitehouse.gov/initiatives/Millennium/clock.html

When does the millennium start? The official word from the White House council is: "According to the United States Naval Observatory, the nation's official time keeper, the end of the second millennium and the beginning of the third will be reached on Jan. 1, 2001. This date is based on a calendar created in Rome in 526 Anno Domini (A.D.), now recognized globally. Rather than starting with the year zero, the calendar begins with the date Jan. 1, 1 A.D. Consequently, the next millennium is not officially reached until Jan. 1, 2001.

"Despite this fact, much of the world is planning to celebrate on Dec. 31, 1999, when the calendars flip to the year 2000.

"During the millennium year (Jan. 1, 2000 to Jan. 1, 2001), the White House will lead a national Millennium Program that will engage Americans in a wide variety of activities and initiatives designed to highlight our heritage and celebrate our creativity."

Missing Link



By error my last *Georgia Tech Alumni Magazine* got thrown out, and I would like to have a replacement copy. It is a great magazine, and I have the prior six copies in my archives. I don't know how the spring edition got away.

Carroll B. Hart,
Text '57
Belton, S.C.

With a letter like yours, we'll do our best to keep your collection connected. The replacement copy is in the mail.

Stalnaker Was Colorful

Thanks for publishing my piece about Professor Thomas Seidell (Spring 1999). It was the stimulus for a fellow 1951 electrical engineering graduate to contact me. I look forward to submissions by others, and am presumptuous enough to send another.

Many of my day will remember professor Ashford W. Stalnaker, who taught electrical machinery and was the most colorful faculty member I've ever known. He was a large man of pleasant countenance, a thick shock of hair, and very sly humor. I and other classmates referred to him as Professor Scale Belly. He wore no undershirt and his big belly popped many a button as he leaned forward on his lectern. He disdained blackboard erasers, preferring to erase with his hand, which was then dusted off in his hair.

Professor Stalnaker was famous for his extended circuit diagrams, which he usually drew from memory. His classroom easily enabled this—three walls being composed of blackboards. Once, in drawing a diagram of a voltage regulator, he used all three boards as most struggled to keep up. A particularly bright student pointed out that there was a dangling wire at the very end. When asked where it was to connect, Professor Stalnaker studied his work for a few seconds, generating clouds of dust as he scratched his head. Finally, he said, "It goes right here," as he pressed chalk to board and walked all the way back near the point of beginning. Naturally, roars of laughter ensued from the students.

H. S. "Hal" Branch,
EE '51
Goodlettsville, Tenn.

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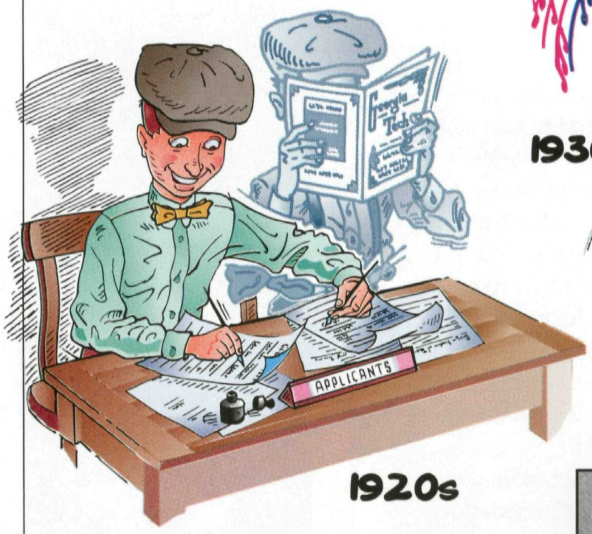
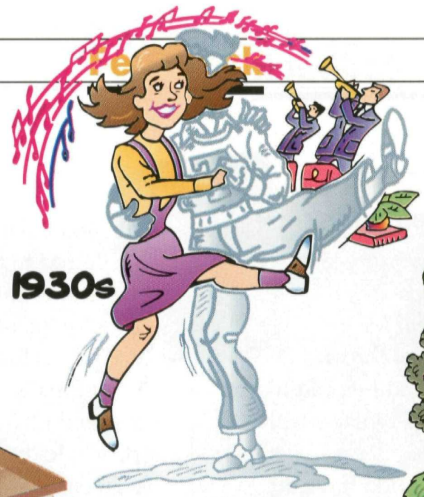


1920s



1930s

1940s

Mystery Man

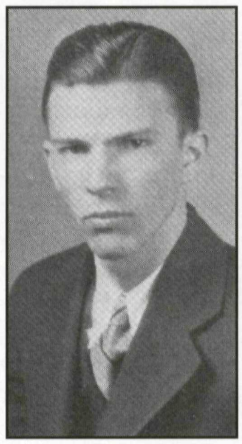
George P. Burdell tradition began during an era of "hilarious America"

Fifty years after George P. Burdell arrived on the scene at Georgia Tech, bringing his peculiar brand of mischief and mayhem, Augusta, Ga., businessman Ed Smith gave a credible account of the origin of George P. Burdell. Smith's article appeared in The Atlanta Journal and Constitution Magazine *on Sept. 11, 1977.*

By Ed Smith, CerE '30
Illustrations by Mac Evans

With this revelation, the mystery of George P. Burdell's origin will be solved.

On Sept. 15, 1927, a group of boys from the Augusta area, most of whom had finished the Academy of Richmond County, left for Georgia Tech. We went together on the Georgia Railroad train. When we reached Atlanta, we hailed two taxicabs and headed for North Avenue. We learned later, as we became more familiar with Atlanta, that the cabbies had taken us on a "Cook's tour" before depositing us.



Ed Smith, CerE '30 in 1930 *Blueprint*

The following Augusta boys matriculated that day: Buck Lanier, Blev and Jim Thompson (twins), Robert Powell, James Chafee, Harry Jefferies, Horace Marlowe, Terrell Wiggins, Ansel Tolbert and me, Ed Smith.

Very promptly we registered in the Administration Building. We were given applications to fill out, and by mistake, I was given two. After completing my application, I had a flippant moment and decided to register my mother's kinsman, George P. Butler.

He was the principal of ARC—although he was more like a headmaster, very strict and stern. His muscular jaws were kept tight, and he reminded us of an ancient Roman emperor. He played football on one of the University of Georgia's first teams and was a loyal alumnus and great booster of the red and black.

Nothing could be more amusing than to register him as a Tech freshman, but I lost my nerve after writing George P. and finished with Burdell.

My best friend was Jack Dawson. His mother's maiden name was Burdell. We had two cats that we played with as children. One cat was named Farrar and the other one Burdell, so the name was familiar to me. Thus was born George P. Burdell.

I rushed out of the registrar's office and down the front steps of the administration building. The first person I saw was Buck Lanier, and I told my old friend about the caper. We both laughed and started to spread the news.

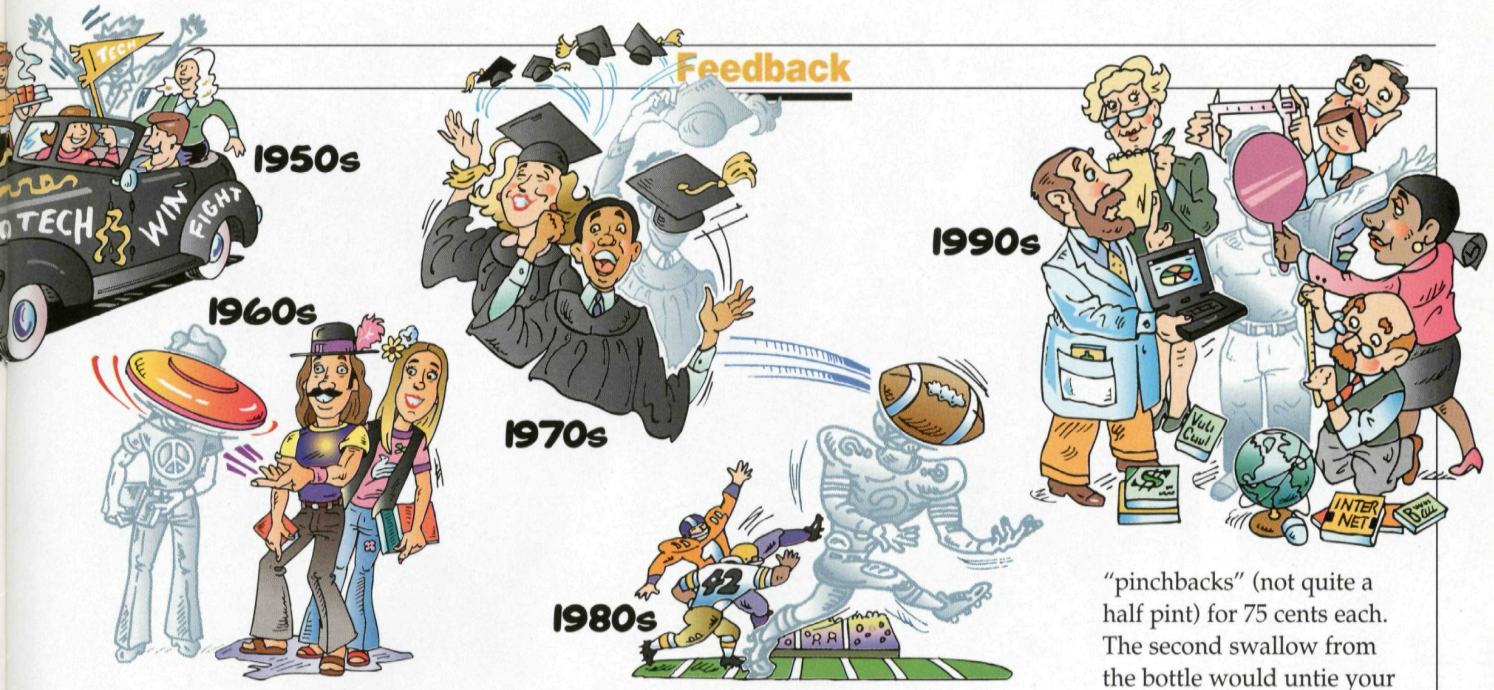
That night, a group of us were singing to the accompaniment of the uke and banjo and between songs we thought up more mischief for George P. Burdell. Boys from other areas joined in the fun.

Tech employed the honor system in those days. Upon entering class, students picked up a small blue-bound paper book from the instructor's desk. The presence of the blue books indicated a quiz, which was usually on the blackboard. Often as not, one did not see the instructor that period.

So it was a simple matter for one of the "George P." group to pick up two blue books and after completing one for himself, turn in one for George P. Care was exercised that only one set of answers was turned in for George P. True or false quizzes were a cinch—and solutions to a problem were just as easy.

George P.'s luck was phenomenal. Invariably, he made better grades than did his master. I do not recall his ever making a low grade.

Both George P. and I were excused from Dr. Rob-



ert Evans Sheppard's class, Col. C. B. Drennon recalled in an article about George P. in *The Atlanta Journal and Constitution Magazine* ("The Spirit of Georgia Tech," Feb. 13, 1977). Dr. Sheppard said, "Those two students know more history than I do." We were studying the French Revolution at the time, and of course Robespierre, Marat and Danton.

America and Tech, in particular, were good places to be in those days. When you saw a group of boys outside Dean Skiles' office waiting to see him, you knew they were in trouble. As I understand it, now if you see a group waiting to see the dean, you know the dean is in trouble.

Americans were respected all over the world. Calvin Coolidge was in the White House and we were "Keeping cool with Coolidge." Jack Dempsey and Gene Tunney ruled the boxing world. Charles Lindbergh had just made his historic flight to Le Bourget Field, Paris. He came to Grant Field in the fall of 1927. Babe Ruth and Ty Cobb, a Georgian, were household words. Ruth hit 60 home runs in 1927—and with a dead ball at that. Bill Tilden ruled the tennis world, completely dominating the game.

Tech's tennis team was superb. Strangler Lewis was the last word in honest wrestling. Tech's Ed Hamm was Olympic broad-jump champion. Tech's own Bobby Jones was "Mr. Golf," and Tech's Watts Gunn was the best known of the collegiate golfers. The Tech golf and swimming teams were outstanding.

Wherever football was followed, Vance Maree, Father Lumpkin, Stumpy Thomason, Frank Speer and our head coach, Bill Alexander, were known. Our former head coach, John Heisman, along with Knute Rockne, were without peers among coaches: Tech and Notre Dame were the teams to beat in football. Y. Frank Freeman and Johnny Mercer, loyal Tech men, were wheels in Hollywood.

On Saturday nights, we usually went to the Capitol, Georgia, Loew's Grand or Paramount theaters to see a movie. The movie was generally preceded by vaudeville. At Five Points, there was a burlesque theater, and we sometimes went there.

There was always a good Saturday night dance at Garber Hall, old headquarters of Jan Garber of dance band fame. Sometimes we patronized Arthur Murray's dance studio where Ramblin' Wreck, first school song ever played for a radio audience, was broadcast. Arthur specialized in tea (afternoon) dances and was a loyal Tech man.

Those were great days. Thornton Wilder, Ernest Hemingway, Eugene O'Neill, F. Scott Fitzgerald, Julia Pewterkin, Richard Halleburton and the remainder of the Lost Generation captured our imaginations.

Al Capone, Frank Nitti and the Aiello Brothers were having their own brand of fun and making money with bootleg booze in Cook County, Ill. Tech had a bootlegger by the name of Dan. He sold "pinchbacks" (not quite a half pint) for 75 cents each. The second swallow from the bottle would untie your shoes.

Into such a hilarious America, George P. Burdell was born. It was started in fun, and no one realized it would get so big. One of our esteemed lawmakers found it hard to believe that such a hoax could be successfully perpetrated at a straight-laced school like Georgia Tech.

As a naval officer in World War II and later at graduate school, I ran into George P. many times. In New York; Chicago; Philadelphia; Memphis, Tenn.; Birmingham, Ala.; Los Angeles—and all over the world, I heard him showing up. I saw him honored with a BS degree in 1930, and I am pleased to learn that he now has his master's.

I am glad to learn that George P. is still very much alive. It is gratifying to know that George P. Burdell, along with the Ramblin' Wreck, became the spirit of Georgia Tech, for, as the ancient Horace is supposed to have said to Caesar Augustus, "It is pleasant and proper to be foolish once in a while." **GT**

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through your company's matching gift program

Georgia Tech alumni in each of the 115 companies listed here have participated in their company's matching gift program. Each company has an alumnus who has volunteered to act as the matching gift coordinator and rally support for **Georgia Tech's 52nd Roll Call**.

If you work for a matching gift company that matches an academic contribution to Georgia Tech, you can greatly increase the impact of your gift to Roll Call. Some companies match contributions dollar-for-dollar, while others will double, or even triple the amount of their employees' gifts.

The companies listed here led the way in raising over $1.48 million in matching gift funds during the 51st Roll Call. Several companies have up to 66 percent of their Georgia Tech alumni participating in their matching gift program. Working with your fellow alumni and your matching gift program, you too can make a positive difference in the future of Georgia Tech.

If your company is not listed here, you may still work for a company that will match your gift to the 52nd Roll Call. Please contact your company's human resources department to determine your company's matching gift policy. To locate your company coordinator, or to volunteer to become the matching gift coordinator at your company, please contact Brett Breen at the Georgia Tech Alumni Association.

Brett Breen, Matching Gift Program Coordinator
Georgia Tech Alumni Association
190 North Avenue
Atlanta, Georgia 30313
Telephone: (404) 894-0766
or 1-800-GTALUMS
e-mail: brett.breen@alumni.gatech.edu

For information updates on the 52nd Roll Call, please visit www.alumni.gatech.edu/Roll Call

Leading Matching Gift Companies

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Air Products & Chemicals
Alabama Power
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Alcoa
Allied-Signal
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Carolina Power & Light
Celanese Acetate
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Conoco
Cooper Industries
Coopers & Lybrand
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Delta Air Lines
Dow Chemical
Duke Energy Corporation
Eaton Corporation
Eli Lilly & Co.
Equitable Life
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Exxon
First Union
Florida Power & Light
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Ford Motor Company
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GTE
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Hewlett-Packard
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Lockheed Martin
Lucent Technologies
Mead Corporation
Merck & Co.
Merrill Lynch
Mobil
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Motorola
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Owens Corning
Oxford Industries
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Rayonier
Reynolds Metals
RJR Nabisco
Rohm & Haas
Rockwell
Sara Lee
Scientific-Atlanta
Shell Oil
Siemens
Southern Co. Services
Southern Nuclear Operating Co.
Sonat
Springs Industries
Square D
Suntrust Bank
Teledyne Brown Engineering
Texaco
Texas Instruments
Textron Systems Division
Trane Company
TRW
Union Camp
United Technologies
Unocal
UPS
Wachovia

And the **Winner** Is ...

Georgia Tech faculty members garner honors and academic recognitions

Zhang gets NSF, Beckman Awards

Dr. Z. John Zhang, an assistant professor in the School of Chemistry and Biochemistry, was named a Beckman Young Investigator by the Arnold and Mabel Beckman Foundation of Irvine, Calif.

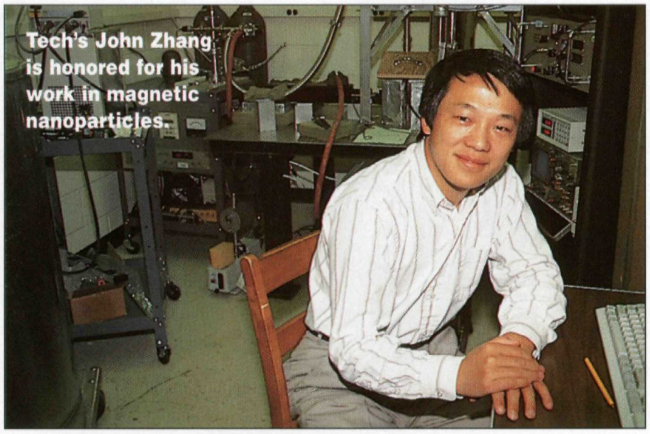
Earlier this year, the National Science Foundation awarded Zhang a Faculty Early Career Development award for his teaching activities and research work.

The Beckman Foundation makes grants to nonprofit research institutions to promote research in chemistry and the life sciences. The Beckman Young Investigators program provides research support to the most promising young faculty members in the early stages of their academic careers.

Out of 135 applications submitted, Dr. Zhang was one of 16 professors to receive a Beckman Young Investigator Award. He will receive $200,000 from the Foundation over the next two years—and $330,000 over four years from the NSF—for his teaching and research work on magnetic nanoparticles. He will attend the Beckman Young Investigator Symposium this August, where he will present posters representing his research project.

Dr. Zhang is a materials chemist who joined the faculty at Georgia Tech in 1996. He completed his postdoctoral studies at Harvard University and holds a doctorate from the University of Wisconsin-Madison. He earned his bachelor's degree in 1984 at Fudan University in China.

His current research focuses on the synthesis and characterization of magnetic metal oxides with an emphasis on controlling magnetic properties using crystal chemistry. Dr. Zhang seeks to understand and control the superparamagnetic relaxation of magnetic nanoparticles. His research is of great importance—the applications of magnetic nanoparticles include high-density information storage, contrast enhancement of magnetic resonance imaging (MRI), and magnetically guided drug delivery.



Tech's John Zhang is honored for his work in magnetic nanoparticles.

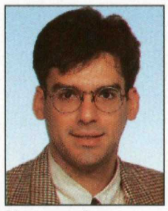
Shawn Jenkins

He is also exploring the applications of magnetic nanoparticles for environmental cleaning and the development of new environmental technologies for creating sustainable environments.

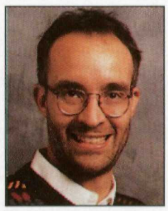
Two Tech scientists take Cottrell Awards

Two College of Sciences faculty members have been named Cottrell Scholars, making Georgia Tech one of only two U.S. universities with two Cottrell winners.

Dr. Rigoberto Hernandez of the Department of Chemistry and Biochemistry and Dr. Michael F. Schatz from the Department of Physics were among 18 winners nationally out of a field of 99 entrants. Each will receive $50,000 to further his research and teaching.



Hernandez



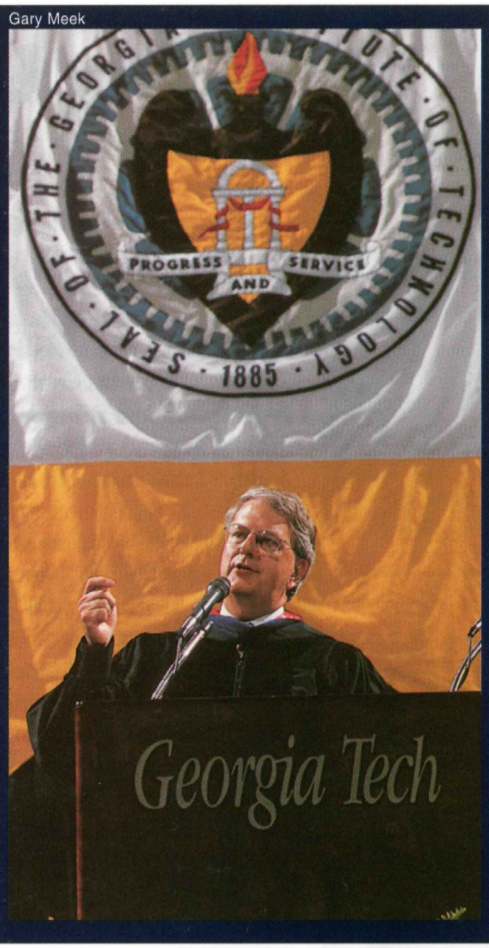
Schatz

Hernandez, who joined the Tech faculty in 1996, is a theoretical physical chemist whose fields of interest include chemical-reaction dynamics of polymerization and protein folding. He also is developing a new area of research to focus on polymer conductivity. The aim is to better understand the role of electron transport in polymer growth, important to molecular-design applications.

Schatz also joined the faculty in 1996, with research interests in experimental nonlinear dynamics, fluid dynamics and pattern formation in spatially extended systems. His Cottrell Award was for research and teaching initiatives centering on the study of the dynamics and control of complex, irregular behavior of patterns in fluid convection.

The Research Corp., based in Tucson, Ariz., makes the annual awards in honor of Frederick Gardner Cottrell, who established the company in 1912 as a philanthropic foundation dedicated to advancing science and technology.

Gary Meek



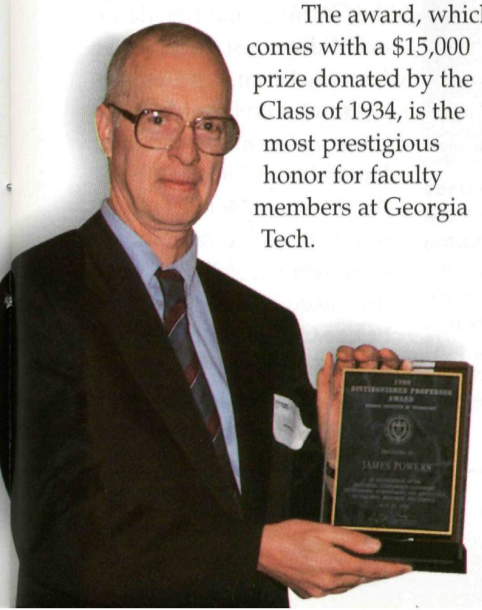
Time to Soar

More than 1,400 Georgia Tech students became alumni June 12, and commencement speaker Gov. Roy Barnes urged them to use their knowledge to help build a better Atlanta and a better Georgia. "What good are your degrees and all of the fine awards your class has stacked up if you cannot hear your city and state calling for your particular talents?" the Democratic governor asked. "The future of Georgia Tech and the rest of the state's educational system can only continue to soar if young people like you commit yourselves to its future. Now is the time for you to see education as something we can give as well as receive."

Powers Named Distinguished Professor

Dr. James Powers, a Regents' Professor in the School of Chemistry and Biochemistry, was honored for his achievements in the classroom and as a researcher with the Distinguished Professor award presented at the annual Faculty/Staff Honors Luncheon.

The award, which comes with a $15,000 prize donated by the Class of 1934, is the most prestigious honor for faculty members at Georgia Tech.



"Jim Powers is the 'founding father' of biochemistry at Georgia Tech," says President Wayne Clough. "His students, from undergraduates to post-doctoral fellows, are unanimous in reporting that he is uncompromising in his expectations of excellence, but at the same time deeply concerned that his students comprehend the material."

With a bachelor's from Wayne State University, and a doctorate from the Massachusetts Institute of Technology, Powers joined Tech in 1970 as the Institute's first biochemist.

His research has focused on the design and synthesis of protease inhibitors for use in treating diseases such as emphysema, arthritis and stroke.

Ramblin' 'Cross Campus

Bowled Over

Tech names for bowling leagues at the Student Center:

"Strike Force"
"High Rollers"
"Four Aces"
"The Screwballs"
"Bowling Impaired."

Getting Personal

A personal ad posted in the Electrical Engineering building:
"Earth-friendly housemates sought ... clothesline, composting, vegetarian/vegan cooking, selective flushing, demonstrating an alternative to the dominant, Earth-crushing culture."

STOP!

And we really mean it.

Considering the massive barricades, this traffic signal may seem unnecessary, but it's a sign of the times at Georgia Tech. Access to roads and parking on "The Hill" has been eliminated in the first phase of a plan to make the campus more pedestrian friendly. Plans call for more green space in the central campus, and moving all parking to perimeter lots. In time, Tech will become an oasis amid the concrete and bustle of a booming Atlanta.

Mean Musical Beat

When the *Technique* asked students to name favorite musical performers at Atlanta's annual festival, Music Midtown, accolades went to "Hole," "Soul Miner's Daughter," "98 Degrees," and junior Phil Zyryanov's vote for "that homeless dude down the street" banging on drums.

T-Week Grad Finale

Graduating seniors celebrate "getting out"

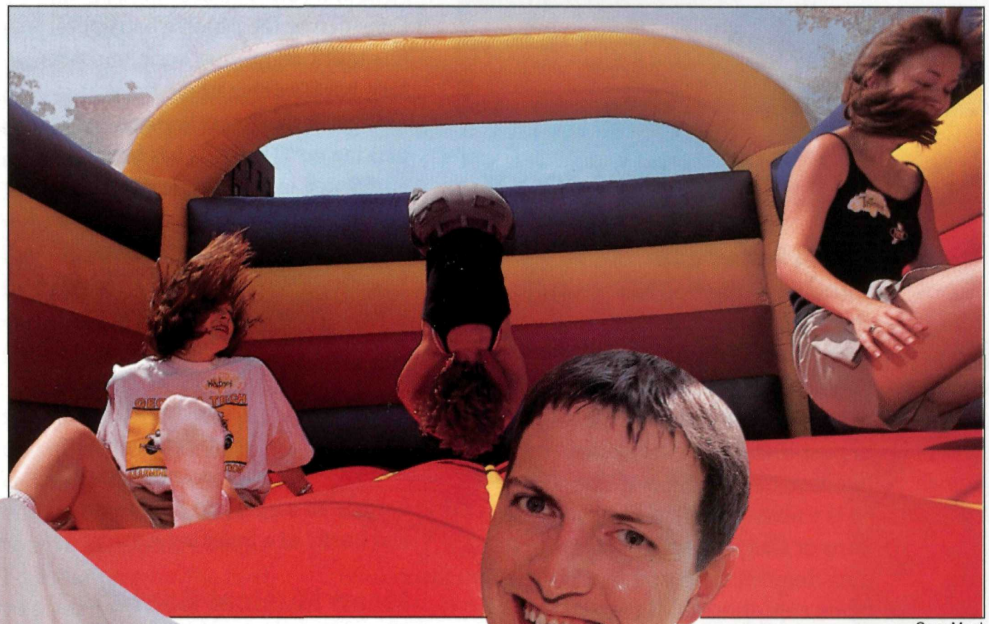
Gary Meek

Gary Meek

While everyone else was taking finals, graduating students enjoyed a week-long celebration—and helped establish one of Georgia Tech's newest traditions: T-Week.

Sponsored by the Georgia Tech Alumni Association, Ambassadors, Georgia Tech Student Foundation and Student Alumni Association, the week's festivities included receptions, seminars, workshops, cookouts, baseball—and most importantly, commencement.

"Our graduates attended seminars on everything from managing a 401K to mastering business-luncheon etiquette," says Lisa Nickel, director of student relations for the Alumni Association.



Gary Meek

Graduating senior James Billingsley shows off the T-shirt he received during T-Week. Whether his wide grin is for the shirt or just "getting out" remains a mystery.

Tech's New

Career Diplomat

John H. Kelly, a former U.S. ambassador and assistant secretary of state for the Near East and South Asia, will join Georgia Tech's Center for International Strategy, Technology and Policy as an adjunct senior research associate.

Kelly will also act as a resource for the Sam Nunn School of International Affairs and support the center initiative to create a limited nuclear-weapons-free zone for Northeast Asia and other cooperative regional security programs.

"John brings his extensive diplomatic experience and contacts to Georgia Tech," says John E. Endicott, director of the Center for International Strategy, Technology and Policy and professor at the Sam Nunn School.

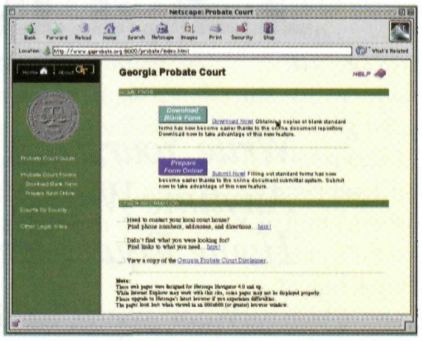
Kelly was U.S. ambassador in Beirut, Lebanon, from 1986 to 1988. He was assistant secretary of state for the Near East and South Asia from 1989 to 1991, during the Gulf War and the Madrid Middle East Peace Conference. A four-time deputy assistant secretary of state, he served as ambassador in Finland from 1991 to 1994. An American delegate to a number of arms limitation negotiations, Kelly has testified more than 20 times before Congress and has appeared on "Meet the Press," the "Today Show," CNN, C-Span and the BBC.

Judge This

Tech students launch probate court Web site

By Elizabeth Campbell

Georgians finding their dealings with the Probate Court easier these days have 42 Georgia Tech computer-science students to thank. The students worked more than 9,000 hours over six academic quarters to develop a Probate Court Web site for filing court forms.



The Web site was launched for public use May 26 for activities related to estates and guardianship of minors or incapacitated adults.

The Probate Court project began in January 1998 when students in a Senior Design class in the College of Computing were assigned a project that included the definition, design, implementation, testing and documentation of a significant software system. The capstone course integrates and applies the computing knowledge seniors have gained to a real-world project with real customers.

"The Probate Court project was intensive but a great way to put all my classes together in one project," says Chris Monahon, a 1999 graduate currently working at MicroStrategy.

Leo Mark, an associate professor in the College of Computing, and Lisa Sills, a senior research scientist in the Georgia Tech Research Institute, collaborated to have the court project become the senior project for Mark's class. Sills is the program manager for the Georgia courts program.

Tech has worked with the Georgia Courts Automation Commission since 1996 to create a computer system for the Superior Court.

The Probate Court project integrates a Web-based interface with a database, is designed for scalability and supports 55 standard forms used by the Georgia Probate Court. Sills and Mark say it is the only online probate court system of its kind in the nation.

"The probate system uses the most advanced technology," Mark says. "My students were able to deliver a large, complex project. Traditionally, students in this class complete small projects for internal campus clients. This undertaking raised the bar substantially."

Due to the need for confidentiality and security, the Probate forms completed online must be filled out in one session and submitted. A system that would allow visitors to complete part of a form at a time would require much higher security measures such as individual passwords, Mark says.

Judge Floyd Propst of the Fulton County Probate Court acted as the primary client contact. He reviewed templates, suggested changes, and provided information and feedback the students needed.

"I am very pleased with the end result of this project," Propst explains. "The students were great to work with. This system will definitely help Fulton County's Probate Court increase its efficiency, and I'm glad other counties will be participating as well."

To see the Georgia Probate Court Web site, go to **www.gaprobate.org**.

Elizabeth Campbell is a writer in the Institute Communications and Public Affairs office.

North Ave. **Almanac**

75 Years Ago • It was the night the lights went *on* in Georgia. Tech students under the direction of a professor installed 20 outdoor lamps to brighten "the flats" in the summer of 1924. The lights were of the latest design, with glassware that made all the lights shine downward only.

50 Years Ago • ANAK alumni and students, as well as members of the Georgia Tech Band, unveiled a monument in memory of Frank "Wop" Roman, the longtime band director at Tech. Dean George Griffin presided over the ceremonies at Atlanta's Greenwood Cemetery. As part of the ceremony, eulogist Harry Siegel, CIs '26, presented Tech with the original compositions of Roman's "Alma Mater" and his orchestration of "Ramblin' Wreck."

25 Years Ago • In 1974, the energy crisis was causing lines at gas pumps and forcing change in the American auto industry. But at Tech it had an unexpected effect. Civil engineering Professor Paul Wright blamed a huge increase in bicycle accidents on the energy problem.

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Funding **Finest** Faculty

Campaign helps strengthen faculty in increasingly competitive environment

Julius L. Brown may not be as big a name on campus as the Ramblin' Wreck or Buzz, but Brown's legacy has had an impact on the Institute that goes far beyond the original gift that bears his name.

Georgia Tech created its first endowed chair in 1910 and named it for Brown, an Atlanta attorney and son of a Georgia governor, who left two-thirds of his estate to the Institute. Originally structured as a single chair, the endowment was later divided to create two Julius L. Brown Chairs, one in the School of Chemistry and Biochemistry, and another in the School of Electrical and Computer Engineering

That pioneering example is an integral part of the Campaign for Georgia Tech, which includes funding for faculty-support programs, such as endowed chairs, junior-faculty awards, visiting-faculty programs and faculty-development grants.

To date, 32 endowed chairs have been funded through the campaign. The minimum funding level for an endowed chair is $1.5 million.

"A great university cannot advance and mature without continually recruiting the finest faculty, and strengthening the skills of current faculty within the campus," says Provost and Vice President for Academic Affairs Michael E. Thomas. "High-quality faculty not only provide the best educational experience for students, but also attract recognition from key supporters and observers."

To keep their finest scholars and teachers over the long term, universities must offer specific programs that allow their most accomplished faculty to continue to grow and challenge themselves. This is most often done through endowments and awards that enable faculty to pursue areas of research interest that excite and motivate them. Consequently, the challenge for institutions of higher learning lies in the ongoing search for new ways to fund such programs.

The current beneficiaries of Tech's faculty support programs are keenly aware of the flexibility and critical resources that such programs provide.

"My endowed chair has provided me with a rapid-response mechanism for dealing with the unforeseen and the unexpected," says William L. Chameides, Charles A. Smithgall Jr. Chair in Atmospheric Science and Regents' Professor in the School of Earth and Atmospheric Sciences. "In my field of research, the atmosphere is our laboratory. Our experiments occur outdoors—sometimes as close to home as Atlanta, other times as far away as China. During these experiments, people and equipment are committed for a specified period of time, and only that time.

"If an instrument malfunctions, you do not have the option of trying the experiment next week. In these situations, the funds from an endowed chair can mean the difference between success and failure."

Faculty-support programs, such as endowed chairs held by Chameides and other prominent Tech faculty, have become increasingly crucial in recent years as competition for the nation's brightest scholarly stars has heated up. Such programs give Tech administrators the ability to provide top scholars with the environment and the resources they need. **GT**

Endowed Campaign Chairs ... **32 and Counting**

Dean's Chair
John P. Imlay Chair in Computing

School Chair
H. Milton and Carolyn J. Stewart Chair in Industrial and Systems Engineering

Institute Chair
Charles A. Smithgall Jr. Institute Chair (2)

Faculty Chairs
Gilbert F. Amelio Chair in Physics
Anderson-Interface Chair of Natural Systems
Arbutus Chair in Digital Design
Margaret T. and Henry C. Bourne Chair in Poetry
John H. Burson III Chair in Biomedicine
Hercules-Gossage Chair in Chemical Engineering
Lawrence P. Huang Chair in Engineering Entrepreneurship
HUSCO/Ramirez Chair in Fluid Power Systems
William W. LaRoche Jr. Chair in Chemical Engineering
Manhattan Associates Chair in Supply Chain Management
H. Bruce McEver Visiting Chair in Writing
Tedd Munchak Chair in Entrepreneurship
Carter N. Paden Jr. Distringuished Chair in Metals Processing
Glen P. Robinson Chair in Electro-Optics
Glen P. Robinson Chair in Nonlinear Science
Frederick G. Storey Chair in Computing
Harry and Linda Teasley Chair in Environmental Biology
Elizabeth Smithgall Watts Chair in Behavioral and Animal Conservation
James and Mary Wesley Chair for New Media Studies
Harry West Chair in Quality Growth and Regional Development

Georgia Research Alliance Chairs
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Lawrence L. Gellerstedt Jr. Chair in Bioengineering
Georgia Power Chair in Air Quality
Price Gilbert Jr. Chair in Tissue Engineering
Roberto C. Goizueta Chair in Chemical Engineering
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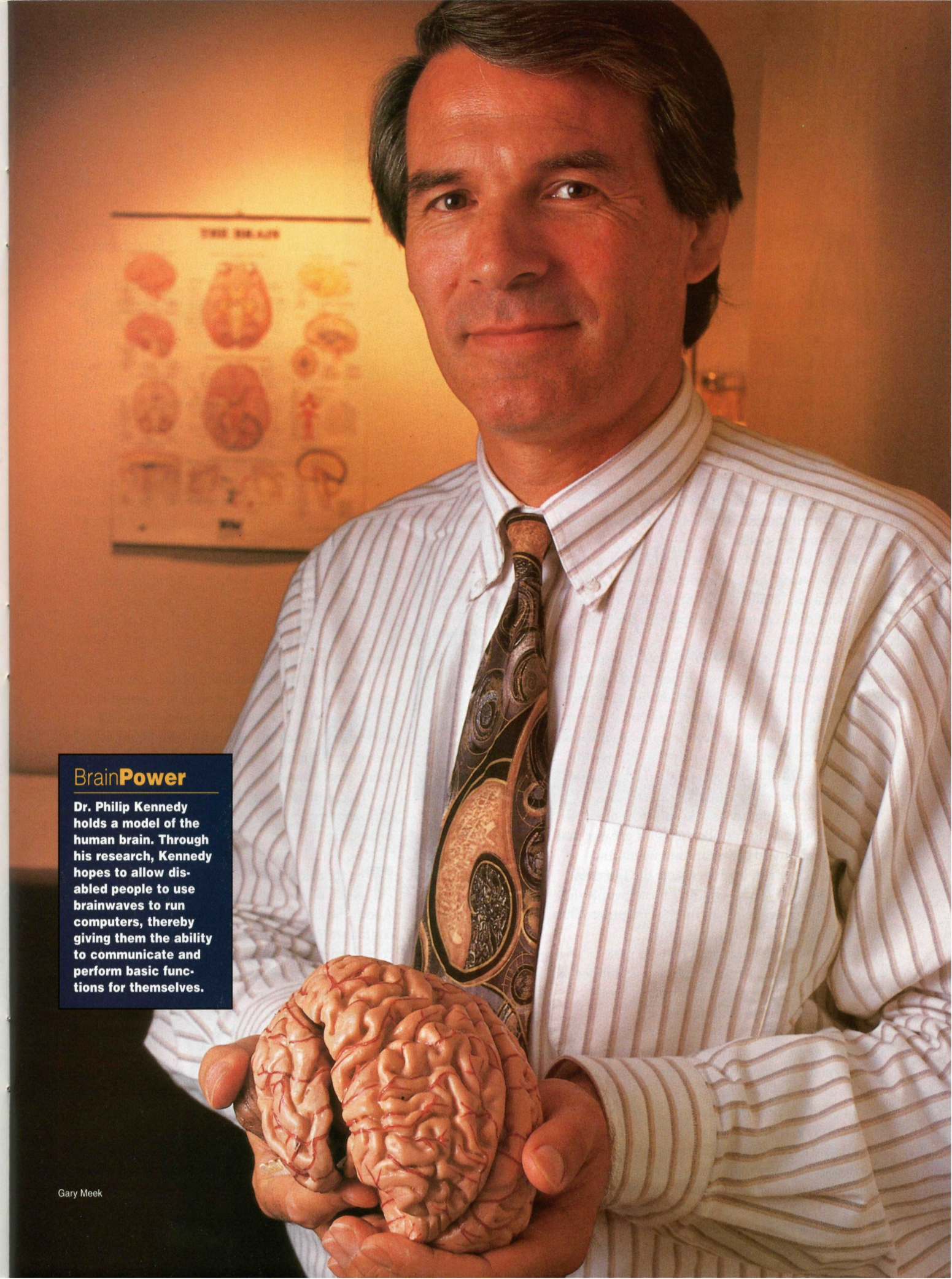
Georgia Tech research aids direct brain-computer interaction

By Gary Goettling

Harnessing the Power of Thought

In a classic "Star Trek" episode, Mr. Spock's brain is implanted with devices that allow remote control-by-thought of the master computer regulating life-support systems in the underground world of Sigma Dracona 6. ■ *"It's not possible!" Dr. "Bones" McCoy exclaims with breathless skeptical awe.* ■ *Apparently, the 23rd-century chief medical officer was unaware of Dr. Philip R. Kennedy's pioneering work at Georgia Tech in the 20th century.* ■ *Kennedy, a clinical assistant professor of neurology at Emory, leads a research project he started 13 years ago while working as a neural prosthetics researcher at Tech. His idea is that the brain's electrical signals can be recorded and amplified to efficiently operate a computer.* ■ *Through the combination of a "neurotrophic electrode" invented by Kennedy while at Tech, customized microelectronics and software applications, the brain's neural signals become, in effect, a computer mouse to move a cursor and select icons on the screen—a computer system controlled by the power of thought.* ■ *"It's actually not very high-tech," says Kennedy. "One thing that has made it possible is that small computers can do so much. It's amazing what they can do."*

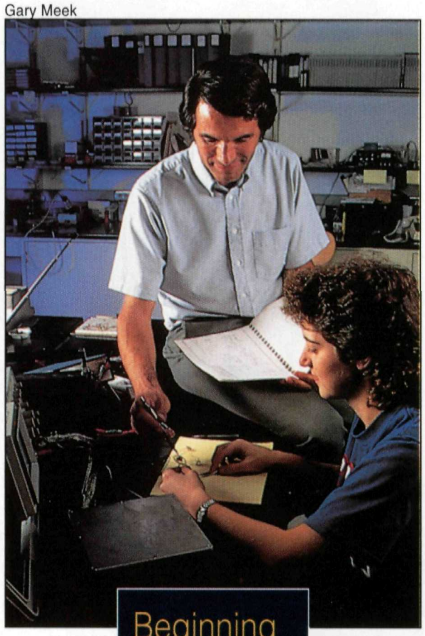


Brain**Power**

Dr. Philip Kennedy holds a model of the human brain. Through his research, Kennedy hopes to allow disabled people to use brainwaves to run computers, thereby giving them the ability to communicate and perform basic functions for themselves.

Gary Meek

Gary Meek



At Emory University Hospital, Kennedy and Dr. Roy A. E. Bakay, a professor of neurosurgery at Emory and Kennedy's principal co-researcher, are preparing for their third clinical human trial. A pair of the patented electrodes will be surgically implanted inside the brain of a patient identified only as "T.T." Several weeks later, T.T. will be linked to the other components in the system.

Doctors Kennedy and Bakay won't know if the electrodes will perform as expected until the end of summer, but they have ample reason for optimism.

While computers have been helping paralysis victims for years through various kinds of adaptive interfaces, Kennedy's project is the first to establish a direct connection between the brain and a computer.

The collaborative, multi-disciplinary effort involves researchers at Tech, Emory and Georgia State. Their short-term goal is to devise new and more efficient means of human-computer interaction, thereby opening a communications window to the outside world for severely paralyzed individuals. Eventually the technology could enable many other interactive functions as well.

For victims of paralysis, the ability to manipulate a computer holds implications far greater than the simple ability to communicate wants and needs. "You can run businesses off the Internet," Kennedy says. "So why couldn't these people do that? All they have to do is run the computer. The technology opens up that possibility."

Kennedy is also convinced that his neurotrophic electrode portends many possibilities of its own, including operating complex robotic prosthetics or muscle stimulators.

A native of County Limerick, Ireland, Kennedy earned a medical degree at the National University of Ireland and trained as a surgeon in Dublin. In 1976, he emigrated to Canada to study neurosurgery, then moved to Chicago and earned a doctorate at Northwestern, studying neurophysiology and neuroanatomy. A naturalized U.S. citizen, Kennedy joined Georgia Tech in 1986 as a research scientist, when he also started developing his neurotrophic electrode.

From 1990 to 1997, he served as director of Tech's Neuroscience Laboratory. For the past two years Kennedy has divided his time among a private neurology practice and his research, the latter facilitated by an affiliation with Emory's School of Medicine.

Beginning **Research**

While a professor at Georgia Tech, Kennedy began exploring ways to use computers to harness brainwaves. Advances in computer miniaturization have made possible much of his progress over the years.

Kennedy and his co-researchers must be very selective for the human trials. "This will not help people in a coma," Kennedy explains. "People have to be cognitively intact and know what's going on, but be unable to communicate." The best candidates at this stage of the experiment are individuals with amyotrophic lateral sclerosis—ALS, also known as Lou Gehrig's disease—or those with high brain stem or high spinal cord injuries, or patients with advanced degenerative muscle disease, he says.

The latest patient has been bedridden for the past four years and in a severely weakened state for the past 10. The metabolic muscle disease afflicting T.T. has left him with only slight eye movement left and right, and slight head movement, says Kennedy.

"His brain is not affected," Kennedy adds, "and that makes him a good candidate for the procedure."

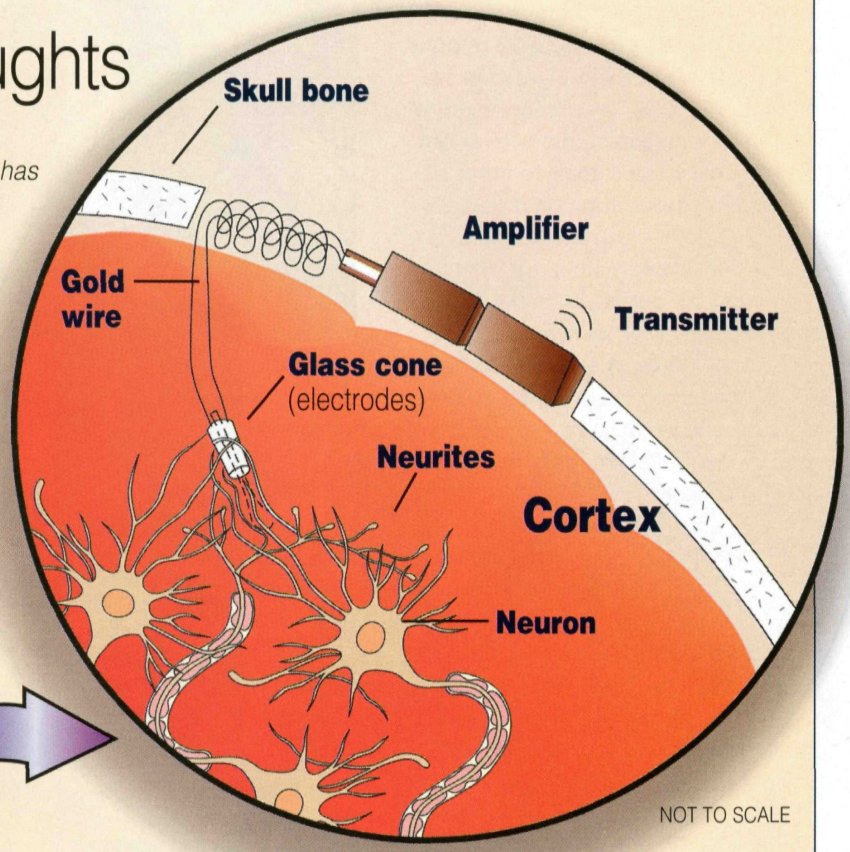
The technique's key component is the hollow glass, cone-shaped neurotrophic electrode. About the size of a ballpoint pen tip, the device contains a pair of microscopic gold wires and is coated with a biocompatible substance. That coating encourages neurites—tentacle-like structures extending from neurons—to migrate into the electrode, thereby ensuring a solid electrical connection and holding the device firmly in place.

Electrical signals traveling across the local cells pass through the electrode, which relays the impulses to a tiny amplifier and transmitter inserted just under the scalp. Those signals, in turn, are broadcast to a computer, where a special interface translates the signals to cursor movement.

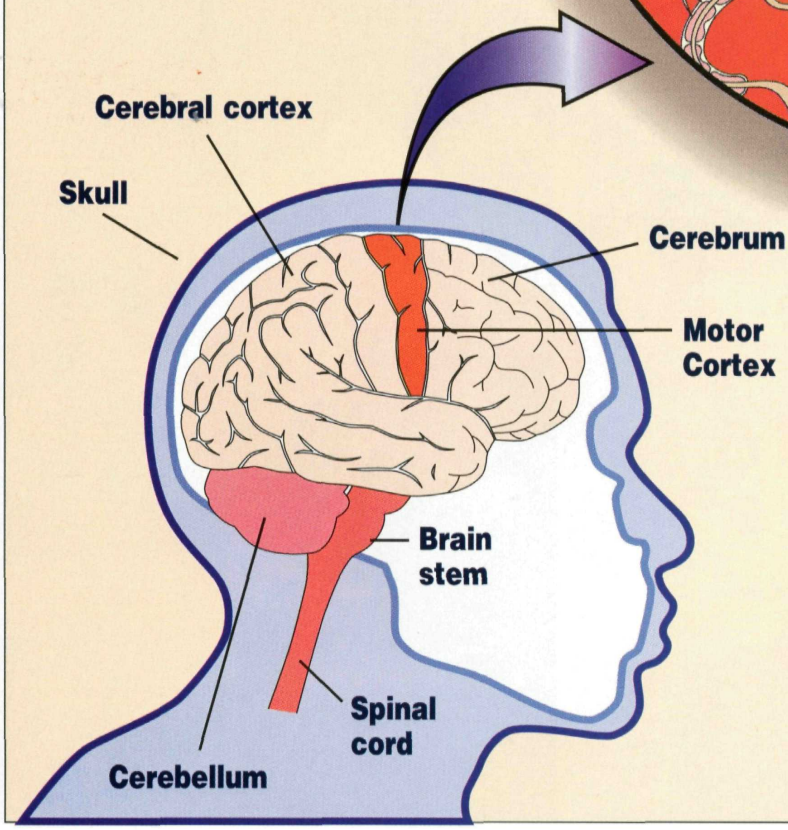
Two electrodes are employed because basic

Capturing Thoughts

A paralyzed stroke victim named Johnny Ray has learned to use thoughts to control a computer cursor via electrodes implanted in his brain.



1 The electrodes (two gold wires attached to a hollow glass tube about the size of a ballpoint pen's tip) were implanted in the motor cortex, where cells controlling various muscle groups lie. Normally, movement begins when neurons in the motor cortex fire.



2 The microscopic tentacles of neurons, called neurites, have wrapped in and around the electrodes. When Ray imagines certain kinds of movement, the electrodes pick up the signals emitted from firing neutrons.

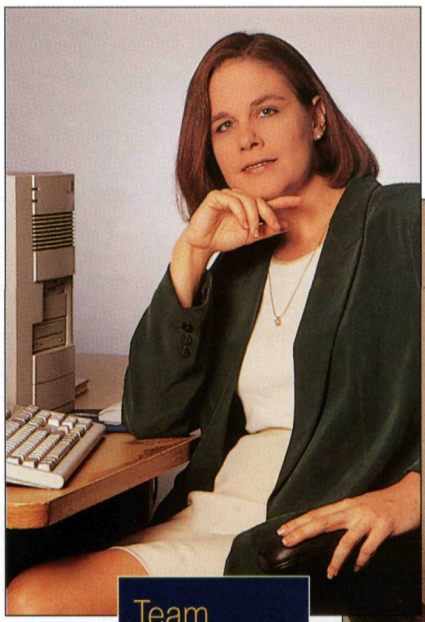
3 The signals are amplified and transmitted to the computer, which translates them into cursor movements.

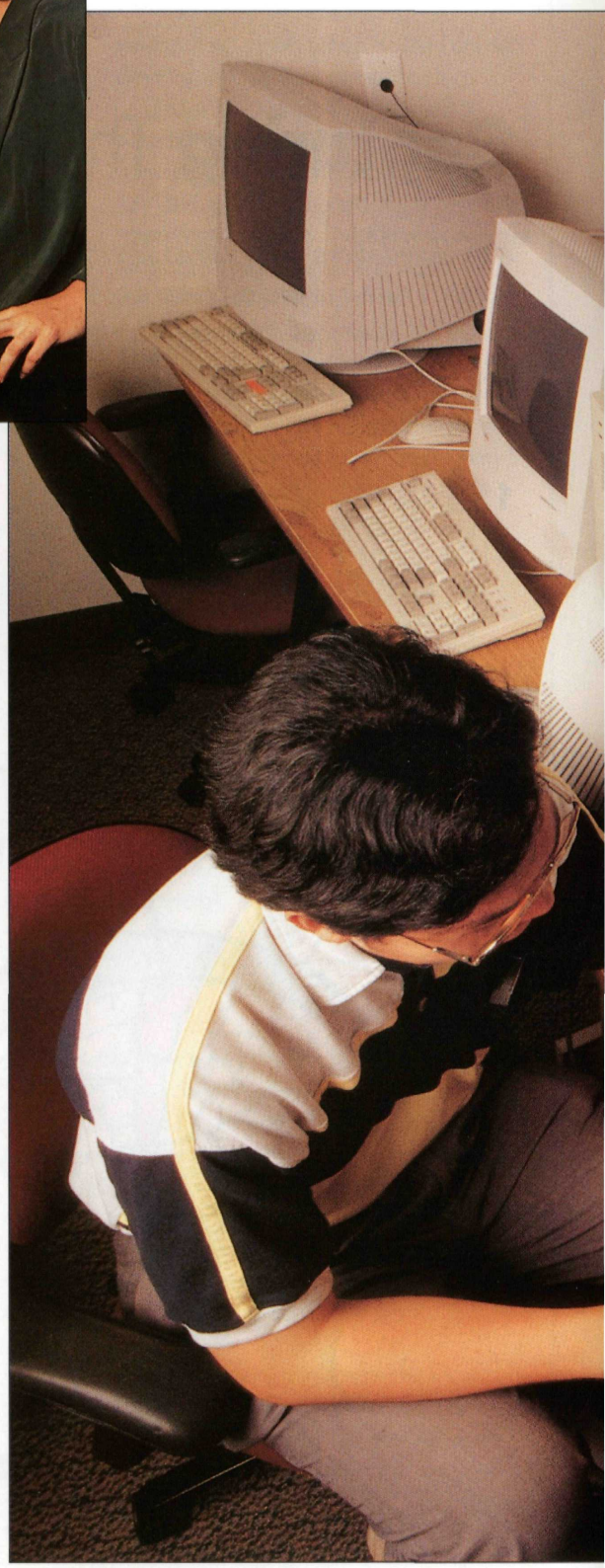
The Washington Post illustration by John Anderson

computer operation is a two-step process. The first requires moving a cursor among a number of options; the second involves selecting one of those options.

If the electrode is implanted in the motor cortex in an area associated with, say, finger movement, the patient can generate electrical signals to move the cursor by concentrating on moving a finger. Another electrode, implanted in an area associated with a different kind of movement, can facilitate the computer's "select" function.

Because the location of movement-specific cells vary from person to person, a magnetic resonance imaging scan performed prior to implantation helps identify the best location for the electrodes.





Team **Work**

Georgia State Professor Melody Moore and a team of her computer students have written programs that help stroke victim Johnny Ray communicate via electrodes connected to his brain. "We are actually having conversations with him," she says.

The implant has been tested on humans twice before. The first patient, a woman suffering from ALS, died from the disease 77 days after surgery and before she could master the computer-control technique. The second patient, who received an implant last spring, achieved a place in medical history—and continues to amaze his doctors and family.

Johnny Ray, a 53-year-old paralyzed stroke victim at the Veterans Administration Hospital in Decatur, Ga., became the first human to communicate via a computer controlled only by his brain power.

F-I-V-E.

That simple word may never achieve the legend of "Come here, Mr. Watson, I need you," but it went a long way to vindicate Kennedy's determined effort. It was Ray's response to the question: How many children do you have? By focusing his thoughts to control the cursor, Ray spelled out the correct answer using a virtual keyboard displayed on the computer monitor. He then carefully, painstakingly, spelled out each of his children's names.

The breakthrough followed several months of trial and error as Ray learned which imagined movements best controlled the cursor, says Dr. Melody Moore, MS ICS '88, Ph.D. CS '98, an assistant professor in the Computer Information Systems Department at Georgia State who is helping

Caroline Joe Photos

Caroline Joe Photos

New Technology

Tech research engineers Andy Hopper *(left)* and Barry Sudduth built the electronics that interface with the electrodes implanted in Johnny Ray's brain. They are among a number of Tech researchers involved in Kennedy's project.

Ray learn to manipulate the computer.

"Project manager" is probably the best overall description of Moore's role, which started about 18 months ago while she was pursuing her doctorate and teaching software engineering at Tech's College of Computing. She still works with students at Tech, and involves both them and her GSU students in the research.

"My students wrote a communications program that allows him to choose an icon that stands for critical phrases like, 'I'm too cold' or 'I need the nurse,'" says Moore. "By selecting one button, he can communicate a whole phrase instead of having to spell everything out."

As Ray's proficiency has increased, so has the sophistication of the communication, says Moore.

"We're actually having conversations with him," she explains. "Instead of asking him to spell Phil or Mel, we're asking things like, 'What's the best book you've read? What's your favorite movie?' He moves the cursor around and selects the letters to go into a writing program, and then he's able to speak them because we added a voice synthesizer.

"He's definitely improving. It's such a thrill for all of us, and it has improved his motivation, too."

Ray may soon begin navigating the Web with a browser built by Moore and her students especially for him. The group is also perfecting a virtual "dart game" to help future patients learn to control the cursor, and analysis software to track the learning curves of patients.

"We're trying everything we can think of," Moore says. "Nobody's ever done this before—this is a totally new area. It's definitely cutting-edge, very futuristic technology—but the neatest thing about it is that it works."

Ray's recent progress is all the more gratifying because it follows a long period of health troubles.

"Anybody with a complete paralysis has health problems, but they are exacerbated by things like skin problems, bed sores and infections," Moore explains. "Sometimes it's hard to work with him because he's on so many painkillers, the brain signals don't happen. But lately he's been feeling better; he's off the ventilator, and he is really doing well."

In addition to Moore, several other Georgia Tech researchers provide extensive and ongoing contributions as the system is refined.

Andy Hopper and Barry Sudduth, research engineers at the Biomedical Interactive Tech Center, built the electronics that interface with the electrode.

"We have recently changed the design of the electronics from surface-mount components that were soldered to each other to a more robust PC board-based design using surface-mount components," says Hopper.

At the Center for Rehabilitation Technology, graduate student Kim Adams and research scientist John Goldthwaite have provided valuable though unofficial assistance.

"We're trying to help with the rehab engineering part—technical equipment, assisted technology, recommending software and things like that," Goldthwaite says, adding that he hopes the center can take a more active role in the future.

"We're trying to stay in it, but we don't have the funding to participate as much as we'd like to," he explains. "At some point, we would like to work with the patients and help them use computer-based augmented communications."

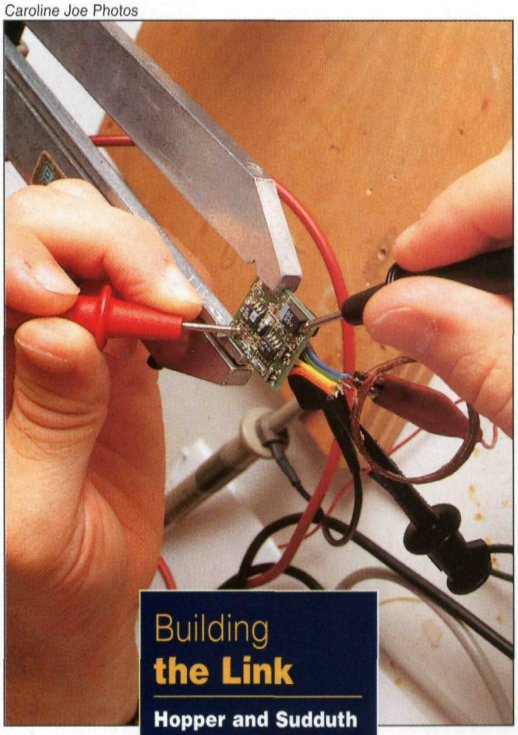
Also, Dr. Steven Sharpe and Neal Hollenbeck of the Georgia Tech Research Institute were deeply involved in the early work to develop a telemetry device for transmitting brain signals to a receiver.

Johnny Ray's electrode implant and subsequent direct brain-computer interaction have brought world-wide media coverage to the research. Kennedy's assessment of his new-found fame is mixed.

On the down side, the attention "puts incredible pressure on me," he says. "I still have to make a living in my neurology practice, and yet I feel more pressure to do more work on my research."

On the other hand, ongoing funding needs may be mitigated as a result of the publicity the project receives. In May, Kennedy received the Health

Caroline Joe Photos



Building the Link

Hopper and Sudduth recently changed the design of the electronics to a "more robust PC board-based design using surface-mount components."

Care Heroes Award for Innovation presented by the *Atlanta Business Chronicle*. And though the prize did not come with a cash award, "it did include a very nice punch bowl," says Moore.

For all its promise, Kennedy's research has been beset with frustrating funding problems throughout its history. At one point several years ago, when Kennedy was making the transition from basic research to application of his electrode, there were fears the work would have to be put on hold for lack of money.

With typical determination, he decided to raise research money by obtaining dollar pledges for each mile he ran in the Atlanta Track Club's Thanksgiving Day Marathon. The Georgia Tech Research Corp. matched the pledges.

The National Institutes of Health provided a grant for his first three human trials, but that support does not extend beyond T.T.'s implantation.

"The technique works, and I knew it would work," Kennedy says. "But it's hard to persuade people because everyone's going a different way" with respect to assistive computer technology.

Holding up Johnny Ray as an example, Kennedy notes that 14 months after implantation, "We're still getting strong signals—and that's incredible, very hopeful."

Various grant proposals are in the hopper, and while there's nothing concrete to report yet, Kennedy remains determined.

"I'm never going to give up." **GT**

Gary Goettling is a freelance science and technology writer in Tucker, Ga.

Kennedy Tops Category for Discover Award

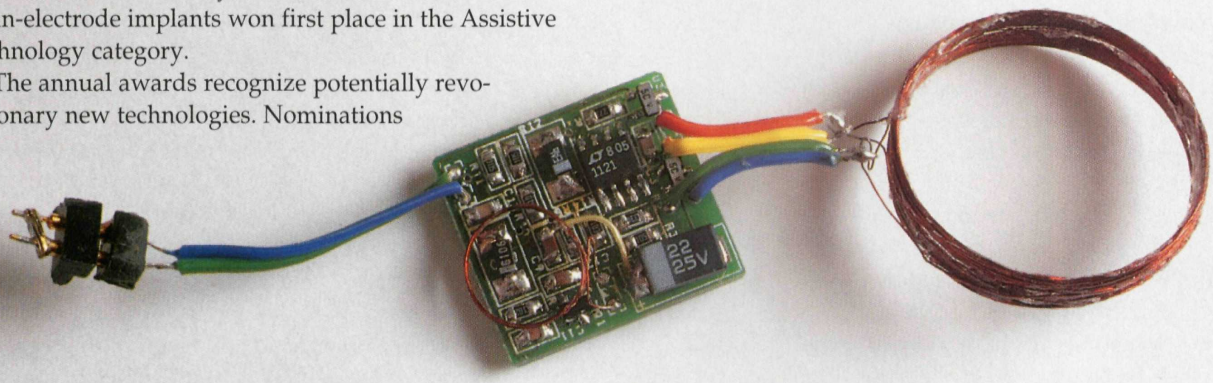
Dr. Phillip Kennedy flew to Florida with high hopes. And though he didn't return to Atlanta with $100,000 for his research, at least he brought home a crystal sculpture from Tiffany's.

The occasion was the announcement of winners of the 1999 *Discover* Magazine Awards for Technological Innovation. Billed as a "gala Academy Awards-style televised ceremony," the event was held June 5 at Epcot Center in Orlando, Fla. Kennedy's futuristic work in brain-electrode implants won first place in the Assistive Technology category.

The annual awards recognize potentially revolutionary new technologies. Nominations are solicited by the *Discover* staff from among universities and research institutions across the country. An independent panel of experts selects the winners in each category.

This year, 27 finalists in nine categories vied for honors and in particular for a $100,000 grand prize.

Kennedy's work and that of the other award finalists will be featured in the July edition of *Discover* magazine.



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Biltmore **Rebuilt**

After 16 years as a tarnished hulk overlooking Georgia Tech, the Biltmore shines with a new luster and a new life

By Hoyt Coffee

Photos by Caroline Joe

Just my connection to Georgia Tech was enough to want to see the Biltmore saved," says developer James Borders, ME '83. "We had fraternity parties here. Lots of people—just about everybody who went to Tech before 1982—went to the Biltmore at some time."

The massive brick edifice has loomed over Georgia Tech for 75 years, a witness to Tech history from the first Homecoming luncheon in 1924 to the last fraternity party before it went dark in 1982, a victim of age and corporate neglect.

Today, the boarded-up windows, playbills and graffiti are gone. Plumes of soot left by homeless denizens trying to keep warm are washed away, and the Biltmore is draped in newly refreshed finery right up to its neon beacons.

In what *Atlanta Journal-Constitution* visual-arts critic Catherine Fox called a "preservation coup," the gleaming Tennessee marble and plaster relief of the first-floor ballrooms and the ornate exterior were saved the inelegant fate of other grand Atlanta hotels of the period by James R. Borders, president of Novare Group.

"Just my connection to Georgia Tech was enough to want to see the Biltmore saved," says Borders, ME '83. "We had fraternity parties here. Lots of people—just about everybody who went to Tech before 1982—went to the Biltmore at some time."

The practical businessman in Borders also saw the "value in the beautiful facade and ballrooms."

"We were already in the business of adaptive reuse," he notes, pointing out that Novare was responsible for Peachtree Lofts in Midtown, the Metropolitan and the Renaissance Lofts downtown. "We felt sure we could tackle it, so we just started charging up the hill, and here we are."

By the June 4 grand opening, the Biltmore's new office space was 25 percent leased, with AGL Resources—the parent firm of Atlanta Gas Light—set to take over the penthouse that housed WSB radio for many years, explaining the landmark twin towers atop the building. And 120 events had already been booked for the ballrooms.

Several floors of the building were still under construction for new office tenants.

A Grande Old Dame

When built in 1924—the brainchild of Coca-Cola heir William Candler, who had the insight to view Atlanta as a convention destination—the 600-room, neo-Georgian hotel was considered the city's most opulent hostelry. Columned porticoes opened into a lobby populated with classic statuary and a circular marble staircase.

Noting the tableau of mythological figures in the Georgian Ballroom, an Atlanta Journal correspondent called it a "veritable Pantheon to the Goddess Terpsichore," the Greek muse of dancing and choral song.

Advertising in the *Georgia Tech Alumnus* touted the Biltmore as "The South's Supreme Hotel" and lauded its rooms with "circulating ice water and private bath." In its time the Biltmore played host to the likes of Charles Lindbergh, Franklin D. Roosevelt and Dwight Eisenhower.

Candler ran the hotel until his death in an automobile accident in 1936, when his wife took over the business. She sold it to Sheraton in 1967, which made improvements but sold the property for a loss in 1979 to a Canadian group. It was closed to all but the prowling homeless in 1982.

Other attempts to recover the classic building failed. Swedish developer G. Lars Gullstedt wanted to make it the centerpiece of a new Midtown complex, but he went bankrupt. And a plan to turn it into apartments by Frank Howington, who redeveloped the Georgian Terrace, never materialized.

Then Borders' company bought the building about two years ago for $10 million, and picked up the Biltmore House high-rise apartment building next to it—which is being converted to condominiums—for $5 million in January. The purchase

Architect Jim Winer *(left)* and developer James Borders brought ornate beauty and practical usefulness back to the grand Biltmore.

Lake County (IL) Museum, Curt Teich Post Card Archives

Advertising in the *Georgia Tech Alumnus* touted the Biltmore as "The South's Supreme Hotel" and lauded its rooms with "circulating ice water and private bath." In its time, the Biltmore played host to the likes of Charles Lindbergh, Franklin D. Roosevelt and Dwight Eisenhower.

included a parking deck on the building's east side, a 15,000-square-foot exhibition hall and property to the north for additional parking and future development.

Since then, Novare has poured millions more into the project, not only saving a piece of Atlanta history, but creating a home for new technology-based business.

From Basement to Towers

The first job was cleaning up after previous attempts to make the Biltmore useful once again. "We took lots of debris away from this place," Borders says. "A previous renovation effort on the arcade level had resulted in lots of debris in the basement. They just cut a big hole in the floor and shoved all the debris into the basement.

"We took all of that out, and we took out just miles of HVAC duct and pipe and really spent a lot of time just cleaning the old systems out of the building. Then, of course, we went in with entirely new electrical systems, HVAC, plumbing, you name it. Everything except the concrete."

Demolition of much of the interior space cleared the way for reconfiguring everything but the grand ballrooms for office space. Borders decided to save the ballrooms for their historical significance and beauty.

Heavily damaged by age, the elements and intruders, the Georgian and Imperial ballrooms needed extensive work, says Jim Winer of Menefee and Winer, the lead architecture firm in a partnership that oversaw the project. Repairing the partially collapsed 22-foot ceilings meant searching for workers with a talent long out of the mainstream. Plasterers in their 60s and 70s were located and brought in to replicate the intricate plaster moldings embellishing the ballrooms.

Additionally, the gilded rosettes on the ceilings were refurbished, and the massive chandeliers were brought out of storage and refitted. Because of the project's complexity and varied scope, Winer's firm had to do more than the usual drawings, contract administra-

We also assisted the owner in finding and working with specialty contractors," says Jim Winer, Arch '83, M Arch '85, son of Tech's mechanical engineering Chair Ward Winer. "There were about 10 of them. The major people were the window contractors, the plaster restoration and specialty or decorative painting contractors."

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"We also assisted the owner in finding and working with specialty contractors," says Winer, Arch '83, M Arch '85, son of Tech's mechanical engineering Chair Ward Winer. "There were about 10 of them. The major people were the window contractors, the plaster restoration and specialty or decorative painting contractors.

"We also hired the major consultants—the civil engineer, the mechanical engineer, the electrical engineer and the structural engineer. They all worked directly under contract with us—with the joint venture."

While the ballrooms provided a showcase worth saving, repairing the plaster in the rest of the building for office space was not practical.

"All throughout the hotel the plaster was in very bad shape," Borders says. "We made the decision that except for the ballrooms, we weren't going to try and restore any plaster in the rest of the building."

On the exterior, the glass-enclosed portico on the Biltmore's west side was returned to its original configuration, as was the courtyard on the east side—a part of the complex many people never knew existed—but important to Borders. He's moving into one of the condominiums with a stunning view.

"We're very excited about moving in there, and the courtyard is incredible. Our third floor balcony looks out over that courtyard, and it's very exciting to go out there."

Technology, Technology, Technology

What the upper floors did get is a heavy dose of high tech, to make the speculative space attractive to technology companies wanting a site near Georgia Tech—and near the land along Fifth Street that the Institute would like to use for campus expansion in the form of an executive- and continuing-education and conference center. Another plus is the growing development of a "Peachtree Corridor" of high-tech firms such as MindSpring in the Midtown area.

"I believe that the Biltmore will be at least 50 percent technology-oriented tenants, and I also believe that there will be a high-tech campus that's developed between the Biltmore and Georgia Tech, in addition to the hotel and conference center that we all hope happens," Borders says. In preparation for that outcome, the Biltmore renovation includes extreme attention to technological detail.

"We have fiber in the building, and we've got two separate phone risers," Borders says. "Telephones are coming in the building in two different places for some redundancy because a lot of the tenants here are very dependent on Internet and telephone. BellSouth is the primary provider in this area, and they're building 1.1 million square feet next door.

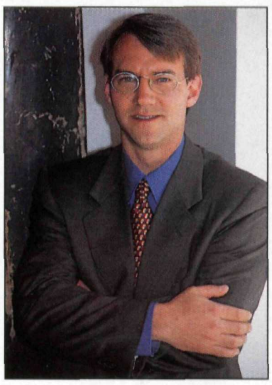
"And we have a third-party provider called Cypress Communications that also does phone systems and high-speed Internet access. Cypress will actually have a person on site. If your Internet goes down, somebody's there in five minutes to figure out what the problem is."

With the build-out complete through the fourth floor (work continues on floors five through nine), the new Biltmore has already shown an ability to attract the kind of tenants Borders hopes will fulfill his vision of a high-tech Mecca in a building with a low-tech look.

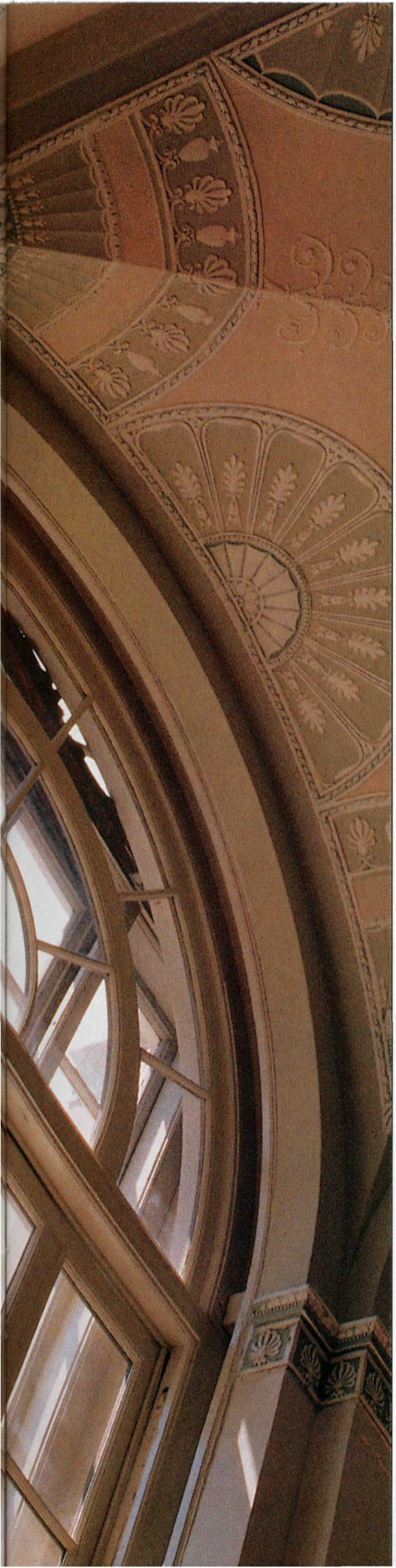
The tenant base the building has attracted includes some of the types you'd expect in a prestige location: law firms and those seeking class-A space for corporate headquarters. But at the same time, Borders says another part of the tenant base is decidedly technology oriented.

"We have Red Hot Law Group, which is a law firm specializing in high-tech firms—that's their client base. We've got Business Systems Design, which is a computer programming company; Clarkston-Potomac, which is the same thing—lots of Tech grads there," he says.

"We've got several other tenants who are in the process of either space planning or negotiating their leases, and almost all of them have some sort of technology bent. They want to be close to Georgia Tech. The technology



We've got several other tenants who are in the process of either space planning or negotiating their leases, and almost all of them have some sort of technology bent. They want to be close to Georgia Tech. The technology firms tend these days to be somewhat creative, and they really like the kind of space that we have here."



firms tend these days to be somewhat creative, and they really like the kind of space that we have here."

The proximity to Georgia Tech, and to Tech's considerable technology resources, was a deciding factor in taking on the Biltmore project. And Borders says the "thing that really made the difference" was that Tech could be coming straight at the building.

"We felt like Tech had purchased that land, and, therefore, Tech was certainly going to have a presence across the bridge, back toward us," he says. "That was a primary factor and, in fact, was part of the analysis when I did my original pro forma and investment proposal to my investors." The whole development, from across the Connector to West Peachtree, will benefit Tech. The strip of Fifth Street from campus to the Biltmore has been a "no man's land" for the past 15 years, but in the future it may mean graduating seniors won't have far to walk from Tech to work.

"We could not be more pleased that Jim has led the charge to renovate the Biltmore," says Georgia Tech President Wayne Clough, CE '64, MS CE '65. "First, the Biltmore has a wonderful past for many of our alumni. Second, it is located on what could become one of the principal entrances to campus. Lastly, we are working to see to the development of a continuing- and executive-education center for Tech and the growth of a high-tech corridor in this area, and a renovated Biltmore is a key step to achieving this vision."

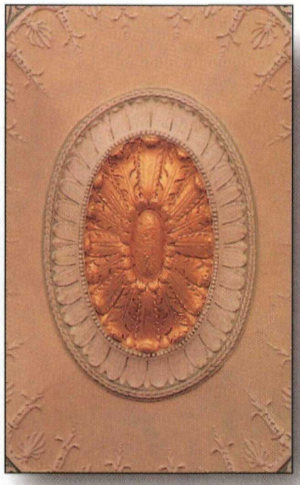
Another important factor was the clear indication of further growth in the area—office, retail and residential—over the next five to 10 years.

The Midtown Boom Explodes

I think that north of the Biltmore there will be some very high-end apartments. I think that to the west of the Biltmore, one way or another, there will be some class-A office space—possibly residential condominiums," Borders says. "Of course, Kim King [IM '68] has the Coke property under contract and is expected to add a tremendous amount of density there—both residential and office."

Development of the Atlantic Steel property, which involves Charles Brown, BC '62, and the Home Park residential area will add to the area's growing density. A primary result of all the development in Midtown is that it has become "a little bit pricey."

"Two years ago, you could buy land for $35 a foot, and now you can't buy land for any less than $50, and you're lucky if you can get it for that," Borders says. "I had somebody call me the other day from out of town, and he said, 'I'm looking for some land. I had somebody tell me that they'd sell me their land for a million dollars an acre. That's just ridiculous. I can't make that work.'



"I said, 'My God! Who was it? I want to talk to them so I can buy their land, because land prices are certainly much higher than a million dollars an acre.'"

Fortunately for the Biltmore, and for the city's heritage, Borders did find something affordable to do. Not that he didn't shop around a bit first.

"We had a choice of several projects to work on. I felt like this was the one. So we did a lot of analysis up front, ran a lot of numbers on it and just came to the conclusion that this was one that would work.

"Once we had made that decision, then there was no turning back. The one thing you can't do on a project like this is ever stop charging up the hill. You've got to keep on going no matter what obstacle you face and just deal with it. So that's what we did, and we got to the top." **GT**

Three Rar

Principia imparts depth and prestige to the Georgia Tech library's rare books collection

By Gary Goettling
Photography by Caroline Joe

re Editions

Momentum genitæ æquatur momentis laterum singulorum generantium in eorundem laterum indices dignitatum & coefficientia continue ductis.

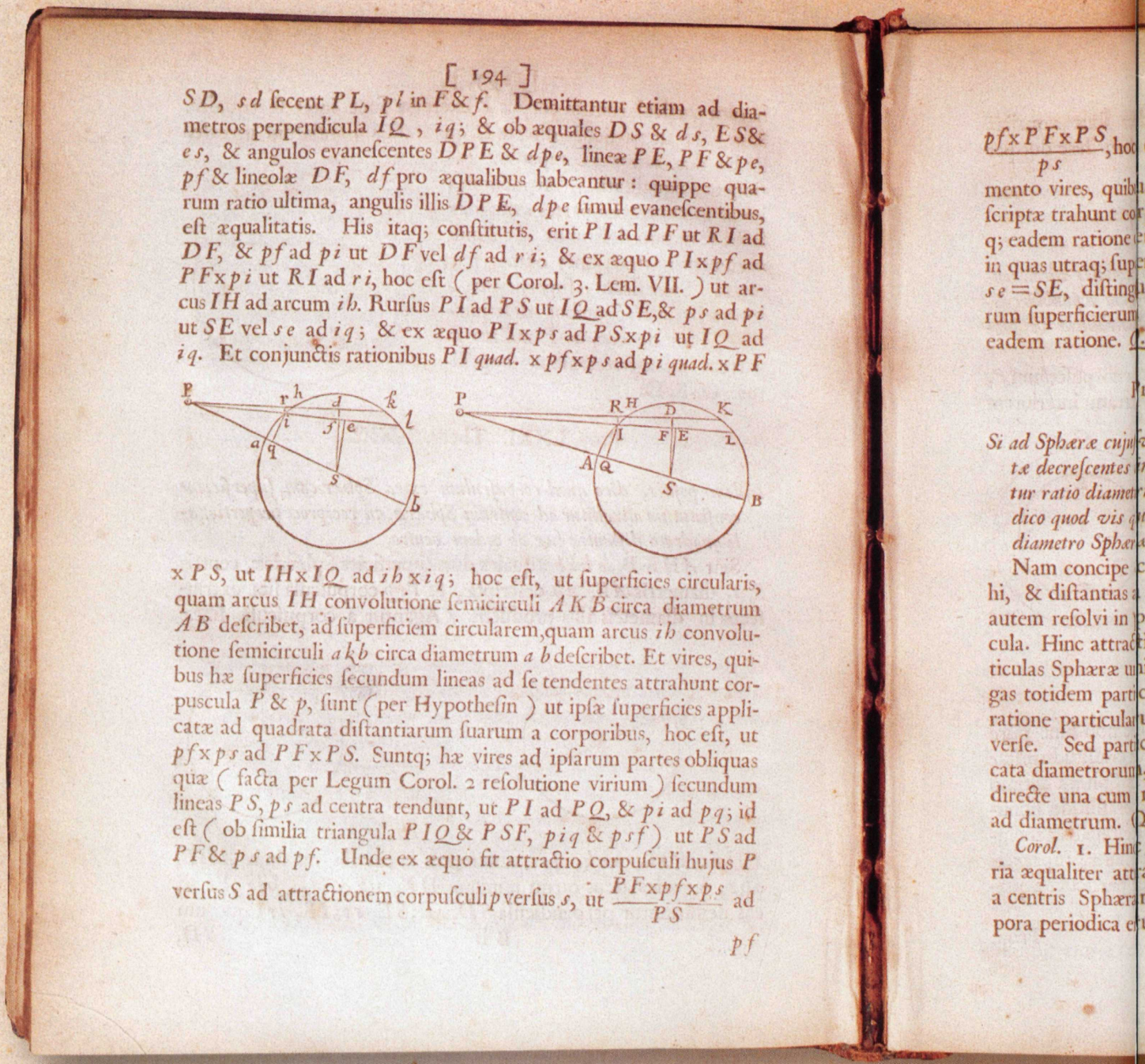
Even without knowing Latin, there's something awe-inspiring and humbling about reading Sir Isaac Newton's application of the Product Rule for Differentiation to motion as it was originally published, on the very pages that were once as new and fresh as the ideas inked upon them.

Philosophiae Naturalis Principia Mathematica—The Mathematical Principles of Natural Philosophy—is without question among history's most influential books. So when a copy of the second edition became available for sale earlier this year, Georgia Tech library officials quickly seized the opportunity to fill a conspicuous gap in the library's rare-book collection.

"The addition of the second edition of Newton's *Principia* completes our set of all the editions of this important work," said Miriam Drake, dean and director of libraries at Georgia Tech. "Our collection of books by and about Isaac Newton is impressive and provides an outstanding resource for scholars in the history of science and the history of physics."

"It's in very good condition," Head of Acquisitions Marilyn Williamson said of the 484-page tome published in 1713. "Only 750 copies were printed by Cambridge University Press."

She noted that the paper quality of antique books is gen-



[194]

SD, sd ſecent PL, pl in F & f. Demittantur etiam ad diametros perpendicula IQ, iq; & ob æquales DS & ds, ES & es, & angulos evaneſcentes DPE & dpe, lineæ PE, PF & pe, pf & lineolæ DF, df pro æqualibus habeantur: quippe quarum ratio ultima, angulis illis DPE, dpe ſimul evaneſcentibus, eſt æqualitatis. His itaq; conſtitutis, erit PI ad PF ut RI ad DF, & pf ad pi ut DF vel df ad ri; & ex æquo $PI \times pf$ ad $PF \times pi$ ut RI ad ri, hoc eſt (per Corol. 3. Lem. VII.) ut arcus IH ad arcum ih. Rurſus PI ad PS ut IQ ad SE, & ps ad pi ut SE vel se ad iq; & ex æquo $PI \times ps$ ad $PS \times pi$ ut IQ ad iq. Et conjunctis rationibus PI *quad.* $\times pf \times ps$ ad pi *quad.* $\times PF$

$\times PS$, ut $IH \times IQ$ ad $ih \times iq$; hoc eſt, ut ſuperficies circularis, quam arcus IH convolutione ſemicirculi AKB circa diametrum AB deſcribet, ad ſuperficiem circularem, quam arcus ih convolutione ſemicirculi akb circa diametrum ab deſcribet. Et vires, quibus hæ ſuperficies ſecundum lineas ad ſe tendentes attrahunt corpuſcula P & p, ſunt (per Hypotheſin) ut ipſæ ſuperficies applicatæ ad quadrata diſtantiarum ſuarum a corporibus, hoc eſt, ut $pf \times ps$ ad $PF \times PS$. Suntq; hæ vires ad ipſarum partes obliquas quæ (facta per Legum Corol. 2 reſolutione virium) ſecundum lineas PS, ps ad centra tendunt, ut PI ad PQ, & pi ad pq; id eſt (ob ſimilia triangula PIQ & PSF, piq & psf) ut PS ad PF & ps ad pf. Unde ex æquo fit attractio corpuſculi hujus P verſus S ad attractionem corpuſculi p verſus s, ut $\frac{PF \times pf \times ps}{PS}$ ad

pf

$\frac{pf \times PF \times PS}{ps}$, hoc

mento vires, quib

ſcriptæ trahunt co

q; eadem ratione

in quas utraq; ſupe

$se = SE$, diſting

rum ſuperficierum

eadem ratione.

Si ad Sphæræ cujus

tæ decreſcentes

tur ratio diame

dico quod vis

diametro Sphæ

Nam concipe

hi, & diſtantias

autem reſolvi in

cula. Hinc attrac

ticulas Sphæræ u

gas totidem parti

ratione particula

verſe. Sed parti

cata diametrorum

directe una cum

ad diametrum.

Corol. 1. Hin

ria æqualiter att

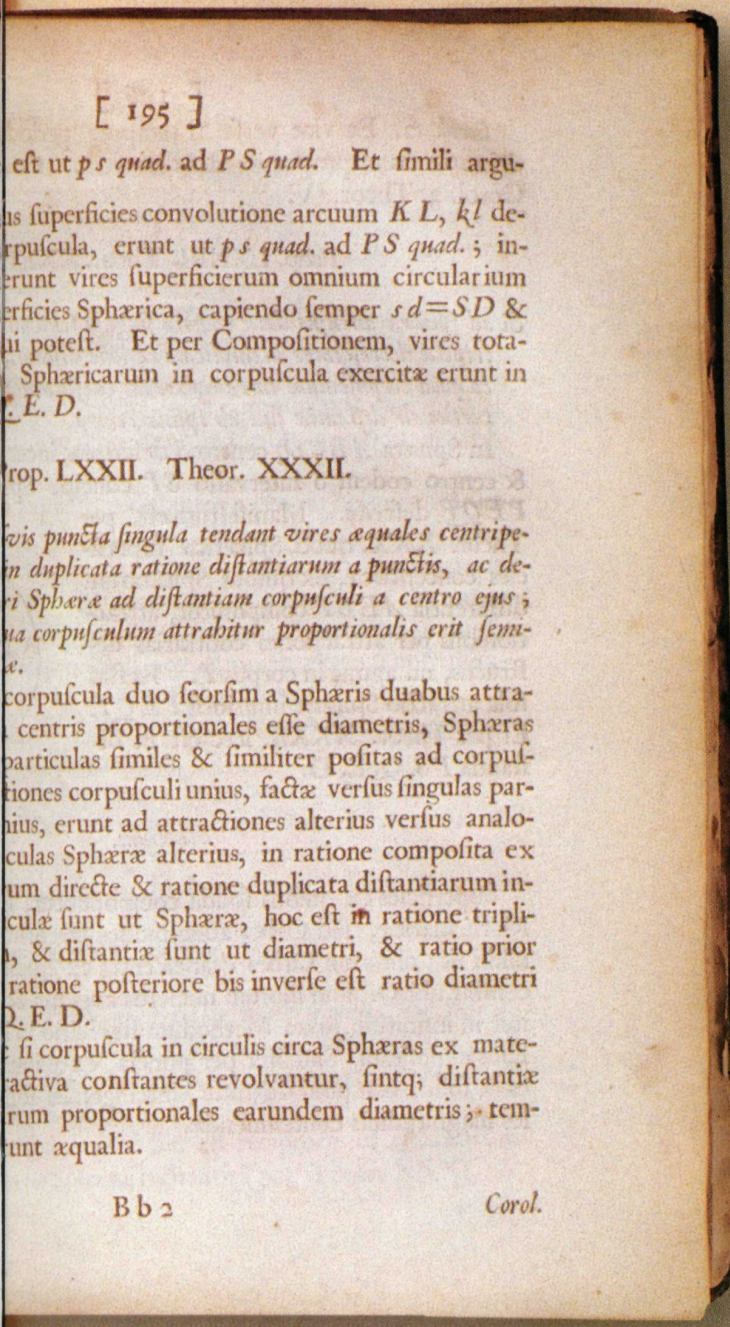
a centris Sphæra

pora periodica e

erally superior even to 20th-century paper, primarily because durable linen was used in its manufacture as opposed to the wood-pulp base of the modern product.

Williamson, who regularly receives rare-book catalogs and keeps an informal eye on the market, said the second edition *Principia* was purchased on the fly, in a manner of speaking.

"When I e-mailed the book dealer in London to say, 'Yes, we want it, please reserve it for us,' the dealer said, 'Oops—we can't get our hands on it right at the moment, because it has been packed up and is on its way to a book fair in San Francisco,' so we bought it while it was flying over us to California."



[195]

eſt ut *p s quad.* ad *P S quad.* Et ſimili argu-

ıs ſuperficies convolutione arcuum *K L*, *kl* de-
rpuſcula, erunt ut *p s quad.* ad *P S quad.*; in-
erunt vires ſuperficierum omnium circularium
erficies Sphærica, capiendo ſemper *s d*=*S D* &
ıi poteſt. Et per Compoſitionem, vires tota-
Sphæricarum in corpuſcula exercitæ erunt in
E. D.

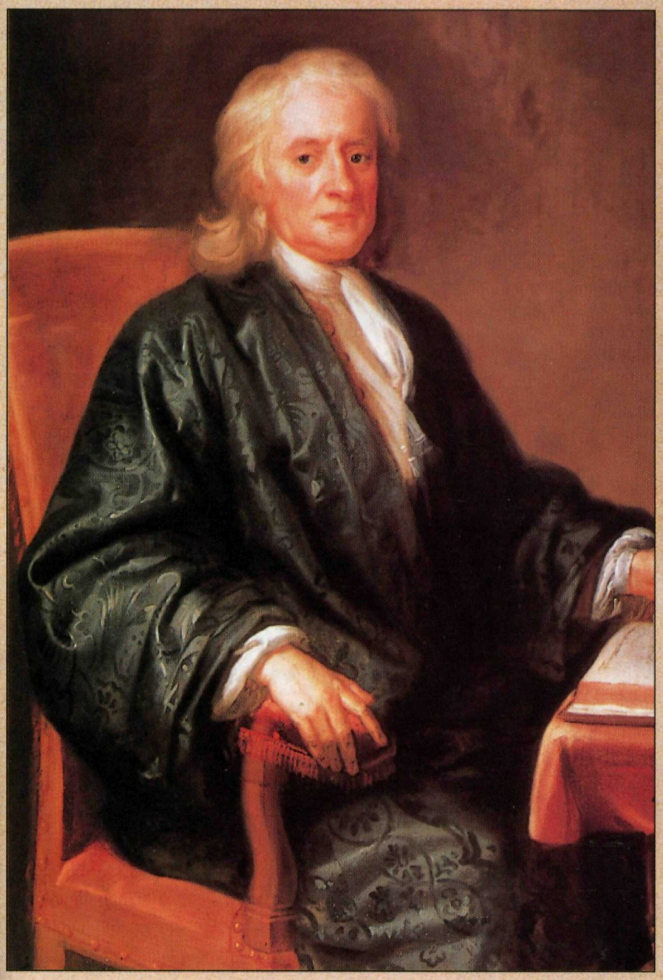
rop. LXXII. Theor. XXXII.

vis puncta ſingula tendant vires æquales centripe-
in duplicata ratione diſtantiarum a punctis, ac de-
i Sphæræ ad diſtantiam corpuſculi a centro ejus;
ıa corpuſculum attrahitur proportionalis erit ſemi-
æ.

corpuſcula duo ſeorſim a Sphæris duabus attra-
centris proportionales eſſe diametris, Sphæras
particulas ſimiles & ſimiliter poſitas ad corpuſ-
tiones corpuſculi unius, factæ verſus ſingulas par-
ıius, erunt ad attractiones alterius verſus analo-
culas Sphæræ alterius, in ratione compoſita ex
um directe & ratione duplicata diſtantiarum in-
culæ ſunt ut Sphæræ, hoc eſt in ratione tripli-
ı, & diſtantiæ ſunt ut diametri, & ratio prior
ratione poſteriore bis inverſe eſt ratio diametri
Q. E. D.

ſi corpuſcula in circulis circa Sphæras ex mate-
activa conſtantes revolvantur, ſintq; diſtantiæ
rum proportionales earundem diametris; tem-
unt æqualia.

Bb 2 *Corol.*



Three's the Charm: Sir Isaac Newton *(above)* created one of history's most influential books when he published *Principia.* Tech's Library has acquired copies of its first three editions for its rare books collection.

The leather-bound volume completes Tech's collection of the three editions of *Principia* published during Newton's lifetime. Perhaps best-known for positing the existence of universal gravitation, the work also sets forth the principles known as Newton's three laws of motion.

The first edition, dated 1687, was purchased by the library in 1958—one of only 250 printed. Bound with its pages is a letter from astronomer Edmund Halley to King James II of England providing a general account of the book's contents and a special explanation of the doctrine of tides.

The recently acquired second edition contains numerous corrections and refinements that Newton had been recording almost from the day the first edition appeared.

The third edition, donated to the library in 1984 by Dr. Henry C. Bourne Jr., was published in 1726, two years before Newton's death at age 84. The best-preserved of the trio with much of its original quality intact, the book includes a short preface by Halley. While it contains no major revisions from the previous edition, Newton added a section intended to continue his running argument with Gottfried Wilhelm Leibniz over calculus.

Miriam Drake *(center)* dean of Libraries, Marilyn Williamson and Greg Raschke compare the three editions of Newton's *Principia* that form the nucleus of Georgia Tech's rare-book collection, which emphasizs science and technology.

The three *Principia* form the nucleus of a rare-book collection at Tech emphasizing science and technology, and Newtoniana in particular. The latter comprises about 20 volumes, including an early English translation of *Principia* (1803) and a first edition of *Opticks*, published in 1704.

"The *Principias* have had more of a historical influence, but actually *Opticks* had more impact at the time it was published," said Greg Raschke, a reference librarian and information consultant who compiled an annotated bibliography of the library's Newton-related holdings.

As a giant in the history of science and technology, Newton is a logical subject for Georgia Tech's rare-book and manuscript collection, said Williamson, who also noted that additions are typically supported by special financial gifts to the library or, as with the third edition of *Principia*, donations of the books themselves.

And while Newtoniana constitutes the largest part of the collection, the library is also interested in a range of scientific subjects, particularly probability and mathematics. "We have some very important works by Pascal and the Bernoullis," she noted.

For the time being, the three *Principias* are secured along with another 50 or so of the most valuable of Tech's rare books in a library vault. But Williamson hopes that one day the items can be exhibited more often.

"Our problem right now is we don't have proper display facilities," she explained. "In addition to climate control, there would have to be a lot of extra security."

The most recent public exhibition of some of the Institute's rare-book holdings occurred during the library's Info Fair in 1994. On display were the third edition *Principia*, *Opticks*, and two of the nine volumes of the Blaeu atlas, a 17th-century Dutch masterpiece.

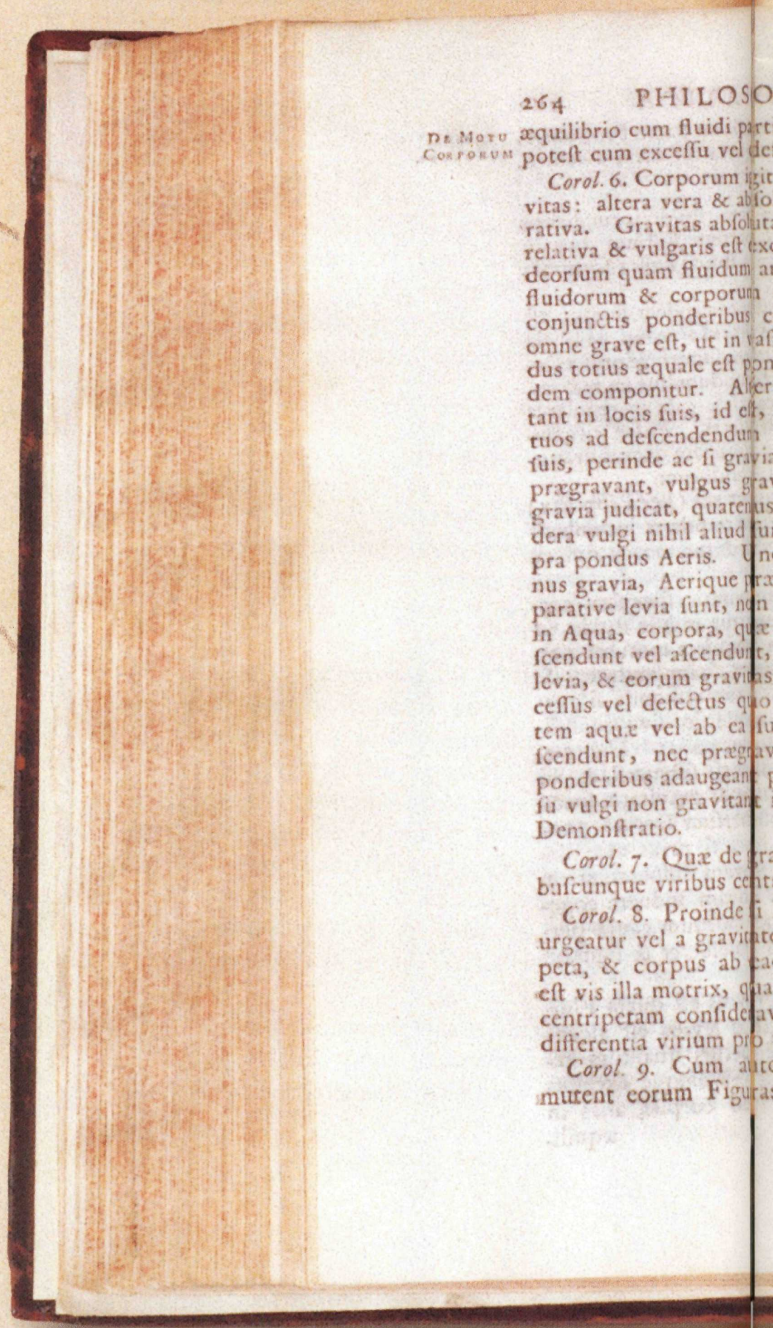
Aside from the prestige its presence imparts to the Georgia Tech library, the rare-book collection is an important way of preserving history, in particular the history of science and technology, Raschke said. "These are monumental works in the development of science that also give us a chance to reflect upon how far we've come," he added.

Williamson agreed, and pointed out that the preservation of historical information also fulfills a library's broader purpose.

"Our rare books are important not only for their intellectual content, but also as early books," she said, noting that each of the hand-tooled, exquisitely bound and illustrated books also qualifies as a unique work of art.

"Libraries like to have this kind of material because, in this particular case, *Principia* is one of the most important books in the history of science," she added. "We feel that to have these early editions enriches our collection wonderfully." **GT**

Gary Goettling is an Atlanta freelance writer.



264 PHILOSO

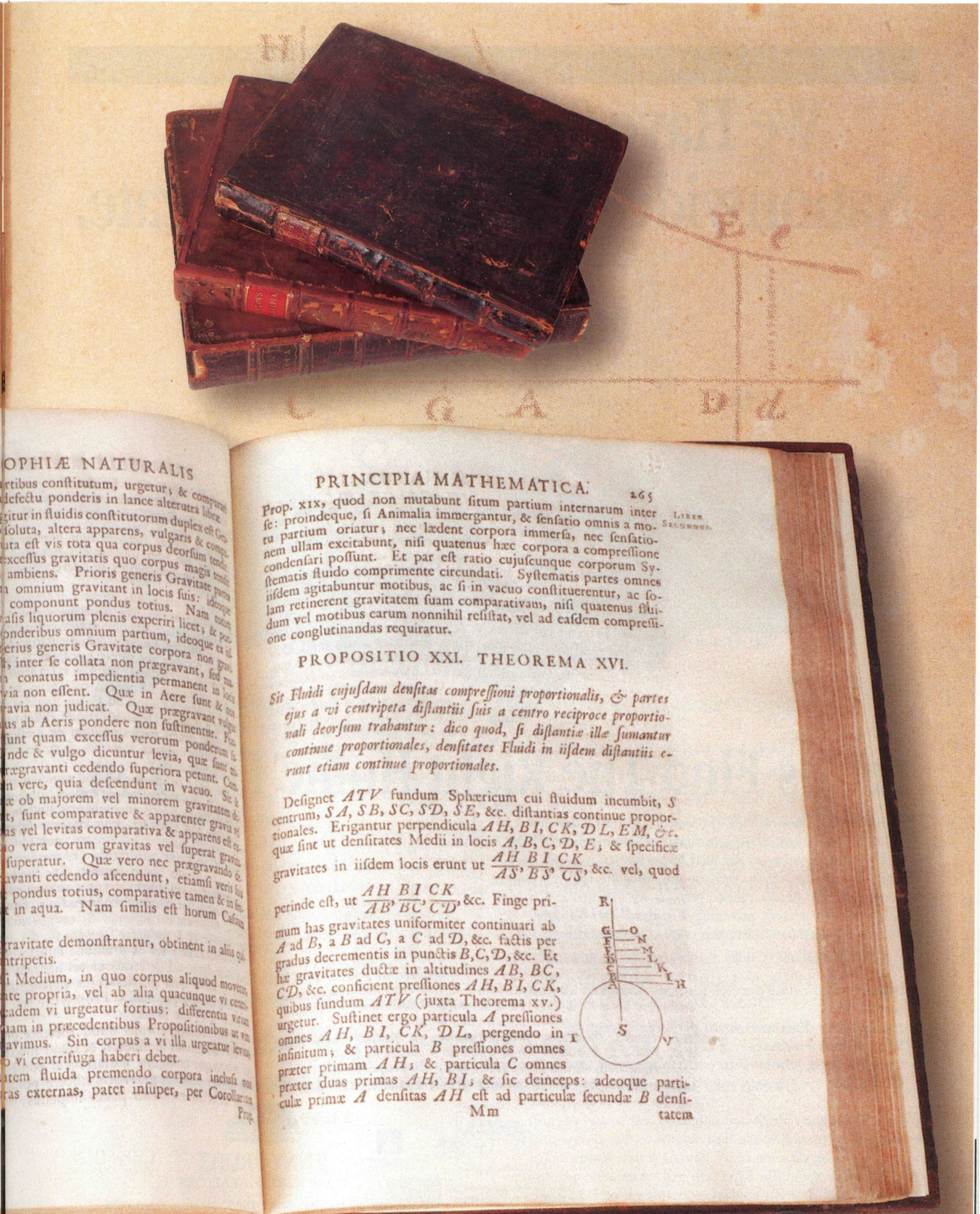
De Motu Corporum æquilibrio cum fluidi part
poteſt cum exceſſu vel de

Corol. 6. Corporum igit
vitas: altera vera & abſo
rativa. Gravitas abſolut
relativa & vulgaris eſt ex
deorſum quam fluidum a
fluidorum & corporum
conjunctis ponderibus c
omne grave eſt, ut in vaſ
dus totius æquale eſt pon
dem componitur. Alter
tant in locis ſuis, id eſt,
tuos ad deſcendendum
ſuis, perinde ac ſi gravi
prægravant, vulgus grav
gravia judicat, quatenus
dera vulgi nihil aliud ſu
pra pondus Aeris. Un
nus gravia, Aerique præ
parative levia ſunt, non
in Aqua, corpora, quæ
ſcendunt vel aſcendunt,
levia, & eorum gravitas
ceſſus vel defectus quo
tem aquæ vel ab ea ſu
ſcendunt, nec prægrav
ponderibus adaugeant
ſu vulgi non gravitant
Demonſtratio.

Corol. 7. Quæ de gra
buſcunque viribus cent

Corol. 8. Proinde ſi
urgeatur vel a gravitate
peta, & corpus ab ea
eſt vis illa motrix, quia
centripetam conſide
differentia virium pro

Corol. 9. Cum aut
mutent eorum Figuras



OPHIÆ NATURALIS

rtibus conſtitutum, urgetur, & comparet
defectu ponderis in lance alterutra libræ.
gitur in fluidis conſtitutorum duplex eſt Gra-
ſoluta, altera apparens, vulgaris & compa-
uta eſt vis tota qua corpus deorſum tendit,
exceſſus gravitatis quo corpus magis tendit
ambiens. Prioris generis Gravitate prædi-
n omnium gravitant in locis ſuis: ideoque
componunt pondus totius. Nam totum
aſis liquorum plenis experiri licet, & pon-
onderibus omnium partium, ideoque ex ge-
erius generis Gravitate corpora non gra-
, inter ſe collata non prægravant, ſed ma-
n conatus impedientia permanent in loco
via non eſſent. Quæ in Aere ſunt & non
ravia non judicat. Quæ prægravant vulgo
us ab Aeris pondere non ſuſtinentur. Pon-
ſunt quam exceſſus verorum ponderum ſu-
nde & vulgo dicuntur levia, quæ ſunt ma-
rægravanti cedendo ſuperiora petunt. Con-
n vere, quia deſcendunt in vacuo. Sic &
æ ob majorem vel minorem gravitatem de-
t, ſunt comparative & apparenter gravia vel
as vel levitas comparativa & apparens eſt ex-
o vera eorum gravitas vel ſuperat gravi-
ſuperatur. Quæ vero nec prægravando de-
avanti cedendo aſcendunt, etiamſi veris ſua
pondus totius, comparative tamen & in ſe-
t in aqua. Nam ſimilis eſt horum Caſuum

gravitate demonſtrantur, obtinent in alis qui-
ntripetis.

i Medium, in quo corpus aliquod movetur,
ate propria, vel ab alia quacunque vi centri-
eadem vi urgeatur fortius: differentia vari-
iam in præcedentibus Propoſitionibus ut vi-
avimus. Sin corpus a vi illa urgeatur leviu-
o vi centrifuga haberi debet.

item fluida premendo corpora incluſa non
ras externas, patet inſuper, per Corollarium
Prop.

PRINCIPIA MATHEMATICA. 265

Prop. XIX, quod non mutabunt ſitum partium internarum inter ſe: proindeque, ſi Animalia immergantur, & ſenſatio omnis a motu partium oriatur; nec lædent corpora immerſa, nec ſenſationem ullam excitabunt, niſi quatenus hæc corpora a compreſſione condenſari poſſunt. Et par eſt ratio cujuſcunque corporum Syſtematis fluido comprimente circundati. Syſtematis partes omnes iiſdem agitabuntur motibus, ac ſi in vacuo conſtituerentur, ac ſolam retinerent gravitatem ſuam comparativam, niſi quatenus fluidum vel motibus earum nonnihil reſiſtat, vel ad eaſdem compreſſione conglutinandas requiratur. LIBER SECUNDUS.

PROPOSITIO XXI. THEOREMA XVI.

Sit Fluidi cujuſdam denſitas compreſſioni proportionalis, & partes ejus a vi centripeta diſtantiis ſuis a centro reciproce proportionali deorſum trahantur: dico quod, ſi diſtantiæ illæ ſumantur continue proportionales, denſitates Fluidi in iiſdem diſtantiis erunt etiam continue proportionales.

Deſignet ATV fundum Sphæricum cui fluidum incumbit, S centrum, SA, SB, SC, SD, SE, &c. diſtantias continue proportionales. Erigantur perpendicula AH, BI, CK, DL, EM, &c. quæ ſint ut denſitates Medii in locis A, B, C, D, E; & ſpecificæ gravitates in iiſdem locis erunt ut $\frac{AH}{AS}, \frac{BI}{BS}, \frac{CK}{CS}$, &c. vel, quod perinde eſt, ut $\frac{AH}{AB}, \frac{BI}{BC}, \frac{CK}{CD}$, &c. Finge primum has gravitates uniformiter continuari ab A ad B, a B ad C, a C ad D, &c. factis per gradus decrementis in punctis B, C, D, &c. Et hæ gravitates ductæ in altitudines AB, BC, CD, &c. conficient preſſiones AH, BI, CK, quibus fundum ATV (juxta Theorema XV.) urgetur. Suſtinet ergo particula A preſſiones omnes AH, BI, CK, DL, pergendo in infinitum; & particula B preſſiones omnes præter primam AH; & particula C omnes præter duas primas AH, BI; & ſic deinceps: adeoque particulæ primæ A denſitas AH eſt ad particulæ ſecundæ B denſitatem

Mm

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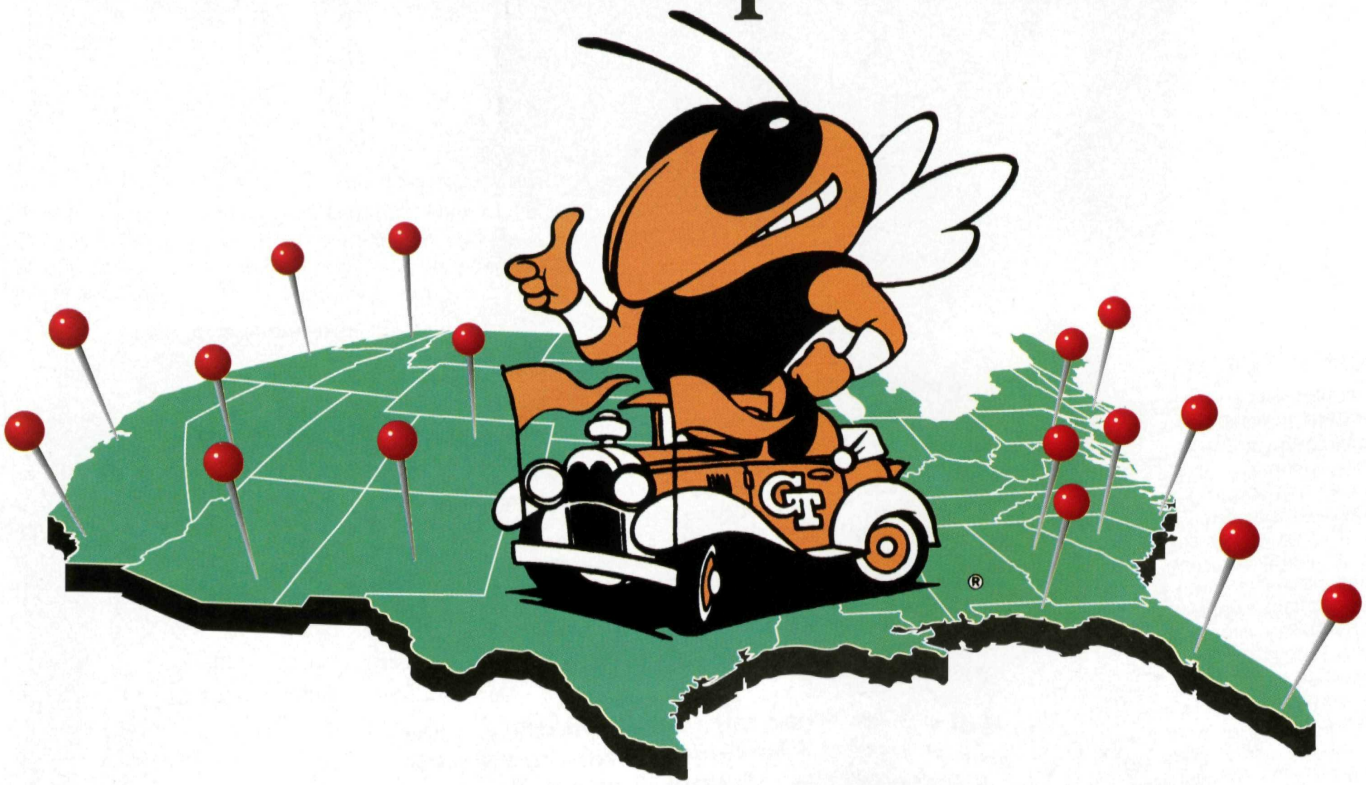

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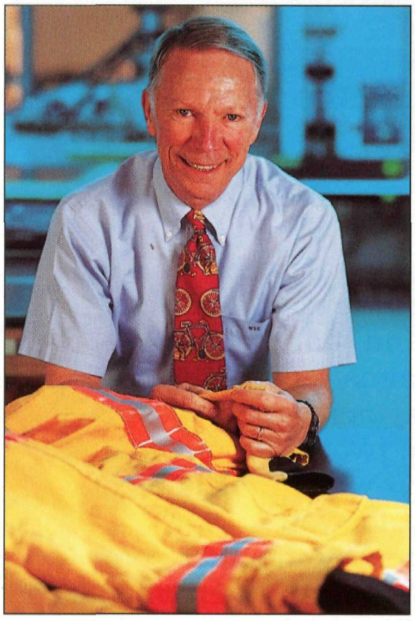
Faster and Higher

Doug Ellis stays in a hurry whether he's in school or managing his textile company

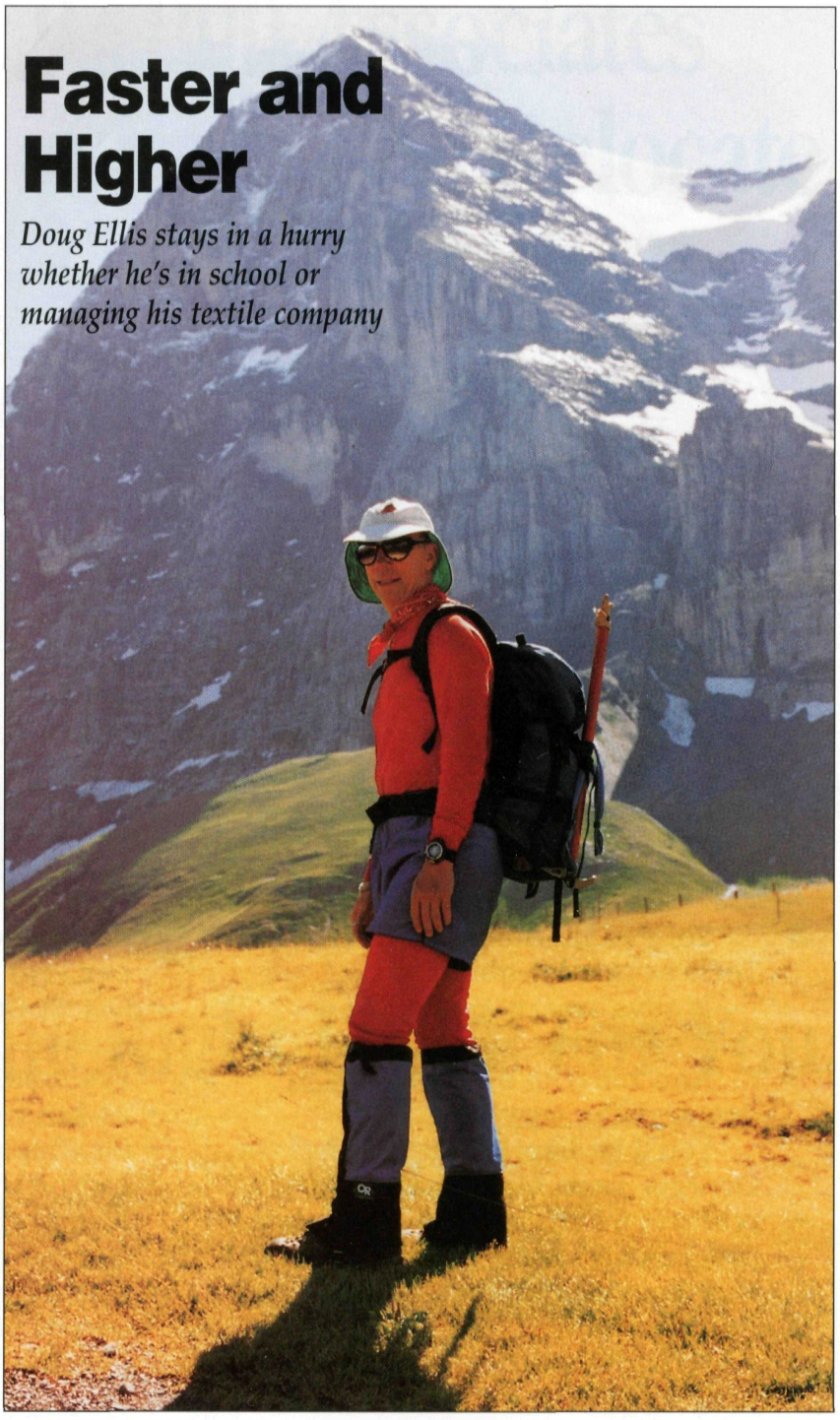
By Mark Clothier

Doug Ellis tore through Georgia Tech in about the same time it took Stephon Marbury to reach the NBA. But while he's a marathon runner and mountain climber, Ellis is no basketball player. He attended Tech in the early 1960s and earned a textiles degree in four quarters.

Ellis is CEO of Southern Mills, an industrial fabrics manufacturer with four factories in Georgia. Southern makes press covers, bags and baskets for industrial laundries; grass-catching bags for lawnmowers and flame-retardant material used by fire departments, race-car drivers, the military and NASA.



Phillip Spears



Southern Mills CEO Doug Ellis prepares to scale the Eiger in the Swiss Alps.

His brief time at Tech was preceded by four years at Princeton University. After Tech, Ellis spent two years at Harvard University Business School.

"Tech accepted some of the math and science from Princeton. But for several courses, I read texts, talked to professors and took the tests. I was getting old," he says. "It was time to go to work."

He was 25 at the time.

"I don't know of anyone who has gone through in four quarters. They were very helpful to let me schedule that. I had to go to all the labs. I had to take mechanical engineering, organic chemistry. That was a killer."

After graduation, Ellis came back to Atlanta to work in the family business: textiles. His father, Bill Ellis, started the business in 1925 with $20,000, half of which was borrowed. Ellis, 63, says he started his work career by implementing an inventory control system and phasing out a product line that had outgrown its

need: replacement seat covers for the auto industry.

Then he moved up to vice president and general manager in charge of marketing. At the time, Southern Mills had five manufacturing sites: one in Roswell, Ga., that was closed in 1974, one in Atlanta's West End, two in Senoia, Ga., and one in Woodbury, Ga.

In 1964, DuPont came out with a flame-retardant fabric called Nomex. The chemical manufacturer went to Southern Mills because it made heat-resistant materials for the commercial laundry business—bags, baskets and press covers—that might have a use for Nomex.

Ellis says Southern Mills did its initial tests on Nomex at Georgia Tech's textile school. The company set up a team and ran production out of the lab, at one point spinning 1,000 pounds a week.

Ellis moved production to the Senoia plant. Once Southern Mills figured out how to dye the material, it was able to sell it for all kinds of uses, including fire department uniforms, astronaut clothing and the suits worn by race-car drivers. Southern Mills does not cut and sew the fabric. It sells it to the people who do. Southern Mills-spun Nomex was worn on the moon, although Ellis can't remember which mission.

"But it's nice to be able to talk about it," he says.

Ellis says each school "offered a different experience, all useful. I had liberal arts at Princeton, and my studies became more specialized as I moved along. Tech gave me a wonderful background in textiles and polymer chemistry. Harvard was terrific for general business practices.

"We still have a very close relationship with the textile school," he adds. "The staff has been very helpful to us over the years. Fred Cook, the head of the textile school, runs a very good organization over there. Wayne Tincher, one of the professors, knows a lot about dyeing fabrics and polymer chemistry."

Ellis now spends half his time working as the president of American Textile Manufacturers Institute, a Washington lobbying group with a 32-person office. The group's members represent 80 percent of the industry.

"It's mostly a lobbying group, but we're also working with standards, regulatory agencies, and trying to open foreign markets and ensure fair trading practice and that everyone plays by the rules." Ellis plans to stay as chief executive officer of Southern Mills for a few more years, then continue as chairman. He has hired Phil Vincent, IE '66, to work as president and chief operating officer.

Southern Mills is a private company with 600 employees and about $100 million in sales, Ellis explains. That's up from 1963, when Ellis arrived from Harvard Business School to start work in a family business with $5 million in sales. Of 1998 sales, 12 percent were export. The rest were spread equally throughout America, Ellis says.

The business that started making fabric for commercial laundry is still the largest of that sort. But Southern Mills also sells the fabric used in mower bags made by Jacobson, John Deere, Murray, Toro, Snapper and Honda, among others.

Southern Mills also developed the first pad used under the AstroTurf in the Houston Astrodome. The company made the turf pads for at least six stadiums, including Busch Stadium in St. Louis.

Southern Mills is still working with Nomex, now figuring out a way to print on it. Ellis would like to print a camouflage pattern on the material for use in the military. **GT**

Mark Clothier is an Atlanta freelance writer.

Exodus from China

Jun-Seng Li routes Hunt's trucks on a prosperous journey

By Jim Lovel

Jun-Sheng Li survived famine, political persecution and exile to reach Georgia Tech from China. Now, he is reshaping the U.S. transportation industry from his office in Lowell, Ark.

Already president of the logistics division of J.B. Hunt Transport Services, the nation's largest publicly traded carrier, Li was also named executive vice president of integrated solutions for the transportation giant last year.

Li, who received his master's in industrial engineering in 1986 and a doctorate in 1989, built the logistics division of Schneider National of Green Bay, Wis., the nation's largest privately held trucking company, before being recruited to J.B. Hunt, one of Schneider's biggest competitors, in 1994. Li immediately transformed Hunt's fledgling logistics operation into the fastest-growing division of the company.

Although experts predict that logistics is the future of the trucking industry, few companies do it well. Li uses the skills he learned at Georgia Tech and from industrial engineering Professor John J. Bartholdi to define the way logistics is done. He has developed computer systems and software applications that allow the company and its customers to track their shipments on the Internet and know exactly where the freight is at all times.

"That is what separates us from

Tom Ewart

Jun-Seng Li, president of J.B. Hunt Logistics, is setting the industry standard.

the competition," Li says. "No other company has even gotten close."

Hunt now has some of the largest logistics contracts in the nation, including such companies as J.C. Penney, Wal-Mart, Target, Anheuser-Busch and Weyerhauser. Li's division of the company grew by more than 60 percent last year.

In his role as executive vice president of integrated solutions, Li is finding other ways technology can make the company more efficient and profitable. He hopes to blur the lines between the company's divisions, to transform Hunt from its traditional role as a freight hauler to a company that can solve any transportation need.

Li's rise to the top of his profession was not the traditional climb up the corporate ladder.

He was born in China in 1958. His father was a newspaper editor in a city of about 40,000 people. Soon after Li's birth, his father was imprisoned for writing articles critical of the Chinese government. The family was forced to relocate to a rural province. There, they endured demanding physical labor and hunger.

"It was a terrible thing to happen to my family, but it shaped my character," he says.

His father was released from the labor camp after two years and finally exonerated by the Chinese government in 1979. When Li was four years old, a famine swept China, claiming the lives of millions in the province. Two of Li's siblings died, one sister at 13 months, a brother at 7 days of age. Li barely survived two bouts of typhoid fever.

Although he excelled at school and finished high school at the top of his class, because of his father's imprisonment he was not allowed to attend the university. That didn't stop him from learning. He studied English by secretly listening to Voice of America broadcasts, his head under thick blankets, the short-wave radio pressed to his ear. He read every book he could find and taught himself science. After Mao Tse-Tung, chairman of the Chinese Communist Party, died in 1976, the government opened the universities and held examinations nationwide.

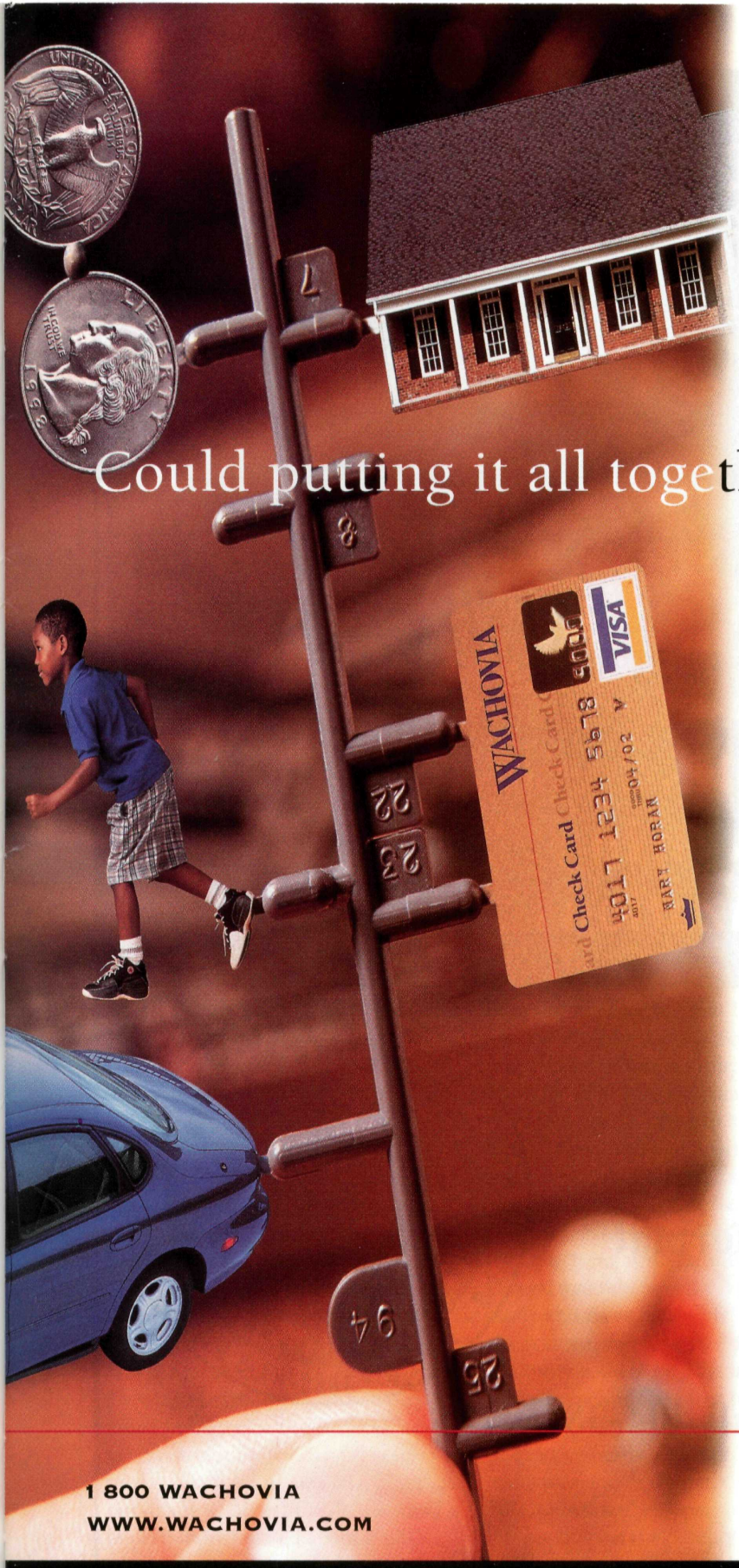
Li scored high enough on a battery of government tests to be allowed to attend the university. He was required to major in English because the country needed English teachers, but his first love remained science. He continued to study it on his own. In his senior year at Hefei Polytechnic University in Anhui Province, he was selected—again based on test scores—to study under Bartholdi and other American professors.

Li received a master's in business administration during those studies in Shanghai, then returned to his university as an assistant professor of management science and assistant director of the university's department of research. Two years later, in 1985, he accepted a scholarship to Georgia Tech. He was presented the Institute's prestigious Wunch Award, and was named the school's Outstanding Young Engineer in 1995. In May, Li returned to Georgia Tech to visit Bartholdi. It was his first time on campus since his graduation.

"I've always wanted to go back," Li says. "Dr. Bartholdi is my role model."

Li and his wife live in Springdale, Ark., with their two children. They became naturalized American citizens in 1996. Last November, he put on his suit and voted in his first election. "It was one of the happiest days in my life," he says. "I love this country." **GT**

Jim Lovel is a freelance writer in Little Rock, Ark.



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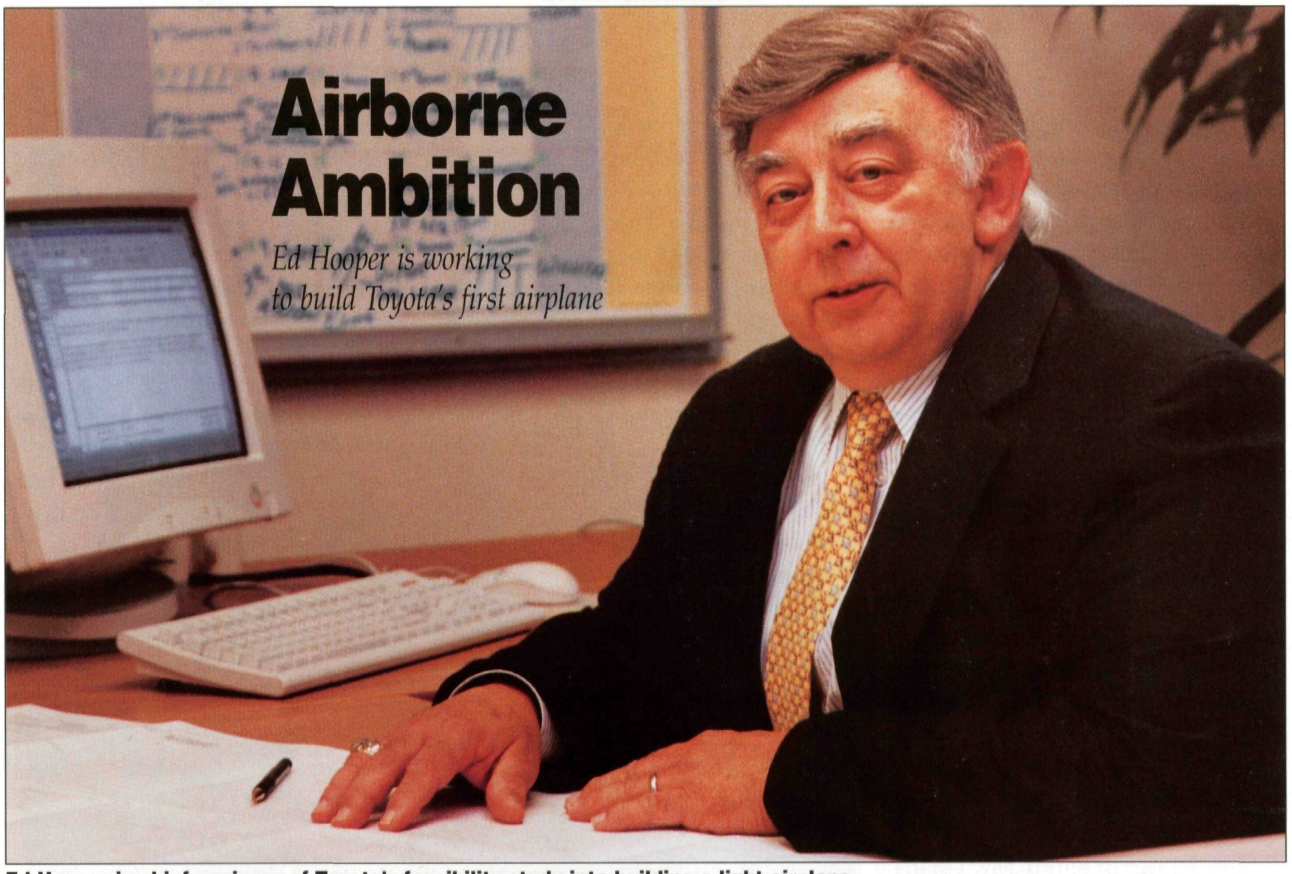


Airborne Ambition

Ed Hooper is working to build Toyota's first airplane

Ed Hooper is chief engineer of Toyota's feasibility study into building a light airplane.

By John Dunn

When Toyota began entertaining ideas of building light airplanes, the automaker recruited Ed Hooper to help earn its wings.

Edwin H. Hooper, AE '61, who spent most of his career at Beech Aircraft, is directing Toyota's newest venture, developing light aircraft. It's an idea that Hooper says could do more than fly—it could revitalize the country's general aviation industry.

"The main thing that intrigued me was the focus of this entire effort from Toyota to strive to revitalize a very ailing industry," Hooper says.

While corporate jets have sold well, general aviation is trying to pull out of a nose dive. In 1979, the small aircraft industry sold about 20,000 planes—a figure that declined to less than 1,000 planes a year a few years ago. But three years ago, shortly after Cessna started making small planes again, sales began to pick up.

One reason general aviation has been dormant for the past 15 to 20 years is product liability. Some of the major manufacturers dropped out of building single-engine planes.

NASA also is trying to help get the industry airborne again with a program it calls AGATE—Advanced General Aviation Technologies Experiment. NASA chief Dan Goldin is trying to bring new technologies to general aviation to make it safer, less costly and more accessible. "The desire is there, and it looks like the opportunity is there for Toyota to help revitalize an industry that has just been really down," Hooper says.

Hooper heads a staff of 30 engineers working in Gardena, Calif. "It's quite new," Hooper says. "We're just barely past the concept design phase, beginning to put things in place for manufacturing and detail planning."

Toyota began studying the aviation industry after its chairman, Hiroshi Okuda, established a goal of generating 10 percent of Toyota's sales from non-automotive business within the next decade. The automaker is also studying the marine industry.

"Toyota's airplane program is strictly a feasibility study," says Diana De Joseph, with Toyota's office of National Media Relations. At this time, Toyota has no definite plans to introduce an aircraft to the market.

Explains Hooper: "The key is going to be: Can we produce this airplane for significantly less than some of the airplanes that are out there today?" Although the plane would cost less, he says, it would have superior performance and would be loaded with modern technology.

Hooper's goal is to "design an airplane that brings new materials, new technology and automotive manufacturing efficiencies together to see if we can significantly reduce the price

tag." He envisions a four-seat, reciprocating, propeller-driven plane that is both stylish and affordable.

Built of all-composite construction, the plane would have low-drag airflow characteristics and today's computer-based avionics and instruments. Instead of a slew of gauges, the panel would be designed to "look like a laptop computer," says Hooper.

A native of Greenville, S.C., Hooper went to work for Lockheed Georgia after graduating from Tech as a co-op student. There he became a specialist in flutter vibrations.

After moving to California, Hooper joined Beech Aircraft (now Raytheon) in 1973, where the product line ranged from prop-driven, light planes to corporate jets.

As with many people in the industry, building aircraft is more than a profession for Hooper, it's a hobby. He has been a member of the Experimental Aircraft Association—a organization of pilots who design and build their own planes—since he was a student at Georgia Tech. In the 1970s, he assembled and flew an open-air biplane.

"I kept it for a lot of years, but it is was tubular steel and fabric—real old technology."

Surprisingly, Hooper says Toyota hasn't given him a firm deadline. "When I worked at Raytheon, we were very schedule-driven to develop and certify new airplanes," he recalls. "I was very much driven by schedule. I'm used to that.

"But Toyota's attitude is that schedule is not so terribly important. And the money we spend on research and development is not so terribly important. What *is* important is that we conduct a diligent, process-driven program—step-by-step—and conceive the best airplane for that particular market.

"Then we prove it with prototype hardware, the manufacturing processes and flying; tweak it, make some changes; and then make a final decision to certify it. They said we've got to do the best dad-gum job that was ever done. And if we can do that in three years, fine. If we can do that in six years, fine."

Eager to see the project succeed, Hooper sees it as an opportunity "to perhaps set a real milestone for general aviation in the future. If we can make airplanes affordable and fun to fly, a whole lot easier to operate than they are now, it could make a tremendous difference." **GT**

Managing Technology

John Voeller's job is more than tactical or strategic: It's figuring out what comes next

By Karen Hill

John Voeller says low-tech can be more important than high-tech. He's not a fan of invention for its own sake, dismissing research that lacks purpose.

For this, he's considered a visionary and honored by *Engineering News-Record* magazine with its 1998 award for most significant individual achievement in the construction industry?

Absolutely, yes.

ENR editors said they picked Voeller, chief knowledge officer for Black & Veatch Co., "for his pioneering efforts in championing effective information-technology (IT) management at Black & Veatch, and for his technology leadership in an industry rarely appreciated for its high-tech prowess."

This honor comes one year after *CIO* magazine gave him its Enterprise Value Award.

Voeller, ME '71, earned his accolades first by leading the company team that developed PowrTrak, a database that handles all aspects of the firm's core work—designing and building power plants, including two nuclear facilities under construction now in Taiwan. He's putting finishing touches now on CygNet, the company's next-generation IT system that executives hope will slash total project costs by up to 30 percent.

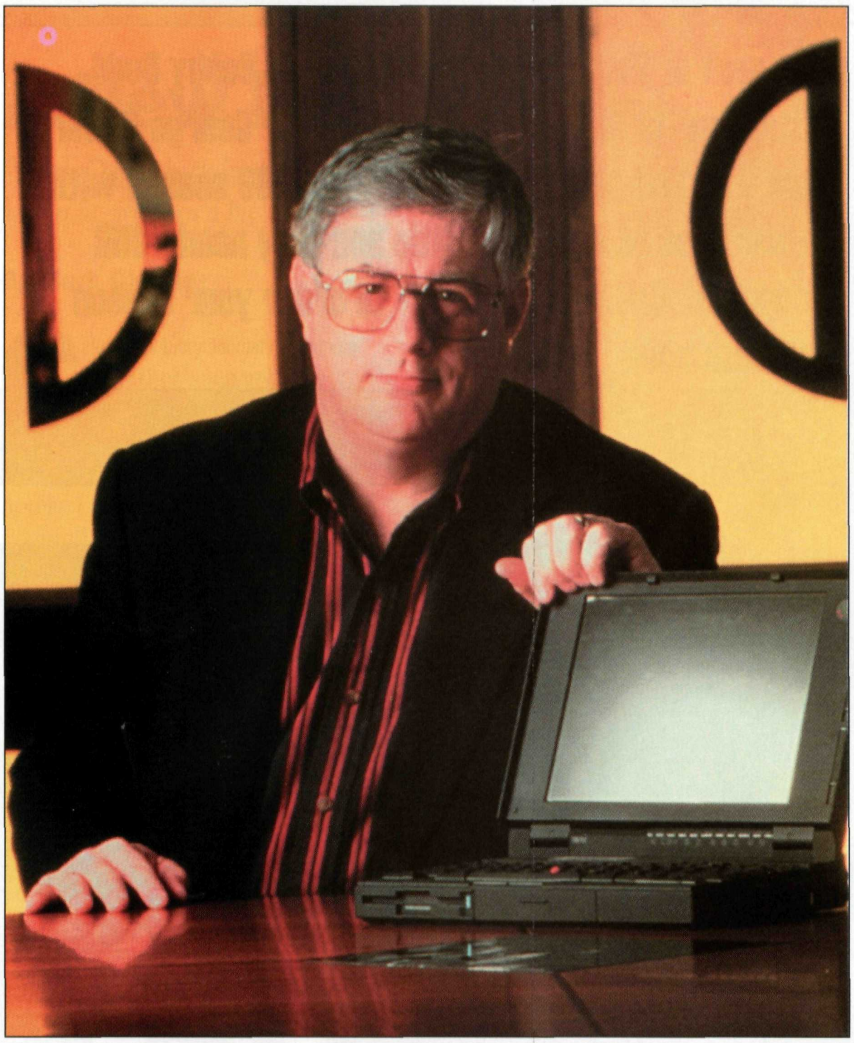
In January, Voeller added the title of chief technology officer for BV Solutions Group, a new consulting company formed by the spin-off of Black & Veatch's IT department. Projected revenues for its first year: more than $40 million.

He's also patented a scanning technology—and he occasionally tinkers with hot rods.

"I have no kids, no hobbies and a very cooperative wife," Voeller says of his 80-hour weeks. "I do this because I love to do it."

He describes his job as unique—basically, looking more than five years down the road.

"My businesses are using data-centric knowledge; that's tactical," Voeller explains. "My developers are now building a decision-centric network, and they already understand where they're going with that. That's strategic. My job is to figure out what comes next."



John Voeller is garnering praise for his pioneering efforts in information technology.

Voeller elaborates on the role that knowledge plays in business.

"Many organizations really have three kinds of knowledge, no matter what their business," he says. "One is process knowledge, where you figure out a way to do something, 'proceduralize' it, tune and optimize it, and do it again and again. An example is figuring out a way to buy a complex piece of equipment, like a boiler.

"Second is spot knowledge, or 'lessons learned.' An example would be when a manufacturer says a valve has a certain type of problem and everyone in the organization needs to know.

"Third—the one most people miss—leads to cumulative decisions. An example would be whether to locate a facility on a certain site. You can say yes or no in one sentence, but the path by which you reach that yes or no could come in a lot of different sequences. Still, once you've traversed that, you know at least one path to reach that decision. Do you store that as a 'unique lesson learned,' or under the general category of 'making that kind of decision?' "

CygNet, Voeller says, is based on decision-centric thinking—and it's not really a high concept.

"It's the low-tech stuff that actually is the most powerful," he says. "We think we've discovered a missing element in all of computing: that a decision is atomic, and everything you do is designed to reach a decision or is a consequence of a decision. That being the case, you organize information using decisions as the key."

Similarly, he says, it was a simple order in the late 1970s that led to the creation of data-centric PowrTrak.

"The boss said put everything in one place and make sure we enter it one time," he recalls. "You can't get more mundane than that."

Voeller says his first job after college graduation taught him not to get too high-minded.

"When I came out of Tech, it was right at the height of the aerospace layoffs and even the guys with 4.0 [grade-point averages] didn't get offers. I'm convinced to this day that I got a job because I checked the little box in the corner of the application that asked if I'd accept field assignments," Voeller says. "Most of the guys had an elevated view of themselves in suits, sitting in offices. I just wanted to get out there. I went to work for Westinghouse and got put on a construction site in New Jersey. There I was, trying to run 150 craft labor people at 22 years old. Running craft labor is a tough proposition, especially in New Jersey.

"But I learned an intense level of respect for the people who have to get the job done. I had a great time talking to a fitter foreman; he was fascinated with quantum physics. One of the millwrights is probably a multimillionaire now; he was investing in a little company called Fairchild Semiconductor when no one knew what a semiconductor was," Voeller says.

"I learned that when someone who's in the thick of things speaks up, you should shut up and listen—to throw in the trash any presumption that where they are in the chain of command has any parallel scaling to their knowledge.

"If I had been put in a classical engineering design job, in an office, I don't think I would have enjoyed that perspective, and I couldn't have done what I have without it." **GT**

Karen Hill is an Atlanta freelance writer.

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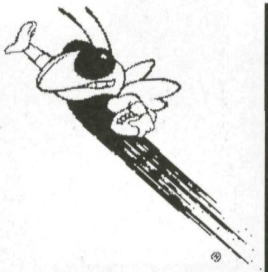

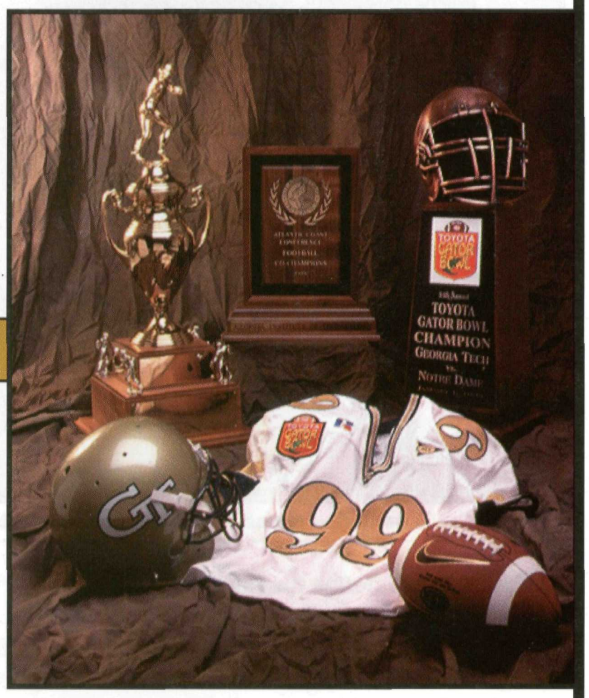

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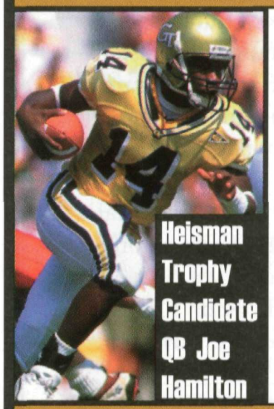

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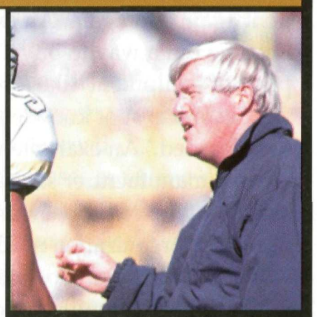

1998 ACC Coach of the Year George O'Leary

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A New Day

Peyton Day is back in the family business in a big way

By Mark Clothier

Peyton Day is carrying on his father's legacy. Day heads Day Hospitality Group, an Atlanta-based company that owns and operates 10 Marriott company hotels. Like his father, Cecil Day, Peyton Day runs hotels. Cecil Day founded Days Inn of America, a chain of 330 hotels across the Southeast.

The Days Inn chain sprang from a Day family trip to California in 1970. Peyton's father was frugal enough to avoid staying in Holiday Inns every night. The only other national hotel chain option was Motel 6, but they didn't have pools, which the Day kids wanted. Cecil Day, who was in commercial development, saw an opportunity. He had some land on Savannah Beach, which is now called Tybee Island. He decided to build a family-style hotel with a pool.

There, in the flagship hotel of the Days Inn chain, Peyton Day got the hospitality bug. He worked there over summers and vacations, cleaning rooms, scrubbing the pool, working the desk—anything that needed doing around the hotel.

Peyton's father died at 44, when Peyton was 17. A few years later, in 1983, the family sold the hotel chain. By then, Day had graduated from Georgia Tech, IM '83.

The benefit of attending Tech was never much of an issue as far as his father was concerned, Day recalls. "I'd go with Dad on business trips and he'd always point out how this guy was a Tech grad or that guy was. He was quick to point out he went to Georgia Tech. He knew he wanted me to go and figured if it worked for him, it probably would work for me.

Caroline Joe

Southern hospitality is more than a tradition for Peyton Day.

"Also, the work ethic and the tremendous legacy of successful business people really kind of gave me vision for the future."

Day grew up expecting to follow in his father's footsteps, "but that all changed when Dad died."

Instead, Day started C.P. Day Development Company. He built single family homes, mostly in Dunwoody. He was 23. Day went to the University of Virginia to study business. He earned an MBA in 1988 and came back to Atlanta to work for Trammel Crow Company, in office and industrial leasing and construction. But the idea of getting back into the hotel business had not left him.

"In the back of my mind, I knew I wanted to be in hotels," he says.

Day met Fred Cerrone at Perimeter Church. They decided to go into business together, building Fairfield Inns, an affordable hotel chain under the Marriott brand.

Day is in charge of site selection and putting the money together, while Cerrone is building on his years of hospitality management experience.

Day Hospitality built its first hotel, a Fairfield Inn in Alpharetta, in 1995.

The company recently broke ground on a 10th hotel project. Day expects to have 15 up and running by the end of 2000. The privately held company employs 250 people. It is on pace to take in $12 million in 1999. Day, 38, expects to do about $16 million in 2000.

Day Hospitality builds limited service Marriott hotels, including Fairfield Inn, Residence Inn, Towne Place Suites by Marriott and Spring Hill Suites by Marriott. Most are in the Atlanta area. Recently, Day decided to start building hotels in Macon and Charlotte.

But while the hotels are not Days Inns, Day still carries on his father's legacy. Cecil Day did not put bars in his hotels. He wanted an atmosphere more conducive to families and drinking did not mesh with his beliefs. For that reason, Day "decided we wouldn't do Courtyards [by Marriott] because you have to have a bar."

Day's values shape the day-to-day operations of the hotels as well. "When Fred and I started this company, we asked ourselves what kind of company we wanted to work for," he recalls. "And we laid out a 22-point value system."

The values include hotel general managers spending five minutes a day talking with the management team about the value of the day and five minutes talking about a training tip related to the value, Day says. The company also offers employees a 3-month paid leave of absence after five years of employment.

"With the cost of training and retraining, it's the best money we can spend," he says. "If you can keep someone five years when the industry average is seven months, do the math."

So far, the philosophy has paid off. Day was named one of five finalists for the Metro Atlanta Small Business Person of the Year in 1998. One of his general managers was named GM of the Year for the Fairfield Inn brand. And the Alpharetta hotel placed first for friendliness.

"We've been very fortunate," Day says. "Things have worked really well. That philosophy has worked really well."

And even though Day is walking the same path his father walked, he's doing it his own way.

"I'm not trying to do what he did," he says. "My main concern is not trying to be the biggest hotel company in the world. It's how you positively impact the lives of those who work with you." **GT**

Mark Clothier is an Atlanta freelance writer.

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Early **Warning**

Tech scientists test cutting-edge technology for detecting tornadoes

By Jane Sanders

Testing has begun on the next generation of tornado-forecasting technology that could increase warning time by as much as 50 percent in North Georgia.

Researchers at the Georgia Tech Research Institute (GTRI) are testing and optimizing the National Severe Storms Laboratory's (NSSL) Next Generation Warning Decision Support System (NG-WDSS) during the 1999 and 2000 tornado seasons. Though the test area is North Georgia, the study results will be applicable throughout the state.

The NG-WDSS was installed at the National Weather Service's Peachtree City office, and two more systems were deployed in GTRI laboratories.

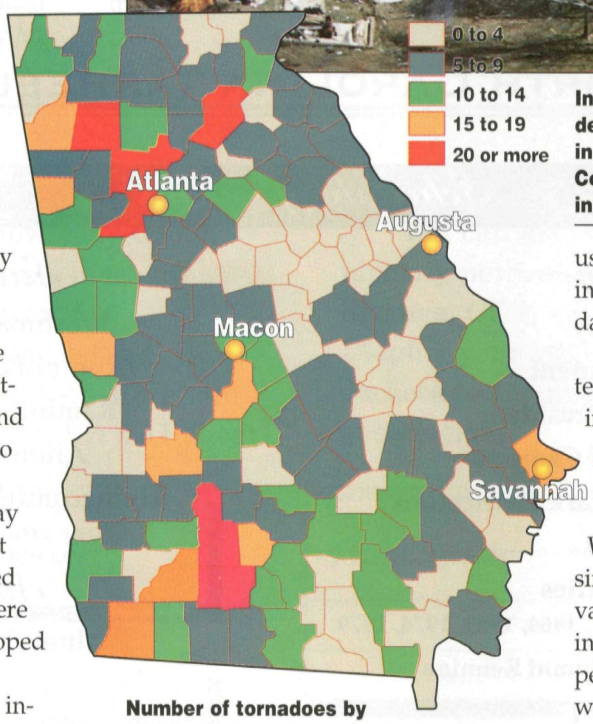
"We will be optimizing the system to reflect Georgia's environment," says Gene Greneker, a research scientist who is heading GTRI's recently established Severe Storms Research Center (SSRC). "Tornadoes in Georgia and elsewhere in the Southeast are often short-lived events. They can come and go in 10 minutes, as opposed to an hour in Kansas. As a result, the radar-signal processing may need to be set slightly different from those that were developed for the Great Plains states, where the NG-WDSS was first developed and tested."

Optimizing the system will involve researchers collecting storm data and determining if changing parameters in the NG-WDSS algorithms will make it work better in Georgia.

NG-WDSS provides a set of tools that help forecasters make more efficient, effective and timely decisions on warning the public of tornadoes, severe thunderstorms and flash floods. The system includes advanced image processing, artificial intelligence, neural network and other algorithms that use Doppler radar data. The data is integrated with other weather-sensor data to guide forecasters.

Courtesy of Georgia Emergency Management Agency

In Georgia last year, there were 23 deaths related to severe weather, including several caused by a tornado in Hall County. Researchers believe better warning systems could lower this toll.



Number of tornadoes by county in Georgia, 1950-1998

Another important part of the system is how it displays and presents information to forecasters.

The NSSL, a part of the National Oceanic and Atmospheric Administration, has successfully tested NG-WDSS in various parts of the country since 1996, when it operated as an advanced system at Peachtree City during the Olympics. Because of the expense of deploying the NG-WDSS, it will not be fully implemented across the country for another five to seven years, Greneker said.

But in Georgia, funding from the Georgia Emergency Management Agency (GEMA), the Federal Emergency Management Agency and the Georgia General Assembly allowed

the SSRC to contract with NSSL to deploy the NG-WDSS systems installed in Peachtree City and at Georgia Tech.

BellSouth Business Systems is providing funds to pay for high-speed data-transmission lines.

An initial one year of funding for SSRC—a three-year project—followed recommendations made last year by former Gov. Zell Miller's Task Force on Warning and Communication. Miller formed the task force after severe storms claimed 23 lives in Georgia in 1998.

Gov. Roy Barnes has pledged continued support for the project.

Forecasters and emergency management officials believe that better warning systems, such as the NG-WDSS, could lower such death tolls. In addition to improving warning time, NG-WDSS should result in fewer false alarms.

"False alarms desensitize the public to valid warnings," Greneker says. "While the NG-WDSS will not totally eliminate the false-alarm problem, test data shows that it can help."

With the NG-WDSS installed in GTRI's laboratories, researchers are testing the system, Greneker says. Part of that effort includes collecting data in the aftermath of tornadoes. "This information will help us determine how much warning the NG-WDSS provided before the tornado touched down," Greneker explains.

So far this tornado season, researchers have not been able to conduct many tests because of the small number of severe storms. "Other than the tornadoes in Vienna and Metter, it's been a very quiet tornado season (usually January to May) this year," Greneker says.

"So it's given us a breather to get the equipment installed. By next spring, we will be ready to really test the (NG-WDSS) system." **GT**

Jane Sanders is editor of *Research Horizons*, Georgia Tech's research magazine.

Studying **Stealth**

GTRI-designed equipment offers improvements in radar-tracking technology

By John Toon

The U.S. Air Force will soon begin operation of an upgraded test facility believed to be the only one of its kind in the world able to conduct wide bandwidth bistatic imaging and radar-cross-section (RCS) measurements of full-sized aircraft.

Bistatic measurements are essential to understanding the stealth characteristics of military targets that use shaping as the primary approach to radar-cross-section reduction (RCSR).

The Bistatic Coherent Measurement System (BICOMS), installed at an outdoor test facility at Holloman Air Force Base in New Mexico, was designed by researchers at the Georgia Tech Research Institute (GTRI) for the U.S. Air Force 46th Test Group, Radar Target Scattering Division (RATSCAT).

"The Air Force has upgraded its existing fixed-site capability to a state-of-the-art system, and provided a mobile system that is almost identical to the fixed system," explains Ted L. Lane, GTRI principal research scientist and the project's principal investigator. "The mobile system can be moved around on the range, allowing the Air Force to do bistatic, as well as monostatic, tests."

The new mobile radar unit—40 feet tall, 66 feet long, 37 feet wide and weighing 90 tons—was built at GTRI's research facility near Atlanta, then shipped to RATSCAT.

The two radar systems are coherent and linked together using fiber optics for bistatic measurements, but can also operate independently to provide high-speed, simultaneous measurements of two separate targets under test. Operating together, the two systems can simultaneously produce bistatic and monostatic data from each radar unit.

GTRI researchers designed and supervised construction of the transportable unit, which is the world's largest mobile radar-cross-section measurement system.

Beyond the expanded capabilities, the system includes automated calibration equipment that will improve its efficiency. A key part is a GTRI-designed field probe that provides detailed information in much less time than earlier systems. The automated field probe (AFP) is a coherent, one-way amplitude probe that links the signals from either of the radar units to a transmitter located in the field probe via fiber optics.

"This is a very big improvement that allows us to quantify how uniform the electromagnetic field at the target plane is in real time," Lane says. "At a big range like this, efficiency is one of the big drivers," he explains.

Difficulties in calibration could affect the accuracy of the data—and performance of the military systems. Calibration must be repeated during the day as normal heating and changes in the sun alter conditions of both the fiber optics and the test range.

"Monostatic radar-cross-section calibrations are relatively straightforward," Lane says. "Bistatic calibration over wide bandwidths (1 to 18 GHz and 34 to 36 GHz), wide bistatic angles, and especially for cross-polarization, is a real challenge. Monostatic testing can calibrate against known targets, but no standard exists for bistatic cross-polarization measurements in this test scenario.

Since BICOMS is also a fully polarimetric system, this complicates the calibration. We have developed what we believe to be a simple extension of existing techniques to solve this problem and will be testing this approach

during system validation," he says.

"Since the radars are wide bandwidth systems and the target is rotated during the measurements, both high-resolution downrange and cross-range images are produced by each radar for both monostatic and bistatic conditions. This is in addition to total or absolute radar-cross-section data," Lane explains.

"Bistatic measurements require linking the fixed and mobile radar systems with a 2-mile-long fiber optic cable, allowing synchronization of timing and control, as well as phase locking necessary for gathering the coherent data."

At BICOMS, the mobile system can measure the scattered energy not only at different angles but also at varying distances from the aircraft under study. Because it can be moved close to the targets, it can also measure near-field effects to understand how factors such as glint affect the radar signature. This is of particular interest for missile-aircraft engagements.

The project began in 1994 with a review of the Air Force's need for bistatic measurements at RATSCAT. Design and construction began in 1997 and involved five subcontractors. The mobile system was shipped to New Mexico in May 1998, and the fixed system began installation in June 1998. **GT**

John Toon is director of Tech's Research News and Publications Office.

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The **Buddy** System

A new rehabilitative device combines form and function to improve the lives of disabled children

By T.J. Becker

Taking a giant step forward for non-ambulatory children, researchers at the Georgia Institute of Technology have developed a rehabilitative device called a prone stander that takes the angst out of therapy.

Prone standers allow children with mobility impairments to stand upright. Proper weight-bearing on long bones helps prevent osteoporosis while improving circulation, muscle tone and functioning of internal organs.

Although important tools, prone standers can be quite intimidating from a child's point of view: Most are cold, sterile-looking contraptions with all the appeal of an Iron Maiden. To help children keep a positive mindset, Mary Lou Tierney, a master's graduate of Georgia Tech's industrial design program, has created a prone stander with lots of panache.

Joann Vitelli

Prone standers, such as this one developed at Tech, allow small children with mobility impairments to stand upright.

Prone standers traditionally have been designed to work at the therapist's level—meaning that children are elevated to adult height. "It's easier for the therapist, but isolates the child," says Tierney, explaining that the height can be frightening to small children and prevents them from interacting with others. Many children spend three or four hours a day in a prone stander, and that is a long time to be separated from playmates.

By positioning children just a few

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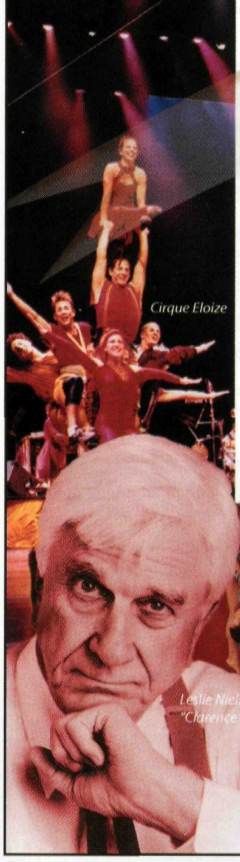

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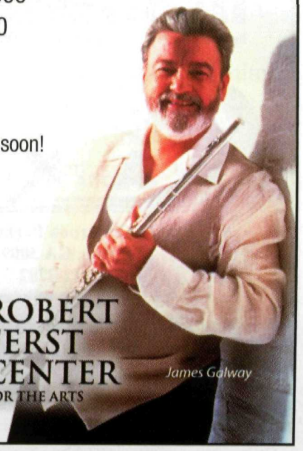

James Galway

inches off the ground, Tierney's "peer-level" prone stander allows them to hobnob with pals, use a computer or putter with a project on the removable plastic tray. Giving children more control helps lower emotional barriers to therapy, says Tierney, who has named her prone stander "The Buddy System" to reflect its user-friendly focus.

With its bright red pod and yellow confetti frame, The Buddy System "looks more like a whimsical space-age toy than some kind of institutional cage," says Julius T. Corkran, an industrial designer at Georgia Tech's Center for Rehabilitation Technology (CRT), a research center that deals with physical disabilities. Corkran helped Tierney with mechanical issues and construction of the prototype.

Placement is another departure from the norm. "Many prone standers provide too much support, and the child ends up being hung by his armpits," says Alan Harp, another CRT industrial designer who worked on the project.

When this happens, weight is not really applied, and strapping can cause pressure sores. In contrast, The Buddy System uses wider straps and unique cushioning that supports the body, but still allows weight to be transferred. "It doesn't hold you as much as it aligns and positions you," Harp explains.

Instead of traditional foam padding, cushioning at the torso, knees and hips is composed of an inch-thick gel. Covered with Darlexx (a soft, hypoallergenic fabric used for wheelchairs and wetsuits), the gel conforms better to a child's body and allows pressure to be dissipated, preventing irritation.

Accommodating children from 25 to 40 inches in height, The Buddy System is easy for therapists to position children in place. Yet there are few removable parts, which is important in the clinical settings where pieces can be easily lost.

The Buddy System also adapts easily to the home environment—narrow enough to fit through standard doorways and with mechanisms that are easy to operate.

A patent application has been filed for the prone stander, and the Georgia Tech Research Corporation (GTRC), which assists in commercialization of research, has begun searching for licensees. The Buddy System comes with a full set of CAD drawings, a bill of materials outlining specific parts and their costs, and a pre-production prototype. **GT**

T.J. Becker is a freelance writer in Grand Rapids, Mich.

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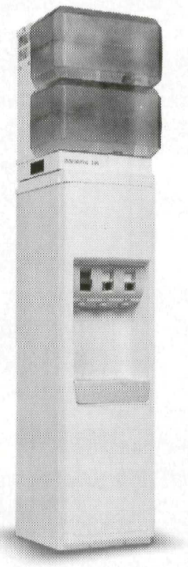

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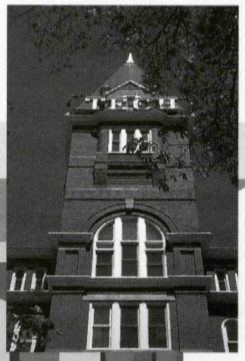

Clunker Pollution

A study monitors emissions of aging automobiles

People are driving their vehicles into the ground. This is good for the family budget, but not so good for air quality. As vehicles age, their emissions control systems become less efficient, and the vehicles release more pollution.

These are some of the findings of a long-term vehicle emissions monitoring program conducted in Atlanta since April 1993 by Georgia Tech's Air Quality Laboratory and funded by the Georgia Department of Natural Resources.

"Previously, there was not a systematic methodology for determining the effect of aging on a vehicle fleet over time with on-road measurements," says Dr. Michael Rodgers, director of the Air Quality Laboratory. "The Atlanta study is now the oldest monitoring program of its type in the world."

The Air Quality Laboratory also conducts similar short-term studies across the nation to complement the findings of the Atlanta monitoring program. These studies, funded by the U.S. Environmental Protection Agency, have been conducted throughout much of the eastern United States and are planned for parts of Oregon, Utah and California.

Using remote sensing, vehicle registration data and roadway observation studies, researchers now know that the average vehicle in Atlanta has about 90,000 accumulated miles on it, and that there are a significant number of vehicles with more than 200,000 miles on them. Knowing this information gives insight into the city's ozone pollution problems.

"As vehicles get older, there is degradation," Rodgers says. "Most vehicles gradually increase their emissions, but there are some catastrophic failures, such as holes in catalytic converters."

Fuel-injected vehicles manufactured since the mid-1980s tend to deteriorate more slowly than the previous generation of vehicles, Rodgers says. But people are driving their vehicles longer now, even in excess of 300,000 miles. So Atlanta can expect to see an increase in catastrophic failures in vehicle emissions control systems as its fleet ages, Rodgers explains.

Emissions inspections presumably detect vehicles with catastrophic failures. In reality, however, only 1 percent of vehicles manufactured in the past six years has failed an emissions test. "It's like looking for a needle in a haystack," Rodgers says. But the search is worth it because vehicles with catastrophic emissions systems failures can be responsible for 50 to 70 percent of emissions.

Georgia Tech researchers use remote sensing equipment at highway entrance and exit ramps to monitor vehicle emissions.

The Air Quality Laboratory uses both remote sensing and roadway studies to obtain its data. In remote sensing studies, researchers gather vehicle information at entrance and/or exit ramps. In just seven-tenths of a second, remote sensing equipment measures a vehicle's emissions as it breaks an infrared beam in its path. Other equipment photographs the vehicle's tag; researchers later use this photo to correlate emissions data with registration data. In roadway observations, researchers determine the total emissions released on a particular roadway.

For example, a recent study was conducted on Interstate 20 near Bremen, Ga. Researchers measured emissions from commercial trucks overnight. They monitored emissions and weather conditions both upwind and downwind.

The Air Quality Laboratory also conducts vehicle tests in its new dynamometer lab, which was donated to Georgia Tech earlier this year by Atlanta Gas Light Company. There, researchers determine when and why vehicles release high and low amounts of emissions. This detailed information complements the less-detailed data gathered in remote sensing studies. Researchers also conduct dynamometer equivalent tests on vehicles they purchase and equip with emissions instrumentation.

"Georgia Tech is one of a very few places in the United States to do both remote sensing and dynamometer testing," Rodgers says. "So we probably have the most comprehensive, university-based vehicle emissions testing program in the country." **GT**

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A Man of Letters

Professor and poet Larry Rubin bids adieu to Georgia Tech

By Shawn Jenkins

By his own admission, Dr. Larry Rubin is a technophobe: He doesn't interface. He doesn't log on. He doesn't download or upgrade—unless it involves replacing his old typewriter ribbon with a new one. The only link from his third floor office in Georgia Tech's Skiles Building to the outside world is a phone. Rotary. No voice mail.

"I'm a troglodyte," Rubin laughs. "I'm not on the Internet. No e-mail. Do you even see a computer?"

But in his 44 years as an English professor at Georgia Tech—a tenure which ended with the 1999 spring quarter—the award-winning poet and Fulbright Scholar has literally communicated volumes—despite his disdain for electronic sophistication.

In 1961, Rubin's poem "Instructions for Dying," inspired by a Tech football game at Grant Field, won him the coveted Reynolds Award as the best lyrical poem of the year. His first book of poetry, *The World's Old Way*, published in 1963, earned the Sidney Lanier Award from Oglethorpe College—now Oglethorpe University—and the Literary Achievement Award in Poetry from the Georgia Writer's Association. He has been named Georgia Poet of the Year by the Dixie Council of Authors and Journalists, and has lectured around Europe as a Fulbright Scholar and Smith-Mundt Award winner.

Quite a feat for a man who teaches iambic pentameter in a world of quadratic equations.

"It's always been a source of gratification to me that the fact that I write and publish poetry has been highly appreciated," Rubin says. "From the very start in the late '50s, when I first began publishing poetry, I'd go running to Ms. Chastain, Georgia Tech's public relations agent. She was very receptive to any of my reports of publications. One of my colleagues saw an item about a poem I published and he asked me, 'Who is your publicity agent?' I would answer, 'Ms. Chastain.'"

Four decades later, Rubin has four books of poetry to his credit: *The World's Old Way; Lanced in Light; All My Mirrors Lie* and *Unanswered Calls*. His published works number more than 800 and his unpublished ones, "more than the sands of the sea," he jokes.

"I guess I liked poetry because it didn't take as long as a novel. The first draft comes in a rush. I dash out my poems in a half hour and then I carry them around for six months and work on them," he says, gesturing to a shirt pocket bulging with nascent works. "I think you can say more in a poem in a more focused way than you can in a novel or a short story."

Rubin's literary journey began in the more structured field of journalism, which he studied at Emory University.

"When my journalism professors told me that you start out as a cub reporter and work from 8 a.m. to sunset with a lot of legwork, it didn't sound so appealing," he says. "I wanted to write editorials, but you don't write editorials right away. You have to be a venerable old person to do that. So, I started drifting toward English."

After earning bachelor's and master's degrees in journalism—with English minors—Rubin switched to English for his terminal degree at Emory.

"The more literature I read, the more I liked it," he says.

In the final year of his doctoral studies at Emory, he was approached by the head of the Georgia Tech English department and offered a full-time position. "We closed the deal on the steps of the library," Rubin says.

As a teacher of literature in a sea of engineers, Rubin sees his role at Tech as "unique," yet necessary. He believes literature does more than just balance out the two hemispheres of a student's brain.

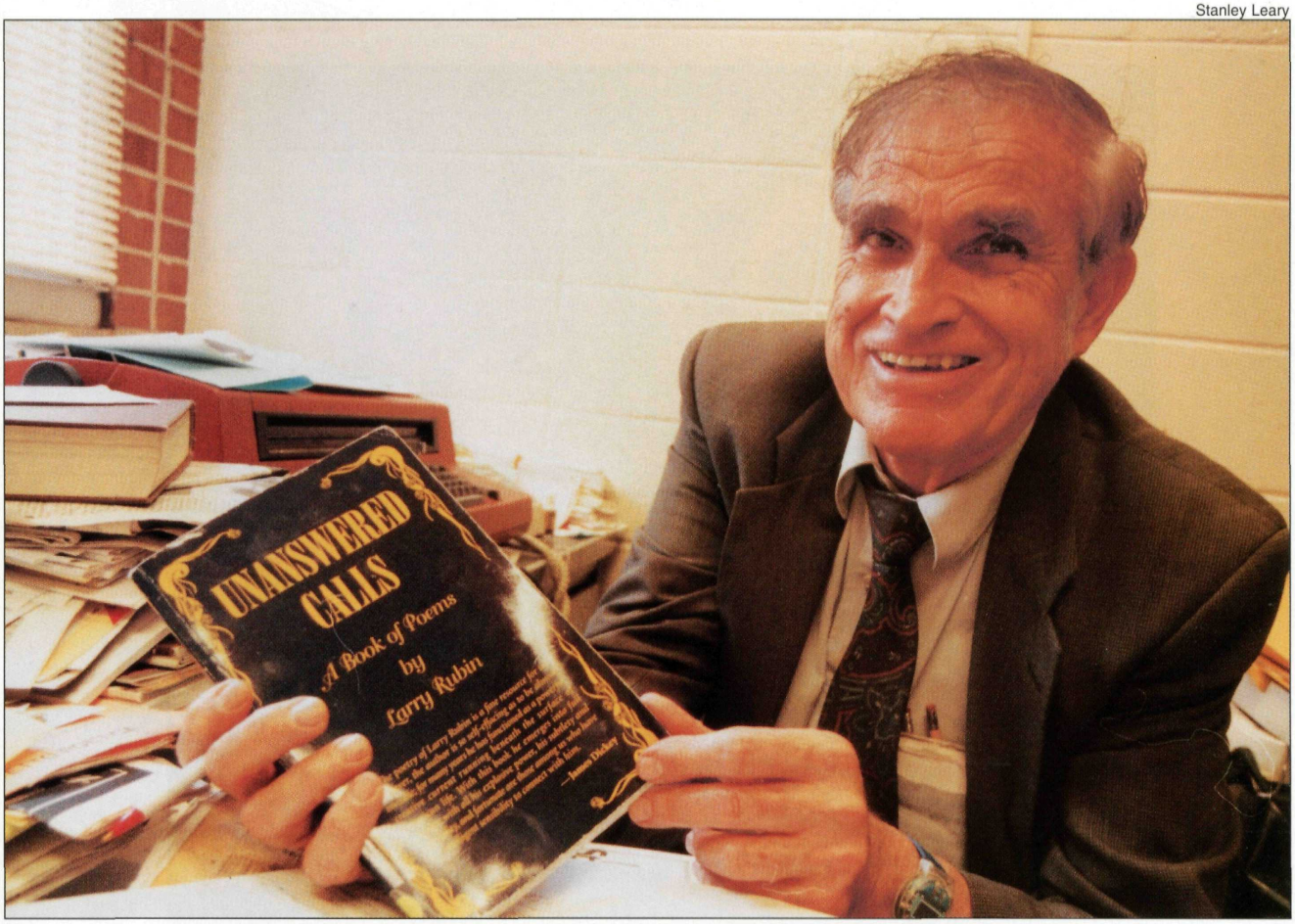
"I think it does for the engineering student what it does for any member of the human community: It sensitizes you to possibilities for being a human being and reacting sensitively," he says.

"It also makes a moral difference. I think somebody who's really turned on to the meaning of literature would never take a rifle and shoot his classmates. They would find it very difficult to turn on the gas in the ovens of the Holocaust. It deepens your bond to your fellow human beings."

The Rubin File

- **Born:** Feb. 14, 1930, in Bayonne, N.J.
- **Education:** BA, journalism, Emory University, 1951; MA, journalism, Emory University, 1952; Ph.D., English, Emory University, 1956.
- **Achievements and Honors:** "I'm really proudest of all to have taught here and for getting some of the students turned-on to literature," Rubin says. "That's a glorious achievement at Georgia Tech."
- **Leisure Interests:** traveling and meteorology—"particularly *hurricane* forecasting," says the Miami native.

Stanley Leary



After 44 years as an English professor at Tech, Larry Rubin is stepping down, knowing that his students' "words are mine."

But Rubin would find satisfaction in the students' mere appreciation of the works themselves.

"I hope they'll just keep reading it," he says. "I sometimes doubt it. I hope they're not just reading it to make a grade. You often get the feeling that—not just at Tech, but at other universities too—they're only interested in the course insofar as it's a stepping stone to that little sheepskin money-maker you get after four years. But, some of the students I've dealt with are truly engaged in literature, and they'll go on reading it. They'll go to poetry readings. They'll buy books maybe ... or am I living in a dream world?"

Rubin sums up his dream for his students in a piece called *The Bachelor, as Professor*.

My sons are always young—
The liquid flowers of their eyes may change
But the light remains.
Their names are always on the chart
Spelled differently year by year
(In rollbooks of my mind
I can correct what seems irregular).
I cannot age.
Waves of time dissolve that flare of faces
Every spring, yet the waters bloom again
With eyes: I swim toward them, an athlete at last.
Though I reach for them invisibly, in voice,
Any bell is strong enough to break that bond—
But when they're safe at home and sipping soup
And telling body parents how they mean to thrive,
Their eyes are fixed upon unborn designs:
Their words are mine.

In his retirement, Rubin plans to keep writing, to travel and to learn Yiddish so he can read the columns and essays his grandfather once wrote for a Jewish newspaper in New York. But first, taking a line from the Robert Frost classic, Rubin has 'promises to keep.'

"The first thing I have to do is go to Charlottesville, Va., and fulfill my function as a literary executor for a poet who died eight years ago," Rubin says. "His name was John Moffitt. He was a very fine poet who made me promise to be his literary executor. He's left a lot of stuff unpublished, and my job is to go through it and see what should be published and make a book out of it.

"I fully intend to carry this out. I made him promise not to haunt me if I waited until I retired, and he hasn't haunted me ... so I have to fulfill my part of the bargain." **GT**

Caroline Joe Photos

High **Five**?

Or maybe high *none*. Brian Skeens seems to be so focused on completing this year's George C. Griffin Pi Mile Road Race that he missed the congratulatory slap from Buzz. Not to worry: just like the other 423 racers, he got a T-shirt and a cold drink at the end of the 3.14-mile course.

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