TECHNOLOGICAL LEADERSHIP IN A CHANGING WORLD

State of the Institute Address, October 2002

Georgia Tech President G. Wayne Clough

(TITLE SLIDE)

I am pleased to have the honor of reporting to you on the state of the Georgia Institute of Technology. Another year has passed during which I have had the privilege to serve as your president in a time of exceptional progress.

Over the past two years, my State of the Institute addresses outlined how we are working to improve Georgia Tech to position us to define the technological university of the 21st century. We understand this in the context of our ambitious agenda, but I would also like to suggest that our goals can help, as never before, to serve the needs of a nation and indeed a world. Never has the need for technological leadership been so great, and never has Georgia Tech been better positioned to step forward and provide that leadership.

This came to me clearly at a recent meeting of the President's Council of Science and Technology Advisors where Secretary of State Colin Powell spoke about the rapidly growing need for technology and technologically informed leaders in the State Department. He said, "I'm trying to create an atmosphere that says science and technology have fundamentally changed the way in which we must operate as a Department, as a group of people…It gets to the heart of what the State Department does… helping people around the world to create a better life for themselves and for their children, especially helping those nations we call developing." That sounded to me like a ringing endorsement of our educational offerings here at Georgia Tech, and the potential for a broader role for us in the future.

(SLIDE #2: Year in Review)

However, before reaching too far, I want to touch on some of the significant accomplishments of the past year and report on the progress of several of the initiatives we have undertaken. Each of you has a brochure at your seat that lists more of the accomplishments of the past year than I have time to name in my talk today. I encourage you to read it. There is much to be proud of and many people are to be congratulated for all they did to make Georgia Tech a better place today than it was last year.

(SLIDE #3: Student caliber)

Walk across campus today, and you will be surrounded by the largest study body in Georgia Tech history. It is not that we are admitting more freshmen – we have held the freshman class at roughly the same size for the past several years. But we are growing in three other ways: First, we are better at keeping our students. Ninety-one percent of last year's freshmen are back this fall – the highest rate of retention in Institute history. Second, as our reputation improves, we are attracting more graduate students, and that is important because they drive our research capabilities. Third, we have a growing number of students pursuing degrees in southeast Georgia, Singapore, France, or online. So that our student population here in Atlanta remains manageable even as our total enrollment continues to grow.

The caliber of our students has been increasing along with our enrollment, and we now boast one of the brightest and most talented student bodies of any public university in the United States.

(SLIDE #4: Athletes)
We are unique among the nation's technological universities in fielding 17 Division I-A athletic teams, and we pursue excellence in athletics just as we do in academics. For many people across the nation, athletics is their introduction to Georgia Tech, and for many of our alumni around the globe, athletics keeps them connected with the Institute.

Georgia Tech is unique among Division I-A schools in that we do not offer a calculus-free major that allows our athletes to cruise through their academics. In addition to the outstanding achievements noted here, I am very proud to say that at the close of last year, 38 percent of our student-athletes were on the Dean's list or Faculty Honors and the grade point average was the same as the rest of the student body. Next year the fruits of our efforts to recruit the best student athletes and to provide them with a supportive environment will pay off in improved graduation rates.

(SLIDE #5: Women)
This fall we celebrate the first 50 years of women at Georgia Tech. Pictured here is Shirley Mewborn, prominent Atlanta engineer who was one of the first two women to graduate from Georgia Tech. In the most recent issue of our alumni magazine you will see stories about many other remarkable women who followed in Shirley's footsteps. The legacy they have left and are continuing to build, is impressive and inspiring, but the best is yet to come as we graduate thousands more bright and talented young women who will take their places as leaders in science, engineering, and other professions.

(SLIDE #6: Faculty chairs)
The caliber of our faculty continues to impress as we have shown an ability to attract top scholars from other universities and industry. In addition to the three school chairs pictured here, we welcomed 16 world-renowned scholars who are filling endowed chairs, many of them created during the Campaign for Georgia Tech. These folks join a class of almost 70 new faculty who came to our campus this year, a group helping us increase the size of our faculty and fill important gaps that will help us meet our strategic goals.

(SLIDE #7: Faculty awards)
Our younger faculty demonstrated their excellence by winning a range of awards over the past year. In addition to two PECASE awards presented personally by President Bush to Reggie DeRoches and John Zhang, thirteen others won CAREER Awards from the National Science Foundation. This number tied our previous record high for one year and pushed our total to second nationally and ten ahead of that other institute of technology up north.

(SLIDE #8: Books)
Recognitions flowed in this past year for outstanding books published by our faculty, and their themes were not among the "usual suspects" normally expected from Georgia Tech. They reflect our growing excellence in areas outside of engineering and science. *The Financial Numbers*

Game was the result of several years' work by DuPree Professors Eugene Comiskey and Charles Mulford, and I'm not sure how they figured out the timing of it. But the book hit the stands right in the middle of the Enron uproar and shot straight into the 25 best sellers on Amazon-dot-com.

The attention that has been received by *Beyond the Neon Lights* and *Lyrics of Sunshine and Shadow* not only demonstrates the outstanding scholarship of individual members of our faculty, but it also indicates that Georgia Tech's contributions to the humanities are becoming more visible and recognized.

(SLIDE #9: Rankings)
Honors and awards like these help strengthen our reputation, and while rankings always have to be taken with a grain of salt, they are a determining factor in our broader image in the world at large. This year we evidenced our staying power, maintaining our ranking among the nation's top tier universities, while a number of our individual disciplines continued a march up the rankings. Getting there was half the battle and I am pleased we showed we now are developing that sticking quality that allows you to stay ahead of competition.

(SLIDE #10: Research)
None of us believes numbers make up the whole story, but it is impressive that the value of the research awards we are receiving continued to increase and even accelerated. This occurred while some universities saw a decline and the environment for such funding became more competitive. What this says to me is that our faculty, students and staff form a team that is hard to beat. Our research volume is now among the top thirty in the nation.

(SLIDE # 11: Entomopter video)
But great research is about more than dollars; it is about creativity and innovation, which we have in abundance at Georgia Tech. One invention that tickles my fancy is the little insect-like robot pictured on the screen called an Entomopter, which in true scale is about four inches long. Developed by Rob Michelson at the Georgia Tech Research Institute, it is undergoing testing for specimen and data collection on Mars which has virtually no atmosphere, making flying extremely difficult. But as you can see, the Entomopter is cleverly designed with tiny front and back wings that flap to do the trick. Within the past year, the Entomopter took top prize over 1,000 other entries in an international competition in Rome, Italy, and it won't be long till this little next generation Buzz takes a giant step for mankind and says to our world and anyone else who might be watching that Georgia Tech is a place where great ideas become a reality.

While you are watching the Entomopter, let me mention another invention that is so good folks are clamoring to be first in line to provide funding to commercialize it. Fast-Talk, developed by faculty in the School of Electrical and Computer Engineering, is a ground-breaking search engine that allows its user to find spoken words on an audio tape or the soundtrack of a videotape. Because it uses signal processing to search for words phonetically, it can search 20 hours of audio tracks in one second to find a key word. An amazing accomplishment!

(SLIDE #12: Improving the Institute)
While we work to provide opportunities for our students and faculty to be creative, at the same time we have to be attentive to the fundamentals. We will not succeed as an institution if we don't continually look to improve the basics and learn from our mistakes. Last year's State of the Institute address focused on the Strategic Plan, which was then in the process of being shaped. The plan is now complete, and you can find it online at www.president.gatech.edu. It lays out the goals and objectives we are going to strive to achieve over the next five years. I encourage you to read it.

Campus safety continues to be an important concern, especially in our urban setting. We are working in partnership with the neighbors around our campus to upgrade our community, which is the long-term key to overcoming crime. But we are also enhancing day-to-day security, including hiring a new director of campus security, increasing the size of our police force, and preparing emergency plans for all events and activities on campus.

Last year's honor code violations have been resolved, but more importantly, we used this problem as an opportunity to engage in a broader discussion as to how to improve our approach to required computing courses and academic misconduct. Our faculty and students worked hard to help us to develop a more effective and sophisticated system to address such sensitive issues.

The Greek system at Georgia Tech is part of our history and alumni who participated in it when they were students are among our strongest supporters. Yet, as with other campuses, there have been problems that require our attention. We are working actively with our alumni and student leaders from our fraternities and sororities to insure that the Greek system continues as a positive social option for our students.

Two years ago, I introduced a major undergraduate initiative in my State of the Institute address, and last year I spent time on the concept of a student-focused education. This remains a high priority since many of the issues highlighted cannot be changed quickly and require our long-term attention.

(SLIDE #13: Midterm grades)
Last fall we instituted a mid-semester grade report, alerting those students in 1000 and 2000-level courses who were not doing well. Students whose performance was unsatisfactory were urged to meet one-on-one with their academic advisors to discuss how to remedy their situation. This in itself is an important step since it encourages faculty-student interaction at a critical stage in the careers of our freshmen and sophomore students.

Last year, about 900 students received unsatisfactory notices, but it is encouraging that about 60 percent of them went on to pass their courses. We still don't have enough data to say whether there has been any long-term statistical improvement, but there was measurable improvement in student academic performance.

(SLIDE # 14: Undergrad research)
Two years ago I announced an initiative to involve more undergraduates in research, and in our Strategic Plan we set a goal to increase by 50 percent the number who engage in research at

some point in their undergraduate career. I am pleased to report that last year we doubled the number of grants we provided from the fund for undergraduate research and this year we are on track to exceed last year's totals.

(SLIDE #15: Campus focus)
Beyond excellent programs, a great university provides a focal point that serves to physically bring students and faculty together as a community and provides an identifiable center that recalls the special nature of the university. On our campus, the area with the potential to do that lies between the Skiles Building with its heavily used classrooms, the Price Gilbert Library, and the Student Center. Changes over the next several years will allow this area to become the most vital part of our campus, particularly with a view to serving the needs of our undergraduate students.

(keystroke) The first step is the demolition of the old Hightower Textile Engineering Building, which provides an opportunity to create a unique open space in the center of campus.

(keystroke) The second is the establishment of the West Commons in the library. Three years ago a group of students visited me asking for 24-hour access to the resources of the library. We also heard reports from the library reference desk that students were increasingly coming to them with technology questions, and from the Office of Information Technology that students were increasingly coming to them with content questions. Under the leadership of Dean Richard Meyer, these needs were answered this fall, as we opened the West Commons, a first-class $1 million center equipped with the best in computer information access and open 24 hours. The Commons is staffed by both OIT and the library reference desk to bring together support from two universes, previously orbiting different planets. Is it working? Our students now fill the seats all hours of the day. The remarkable success of the West Commons concept has led to plans to expand it by renovating another space the existing library in the short term.

(keystroke) The third component of creating a new focal point for undergraduates is the Houston Building, which now houses the Georgia Tech Bookstore. Next August the bookstore will move to Technology Square, becoming the South's largest source of technology-related resources. That will free up a large space in the Houston Building, which we will renovate for services and student-focused activities. The first $4.2 million renovation phase will be completed next year.

(keystroke) Next, with the open space created by the demolition of the Hightower Building, we will create a landscaped, green quadrangle that will be inviting for all to visit, alumni, friends, students and faculty. We will preserve the wonderful old trees that are there now and over a five year period gradually develop a green space, that will form the centerpiece of our campus.

(keystroke) Finally, framing the east side of the quad will be the new undergraduate learning center, located on the central core along with the library, the Skiles Building and the Student Center.

(SLIDE #16: ULC)
This innovative facility will be unique in the nation. Its Georgia Tech flavor will come from housing all of the basic science laboratories for freshmen and sophomore science classes in one place, which means virtually all underclassmen will come here regularly, if not daily. To support the teaching activities we will include the Information Commons – an advanced version of the present West Commons. And, because our freshman and sophomore students will be in the ULC

frequently, we will bring a comprehensive array of academic services into the building so they can find what they need in one convenient place.

(SLIDE #17: SAC-II)
In addition to these developments to create a new academic focal point for campus, we are also creating a new recreation focal point. Construction is underway to enclose the Olympic swimming pool. The gym and track pictured here are just two of the amenities that will be located above and around the pool. Others include game rooms, raquetball courts, a weight room, and a climbing wall – plus a stunning view of Atlanta's skyline. We are looking forward to making this new facility available by fall of 2004.

(SLIDE # 18: Tech Square)
As the little brochure at your seat indicates, we have nearly $500 million in construction underway right now. The largest undertaking is Technology Square between the interstate and the Biltmore. This $300 million project includes the DuPree College of Management, a Global Learning Center for distance learning and continuing education, a hotel and conference center, the 200,000 sq ft Technology Research Building, and a new home for our business incubator, the Advanced Technology Development Center, among others. Look for our grand opening next summer.

(SLIDE #19: Life Sciences)
At the Life Sciences Complex, the finishing touches are being put on the Ford Motor Company Environmental Science and Technology Building, which is the largest single academic structure ever built at Georgia Tech. And the Whitaker Biomedical Engineering Building is beginning to rise up out of the ground. The combination of Technology Square, these two buildings, and the Klaus Advanced Computing Building will provide 20 new classrooms, 8 new lecture halls and numerous computer labs, many of which will be available by next fall.

With all that is happening, there is much more that I could say about our progress, but I would like to use the remaining time to address the important issue of technological leadership and our role in providing it.

(SLIDE #20: "serving national needs")
As a concept, globalization has been around for a long time. The Canadian futurist Marshall McLuhan was talking about the global village as far back as the 1960s, and it took form as the Cold War ended and advanced technology began to leap geographic and political barriers.

Although much good has come from globalization, we have also learned that it is not so simple and, unfortunately, not always benign. We have discovered that an ocean on each flank no longer buffers us from the problems of the world. When somebody sneezes on the other side of the globe, we are in danger of catching cold. The world is increasingly looking for leaders who can provide solutions for the complexities and problems we face, and Georgia Tech is increasingly seen as one of the places where they are found.

(SLIDE #21: Homeland security)
Most of the time the world changes in gradual and seamless ways that feel like a natural progression. However, on September 11, 2001, it changed abruptly. Homeland security has become a priority concern, and Georgia Tech is stepping forward through its Center for Emergency Response Technology, Instruction and Policy (CERTIP for short). Directed by Dr. Tom Bevan, it was originally created to help prepare for the 1996 Olympics, but its relevance is now more important than ever before.

(SLIDE #22: Bush)
President George W. Bush and Homeland Security Director Tom Ridge made a special a visit to campus to see firsthand an emergency response demonstration featuring CERTIP's technologies. In a speech after viewing the demonstration, President Bush praised the technology he saw that allows our firemen, policemen and public health officials to understand the weapons they are facing, track their movement, communicate between themselves, and minimize the threat to innocent civilians.

We did not have to wait long after 9/11 for another of Georgia Tech's influences to be felt. Professor David Frost and his students were among the first called to Ground Zero to assist firefighters and policemen in locating victims and to map the heavy debris for removal from the site. Using a portable high-tech damage survey system first developed to for use after earthquakes, David and his team of graduate students made a high-tech damage survey at Ground Zero, providing immediately usable information in the recovery effort.

(SLIDE #23: Shoebox sensor)
Other research projects underway at Georgia Tech took on new meaning after September 11th. Technologies like a portable sensor that can instantly identify chemical and biological agents took on a new level of urgency. And once the war in Afghanistan was underway, clinical trials began on a remarkable biogel, which can be applied to protect and treat wounds where immediate medical care is not available.

(SLIDE #24: "finding international solutions")
The events of September 11 also reminded us that the best way to eliminate the scourge of terrorism over the long term is to contribute to international solutions. Georgia Tech's work with land mine victims in the Republic of Georgia in the former Soviet Union alerted us to the need for better technology and qualified practitioners in orthotics and prosthetics.

(SLIDE #25: Mark Geil)
As a result, the new School of Applied Physiology now offers the only master's degree in this area the nation, taking a fresh approach that incorporates hands-on experience with new technology like computer-aided design.

In addition to taking technology solutions around the world, we've taken them into outer space. A unique antenna designed and built at Georgia Tech is now an essential part of communications on the International Space Station. And the Hubble telescope is now sending back what NASA terms "the best images of the distant universe humans have ever seen," because of the efforts of a former Georgia Tech professor during a Space Shuttle mission last February.

(SLIDE #26 “sustainable environment”)
Our growing world population is increasing the pressure on a natural environment that is already strained and fragile, and it has become clear that politics will not fix the problem. Technology is the key and Georgia Tech research is helping provide the solution.

(SLIDE #27: Water & air)
The Nile River and its tributaries are the veins through which the lifeblood of Africa flows, and as the demands for water increase, so does the potential for conflict among the nations the Nile serves. Managing the Nile in a sustainable way calls for a system that integrates a range of complex factors, from weather patterns to river hydraulics. Georgia Tech research is designing that system, giving policy makers and river basin planners the tools they need to make sound decisions and resolve differences fairly and peaceably.

Air quality is yet another important issue, from ozone smog in the United States to a brown haze two miles thick over Southeast Asia that blocks sunlight and reduces agricultural production. New instrumentation developed at Georgia Tech is in use at air quality stations around the world to measure fine-particle aerosol pollutants and track the trends that are observed.

(SLIDE #28: Skidaway)
At the Skidaway Institute of Oceanography, Georgia Tech researchers are actively working on issues ranging from the impacts of global warming to the effect of water borne pollutants brought to the ocean by rivers and estuaries. At any given time, we have several faculty members and 15 to 20 graduate students working from facilities we have built to support our research initiatives. Our operations in this area will grow reflecting the increasing importance of water, and the water environment, in our lives.

Energy is another pressing global problem in search of a technological solution. Georgia Tech researchers are developing new power technologies that are not only cleaner, longer-lasting, and more efficient, but also do not require a huge grid of plants and power lines, so they are easily adaptable to developing countries.

(SLIDE #29: “shaping policy”)
And our leadership role goes beyond pure technology. A recent National Research Council report entitled “Technically Speaking,” highlighted another need. Quoting the report, “Congress and state legislatures often find themselves grappling with policy issues that require an understanding of technology. There is no evidence to suggest that legislators or their staffs are any more technologically literate than the general public.” It is not surprising that Georgia Tech increasingly finds itself called to lead in shaping public policy.

(SLIDE #30: Faces)
Growing numbers of Georgia Tech experts are serving the federal government in policy roles. In addition to those pictured here, Ed Reedy of GTRI serves on the Army Science Board; Ivan Allen College Dean Sue Rosser is a national expert on efforts to increase women in science and engineering; and Helena Mitchell of the Georgia Center for Advanced Telecommunications Technology advises state and federal policy makers on telecommunications issues.

(SLIDE #31: Goodman)
Georgia Tech is also active in local and international policy. Sy Goodman's expertise is sought after by countries like Egypt, Israel, and Zambia that have their eye on developing Internet access and e-commerce. And data from the College of Management's CIBER – the Georgia Tech Center for International Business Education and Research – provides a framework for doing business in the global marketplace.

Here in Atlanta, Larry Keating of the College of Architecture created the Community Design Center of Atlanta to promote a better quality of life for Atlanta's low-income neighborhoods. His recent book entitled *Atlanta: Race, Class and Urban Experience*, provides advice for local economic policy.

(SLIDE #32: "educating leaders")
From these examples it is easy to see the growing importance of our role in the issues that will dominate our lives in the future. But, as important as all of these contributions are, the most significant thing we do is educate the next generation. We are intent on graduating students who see their chosen professions through the prisms of environmental sustainability, globalism, and civic responsibility, and who have the skills to become leaders while leveraging their education and experiences at Georgia Tech to greater ends.

(SLIDE # 33: Leadership)
Last year I announced the creation of our student leadership initiative and over the past year this program has taken shape. Our goal is to allow every one of our talented students to be prepared for the time when they are offered a leadership role at some point in their career. In the future all undergraduate students at Georgia Tech will be exposed to leadership theory and get to practice it through a range of options, including internships, volunteer activities, capstone projects, and study abroad opportunities.

(SLIDE #34: Study abroad)
Mark Twain traveled the world and in his book *Innocents Abroad*, he concluded, "Travel is fatal to prejudice, bigotry and narrow-mindedness." His advice is even more appropriate today to prepare our students for their futures, and we are working hard to provide study abroad opportunities to more of them. During the past year nearly 800 participated – the most in Institute history.

A special group of our students are also headed abroad to study after having won some of the world's most prestigious scholarships. Here you see eight of the nine students who have won exclusive scholarships over the past two years – including our first Rhodes Scholar in many years and our second British Marshall Scholar in two years, after not having any for 25 years. Students also won Gates Cambridge scholarships, Fulbright Fellowships, and Goldwater Scholarships – a remarkable accomplishment for any university.

(SLIDE #35: Interns)
When it comes to leadership abilities there is a limit to what can be taught in the classroom. A lot of what makes a leader has to be learned through practice and from experience, and internships

often provide a structured opportunity to do that. Here are just two examples of the many Georgia Tech students who take full advantage of the opportunity internships to develop their leadership skills, and, as often is the case, their efforts have been recognized and rewarded. We encourage such involvements and feel they enrich a Georgia Tech technological education, preparing our students to tackle whatever the world might bring in the future.

(SLIDE #36: Quote)
In conclusion, we live a world of new realties where a naïve sense of innocence has been replaced with a harder edge. We are at risk for terrorism and diseases like West Nile virus. The economy wobbles and seems unlikely to resume its previous bubbly expansion. Population and industry growth is straining an already-stretched environment toward the breaking point.

It is a time that calls for leaders who can create effective technology and manage it constructively to shape the future. I hope I have illustrated in these remarks that Georgia Tech's strengths and abilities give us a unique opportunity to answer that call with the science, technology, management strategies, public policies and graduates that open the doors to a future defined not by pessimism and withdrawal, but by optimism and openness.