It is always a pleasure to come to Gwinnett County, and I want to thank you for inviting me to speak to you today. Gwinnett County has for many years been one of the most forward-looking places in Georgia. For the past several decades, you have been one of the fastest growing counties, not just in the state but in the United States, and it has been incredible to me to see the changes that have resulted.

Back when I was a student at Georgia Tech, Gwinnett was mostly farmland, with a population of about 45,000 people. By the time I came back to Atlanta as president of Georgia Tech 11 years ago, the population had increased about ten-fold. Of course, I knew that Gwinnett had become one of the fastest-growing counties in the United States while I was gone, but to come back and see the dynamic changes that growth had caused was still pretty amazing.

Today, Gwinnett County has more than 700,000 people, and you are about to become the site of the newest college in the University System of Georgia. The rapid growth of the Gwinnett University Center to an enrollment of about 8,000 students was a clear indication of the value this community places on higher education. And next fall at this time Georgia Gwinnett College will have enrolled its first group of students in a range of associate degree programs plus several bachelor’s degree programs that focus on Gwinnett County’s workforce needs. This is a very important step forward for Gwinnett County, because the global economy that is developing around us demands an educated workforce.

Within the past two weeks or so, Georgia Tech hosted two events on our campus that brought the nature of the global economy into clear focus. One was a visit by Tom Friedman, who wrote the book *The World is Flat: A Brief History of the Twenty-first Century*. And if you haven’t read it yet, I highly recommend it. The other was The Innovation Summit, which gathered business, education, and government leaders from around the South and experts from across the nation to begin the discussion of how we as a region can become more deliberate and focused about stimulating the innovation it will take to compete in the global economy.

Those two events are book-ends of what I want to talk to you about today. I begin with Tom Friedman. There are probably some who would disagree that the world is flat – those who are the victims of off-shoring would probably say the world is tilted, so that jobs are sliding downhill from the United States to other countries where wages are
cheaper. If you have read the book, you know that Friedman is actually describing the leveling of the global economic playing field, which is threatening the economic leadership the United States has enjoyed since World War II. Information technologies now interconnect the world, and anyone with a computer and Internet access can be an instant player in the global economy. Rising technological competency in nations from Ireland and Finland to China and India mean that skilled workers from anywhere in the world are only a mouse click away. The United States is finding itself challenged by ambitious nations who are entering the innovation space with plans to knock off those at the top.

The Hart-Rudman Commission on National Security in the 21st Century, which did its work between 1998 and early 2001, produced the single most accurate predictive report of any commission of its kind. Well before the terrorist attacks of 9/11, it foresaw the rise of terrorism and proposed the establishment of a cabinet level homeland security department. But few have noted something else the commission’s report also said: “The inadequacies of our system of research and education pose a greater threat to U.S. national security over the next quarter century than any potential conventional war that we might imagine.”

Craig Barrett, Chairman of Intel put it this way: “The U.S. is not graduating the volume of scientists and engineers, we do not have a lock on the infrastructure, we do not have a lock on the new ideas, and we are either flat-lining, or in real dollars cutting back, our investments in physical science and engineering. The only crisis the U.S. thinks it has today is the war on terrorism. It’s not.”

With the start of a new century, we suddenly find ourselves facing a new world. Population demographics indicated that in 20 years from now, 56 percent of the world’s population will live in Asia, compared to 4 percent in the United States. As Tom Friedman points out, even if only 10 percent of Chinese, Russians, and Indians become engaged in the global market, that is still more than the entire population of the United States. Already the number of cell phone users in China is greater than the entire population of the United States.

Nations like China and India have been deliberately investing in building world-class universities. Thirty years ago, the United States was conferring 54 percent of the world’s Ph.D. degrees. The brightest and best students from around the world were attracted to our shores for graduate study, and many of them stayed because opportunities here were better than at home. By 2001, our share of the Ph.D.’s awarded around the world had dropped to 41 percent, and China, which was conferring no Ph.D. degrees at all as recently 1985, was producing 12 percent of the world’s Ph.D.’s.
What’s more, in China 40 percent of college students are majoring in engineering, compared to 6 percent in the United States. Just in this year, 325,000 Chinese earned engineering degrees compared to fewer than 60,000 Americans. India and the European Union have also surpassed the United States.

As nations like India and China develop world-class universities and offer skilled workforces, we are seeing high-tech corporations move their research and development facilities overseas to join their manufacturing and service facilities. Microsoft’s biggest R&D facility is not in Seattle, but in Beijing, China. GE’s Jack Welch Research Centre in Bangalore, India, employs 2,500 scientists, and CEO Jeff Immelt recently announced a $250 million medical facility to be built in New Delhi. Pharmaceutical giant Merck & Company has major research and development facilities in 11 nations.

Companies such as these can hire five chemists in China and at least that many engineers in India for the cost of one equivalent in the United States. But lower wage scales are not the only attraction. These nations, with their emerging middle classes who are hungry for consumer goods, represent the world’s largest technology markets. In an economy that is driven by innovation, the winners are those who are first to get new ideas to the market, which makes it very attractive to locate your operation close to a major research university that is in a major market.

We are standing on the brink of a new industrial order with clear potential for the 21st century to be the age of Asia’s economic ascendancy. America has a rich heritage of entrepreneurism that propelled us to the forefront as the most prosperous and powerful nation in the world. But it is growing clear that we are in trouble if we simply rest on our laurels and put our economy on cruise control. As Will Rogers once quipped, “Even if you’re on the right track, you’ll get run over if you just sit there.”

In this new, highly competitive, global economy, it would be unrealistic for the United States to think that we will continue to dominate the high-tech end of the economy as we have in the past. Our wages and health care costs are higher than those of our global competitors. The largest technology markets and technological workforces will soon be in Asia. And we can expect to produce only one of every four or five major inventions. How can we compete in this environment?

No nation, no region, no community, no business can compete against hungrier, highly educated, lower-cost global competitors by using the same old status quo products and methods. The trick is to cultivate the kinds of research, jobs, and industries that cannot be easily done elsewhere. And that requires us to be in the leading edge of innovation. The U.S. Council on Competitive defines innovation as I$\textsuperscript{5}$, or the intersection of five I’s:

3
ideas, imagination, invention, insight, and implementation. Innovation begins with research in science and engineering to generate the discoveries and inventions, then adds to them the ideas and insight that enables them to be implemented to solve problems, address the needs of society, meet market demand, and even create new markets.

Innovation is a social activity that emerges from conversations and collaboration. At universities like Georgia Tech, it is often triggered by open-ended conversations across the traditional academic disciplines that enable people to piece together their ideas, knowledge, and inventions together in unique ways. For example, Mark Allen is an electrical engineering professor at Georgia Tech and a recognized expert in MEMS, which stands for micro-electro-mechanical systems. Mark used this technology to develop a tiny sensor for the Defense Department that is placed inside the engine on an unmanned military drone aircraft. It monitors the air flow and turbulence in the engine and radios its measurements to a controller who is somewhere else on the ground. Mark’s technology helped make the successful use of drones possible in Afghanistan and Iraq.

Then Mark struck up a conversation with a doctor at a hospital in Cleveland who was looking for a solution to a problem that cardiologists have with patients who have congestive heart problems or stents inserted in their arteries. These patients need frequent monitoring, and the current technique is a CT-scan, which is not only expensive, but requires the use of a dye that is toxic to the kidneys. Pretty soon these heart patients develop kidney problems that keep getting worse with each CT-scan.

The result of this unusual collaboration between an electrical engineer and a cardiologist has been the development of microscopic sensors that are either built into a stent or sent through the blood stream to lodge in a lung. Instead of a CT-scan, the doctor simply waves a wand in front of the patient’s body. The wand uses radio waves to activate the sensor, then picks up the readings it sends. In some cases, the patient does not even to the doctor’s office, but sends in readings over a phone line.

Mark Allen is now the co-founder of a start-up company called CardioMEMS. The company’s first sensors began human clinical trials last year and should soon enter the market. This is the kind of interdisciplinary collaboration that is at the heart of innovation.

It was my privilege to co-chair the National Innovation Initiative of the U.S. Council on Competitiveness together with IBM CEO Sam Palmisano. During 2004, we conducted a year-long discussion involving more than 400 leaders from industry, academia, labor,
and government about how to create a more favorable environment for innovation. The 30 recommendations that resulted are contained in a report entitled “InnovateAmerica.” I obviously do not have time to tell you about all 30, but they fall under three broad topics: Talent, which is the human dimension of innovation; investment, which is the financial dimension; and infrastructure, which provides the framework for innovation.

The talent recommendations address the question of replenishing the pipeline of scientists and engineers who make the discoveries and inventions that are at the heart of the innovation ecosystem. We also need to help our broader workforce prepare to participate and thrive in an innovation economy. This represents a challenge for Georgia and the South, because we have traditionally undervalued education and used low-wage strategies to compete.

The investment recommendations range from increasing federal and industry funding for research, to growing venture capital, to providing support for risk-taking and longer-term innovation strategies. On this one, we have several challenges here in the South. We tend to be below the national average in the R&D that goes on in industry, and we are thin on venture capital compared to hot-beds of innovation like Silicon Valley in California and Massachusetts.

The venture capital business is a form of “service industry” and as such it does not travel well. Venture capitalists have come to understand the need to be close to their investments so that they can help to strengthen the management and strategy development of the young companies they invest in. So it is essential to provide seed funding to help jump-start the venture capital process in our region. As last week’s Atlanta Business Chronicle reported, Governor Perdue, who is the present chairman of the Southern Technology Council, is involved along with Mike Cassidy of the Georgia Research Alliance and Atlanta investor John Huntz, in exploring the creation of a regional venture capital “super-fund” for the South.

The third group of National Innovation Initiative recommendations address infrastructure, by which we mean not only physical infrastructure, but also policy tools in areas such as intellectual property and metrics to help us better value the intangible assets that increasingly drive economic growth.

But in a very real sense, innovation needs to happen at the local level. The things that need to happen in Washington – funding fundamental research, making policy changes, updating our antiquated patenting process and floundering health care system – these things are necessary to create a climate in which innovation can flourish. But innovation itself happens in communities and regions where the research is conducted and the
workforce is educated… at places where skilled people translate research and inventions into marketable products and services. Innovation itself occurs in places that provide opportunities for conversation and collaboration between and among universities, businesses, and governments… and in communities and regions that are strategic about aligning their resources for maximum effect.

That is why we convened the Innovation Summit for the South, bringing business, government, and university leaders from across the region to our campus to begin the discussion of how to generate innovation and position our region to competitive in the new global economy. That discussion will now be carried forward by the Southern Technology Council through its Southern Innovation Initiative, which will reach out to thousands more of the South’s leaders over the coming months. And if any of you have an opportunity to participate, I hope you do so. This effort will develop a regional report and action plan, which will be presented next June.

Within Georgia, Governor Perdue has put more than $200 million in state funds into innovation-related projects, especially focusing on labs, equipment, and eminent scholars for our research universities through the Georgia Research Alliance. In 2003, he announced his Centers for Innovation Initiative, which is designed to provide support for researchers and entrepreneurs in several strategic Georgia industries, including aerospace, agriculture, biotechnology, information technology, and maritime logistics. This program provides small seed grants that are matched by industry at a level of greater than 1:1.

At Georgia Tech, we are also deliberately working to be a driver of innovation. We are working with organizations like the state Department of Economic Development, the Metro Atlanta Chamber of Commerce, and the City of Atlanta to make sure that our objectives are aligned with theirs for maximum impact. A few moments ago, I said that the trick is to cultivate the kinds of research, jobs, and industries that cannot be easily done elsewhere. Georgia Tech is a critical resource to help the metro area and the state to do that. Our most obvious contribution is to provide a skilled workforce that cannot be found overseas.

A study done by McKinsey & Company in June of this year indicated that low-wage countries have 33 million young professionals who are university graduates with up to seven years of work experience compared to 7.7 million in the United States. China is producing engineers six times faster than the United States; India is producing engineers three times faster than the United States. There is no way we can compete on sheer numbers.
But the McKenzie study also indicated that less than 15 percent of that young professional workforce in low-wage countries have the more sophisticated skills that enable them to be leaders. They lack language and communication skills. Their education focused on rote memorization and did not cultivate problem-solving or creative-thinking skills. They do not have any cross-cultural or teamwork skills.

By contrast, Georgia Tech not only gives its graduates a rigorous grounding in their disciplines, but we also give them a leg up over their international competition. Our curriculum stresses good oral and written communication skills, and provides opportunities for students to learn teamwork skills. Forty percent of our undergraduates participate in structure research activities, learning to think for themselves and solve open-ended problems. A third of our students study abroad, learning cross-cultural skills and becoming comfortable with diversity. We offer a variety of opportunities for our students to learn leadership and management skills. And we are continually expanding these efforts to give our students skills and talents that corporations need but cannot get in other places.

Another way in which we drive innovation is through our dynamic research enterprise, which is the largest in Georgia and among the largest in the United States. We are a leader in cutting-edge interdisciplinary fields like biotechnology and nanotechnology. In biomedical engineering, we have a unique multi-faceted partnership with Emory University that not only graduates students at all degree levels, but also is a major research engine that ranks third in the nation in federal funding from the National Institutes of Health. We are a widely-recognized pioneer in the application of nanotechnology, and have received more than $40 million in research funding just within the past year or so, including most recently a $19 million nanotechnology cancer center.

Nanotechnology creates new materials and tiny tools and machines at the level of individual atoms and molecules, and it is expected to touch virtually every aspect of human life. It is expected to generate trillions of dollars in economic activity over the next several decades, and Georgia Tech wants a piece of the action. We have several world-renowned nanotechnology experts on our faculty, and we are preparing to build the South’s largest Nanotechnology Research Center on our campus.

Not only is Georgia Tech a leader in conducting research, but we are also widely recognized as one of the best in the nation in commercializing our discoveries and inventions. A national survey by the Southern Growth Policies Board and a study commissioned by the state of Connecticut recently ranked Georgia Tech among the best in technology transfer and economic development.
We are deliberately strengthening our commercialization efforts and accelerating our ability to create new start-ups. Within the past five years, we helped spawn a remarkable 50 new companies – half of them within the past two years. Each of these has the potential to grow into the next technology giant. Many of them are in incubation at our Advanced Technology Development Center, which is not only the first university-based business incubator in the nation, but also widely regarded as one of the best.

We are now working on the next stage of the process, which is to provide space close to our campus for the companies that graduate from our incubator. We began with space at Technology Square, which extended our campus across the downtown connector and into the heart of the emerging Midtown Atlanta high-tech business community. And we will continue with the construction of Technology Enterprise Park, adjacent to our campus on the southwestern side toward the new Georgia Aquarium.

The ability to house technology companies close to our campus also offers us an opportunity to attract the R&D operations of international companies. For example, just within the past several months, both Samsung and Pirelli located major broadband research centers adjacent to our campus, and Pirelli brought its North American headquarters as well.

Georgia’s many efforts to create a positive environment for innovation is one of the reasons why our state’s business climate was just ranked third in nation by the November issue of Site Selection magazine. That is up from number seven last year and number 12 in 2003.

At Georgia Tech, we are working hard to drive innovation and help metro Atlanta and Georgia become a “hot spot” for innovation, because we know this is the only way we will prosper in the competitive environment of the 21st century. It will take a concerted effort to achieve that goal. But if the businesses and business organizations like this Chamber, the governments, and the universities of metro Atlanta and Georgia all focus on innovation and bring our efforts into alignment with each other for maximum effect – together we can make it happen. And our children and grandchildren will inherit a prosperous future that is filled with opportunity.