REMARKS BY GEORGIA TECH PRESIDENT G. WAYNE CLOUGH
NCSSSMST dinner, November 18, 2005

I'm pleased to welcome all of you to Atlanta and to Georgia Tech. We are honored to be your hosts for the annual conference of the National Consortium of Specialized Secondary Schools of Mathematics, Science and Technology, which is being held together with the Siemens Westinghouse Science Competition. We have a habit here at Georgia Tech of giving things long names, then reducing them to acronyms. But I don't think we have any that can top NCSSSMST in length or complexity.

It is exciting for me as the president of a technological university to look out over this group of high school students who are especially focused on math, science, and technology. You are growing up and coming of age at a time when several forces and trends are coming together to make math, science, and technology not only more exciting than ever before, but also a very important part of America's ability to be a world leader. So the opportunities that lie ahead of you, both for exploration and discovery and for leadership are phenomenal. Both of those ideas are captured in the theme of this conference, "Research and Innovation: A Competitive Lifestyle." And I'd like to talk a little about both of them.

First, research. If you look at the history of the development of scientific knowledge, you find an interesting pattern. It is said that the German author Goethe, who lived from 1749 to 1832, was the last person in history to "know it all." In addition to being a playwright and poet, he was also a man of political action and a respected voice in some of the most important scientific debates of his day. I doubt that he literally had command of every bit of knowledge that was out there during his time, but he lived at a significant turning point in the history of science. At the beginning of his career, all of science was one single discipline, and anyone who was a scientist was knowledgeable about its full scope.

Then, around the turn of the century from the 1700s to the 1800s, knowledge began to explode. Soon it was no longer possible for any one person to know it all. Specialization got underway in earnest. Science was no longer simply science, but was broken into biology, chemistry, and physics. And as we moved through the next 300 years, science became more and more specialized, and the work of individual scientists became more and more narrowly focused.

The same thing happened with engineering. Engineers used to be either military engineers who designed and made weapons and machines for war, or they were civil engineers, who did everything else. Those were the only two varieties. Then the industrial age spawned new engineering disciplines like mechanical engineering and chemical engineering. Now we have all kinds of disciplines, and within them we have all kinds of specialties. So that today, a research scholar in science and engineering knows an awful lot about a very narrow, specific thing.

However, we are now seeing something of a reversal of this trend. The hottest new fields in scientific research stretch across two or more traditional disciplines of science and engineering. You can see that the displays here at this conference, which cover nanoscience and nanotechnology, biotechnology, micro-electronics, computing, digital media, and the science and engineering of materials. These are research fields that have emerged between two or more disciplines.

For example, here at Georgia Tech nanotechnology involves hundreds of faculty and students from a wide variety of fields. Professor Z.L. Wang, who is one of the most cited nanotech experts in the world, works in the creation of new materials like nano-coils and nano-springs in the School of Materials Science and Engineering. Robert Dickson, who is a professor in the School of Chemistry and Biochemistry, has developed a nano-scale optical-electrical device that does math. Professor Uzi Landman in the School of Physics makes computing models that predict how materials will behave at the level of individual atoms and molecules. Professors Shuming Nie and Gang Bao in the School of Biomedical Engineering are pioneers in designing tiny nanoparticles that will help to diagnose and treat cancer. These are just a few examples from a few of the different fields that are engaged in nanotechnology research. And the applications for this research are just as numerous and varied. In the coming years, nanotechnology will touch every aspect of our lives in marvelous ways.

Does this broadening out of research fields to include several disciplines mean that scientists and engineers are going back to being generalists again? No. With knowledge continuing to increase exponentially, scientists are still very much specialists. But a lot more conversation and collaboration is taking place between scientists and engineers from different disciplines. We used to think of scientists and inventors as lone geniuses who were busy inventing new things by themselves in the garage or the garret. But innovative new technology is increasingly the result of collaboration between scientists whose expertise complements each other.

Here at Georgia Tech, we encourage conversations and collaborations by gathering faculty and students from different fields in research neighborhoods organized around broader topics or problems. For example, our Ford Environmental Science and Engineering Building gathers faculty and students from five different academic disciplines who are working on environmental problems. You might have a chemist next door to a civil engineer with a biologist across the hall. In this arrangement people who have different kinds of expertise but are interested in the same sorts of broader issues bump into each other in the hallways or meet at the coffee pot. Pretty soon they are comparing notes on their research projects, and the chemist realizes that the biologist has expertise that she needs or vice versa. So they begin to collaborate.

For example, Dr. Ajit Yoganathan is a biomedical engineering professor here at Georgia Tech and an internationally known expert on the cardiovascular system. He wanted to improve the design of artifical heart valves to make them work better. So he went to see Dr. Fotis Sotiropoulos, who is a civil engineer. Now, that sounds like an odd combination, and in a traditional university environment, their paths probably would not cross. But Fotis is an expert in the flow of water around structures like dams and bridge foundations and through structures like the channels and turbines of hydro-electric power plants. And he is the author of several computer models that simulate the behavior of flowing liquids through passageways and around obstacles. He had expertise that Ajit needed to describe and define the complex patterns of blood flowing through heart values.

Or another example: Dr. Mark Allen is a Georgia Tech professor of electrical engineering, and within that discipline he is a specialist in MEMS, which stands for micro-electro-mechanical systems. These systems are teeny-tiny machines and sensors that are made in special labs called cleanrooms that are free from contamination and vibration. Mark 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. This 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, which are tiny tubes inserted into an artery to support a weak spot. 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 conversation and 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 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 story is a good illustration of how innovation works. During 2004, I had the privilege of co-chairing the National Innovation Initiative of the U.S. Council on Competitiveness together with IBM CEO Sam Palmisano. And we brought together more than 400 of the best minds in the United States to help us get a bead on what innovation is and what we need to do to encourage it. Innovation can be represented as I^5, or the intersection of five I's: ideas, imagination, invention, insight, and implementation. Innovation begins with research in science and engineering to generate the discoveries and inventions. Then to those discoveries and innovations are added the ideas and insight that enable them to be implemented to solve problems, address the needs of society, meet market demand, and even create new markets. Innovation is critical to the economic future of the United States, which is why you as the next generation of scientists and engineers, will have incredible opportunities for leadership in the future.

There is no question that as we begin a new century, we are facing a new world. Last week Pulitzer Prize winning newspaper columnist Thomas Friedman was on the Georgia Tech campus discussing his book, *The World is Flat: A Brief History of the Twenty-first Century*, with our students. 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.

But what Friedman is actually describing is the leveling of the global economic playing field, which is threatening the economic leadership that the United States has enjoyed since World War

II. A vast web of information technologies now interconnects 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 means that skilled workers from anywhere in the world are only a mouse click away.

Population demographics tell us that 20 years from now, 56 percent of the world's population will live in Asia, compared to just 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.

Not only have nations like China and India have been deliberately investing in building world-class universities, but in China 40 percent of college students are majoring in engineering, compared to just 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 in graduating engineers.

There is clear potential for the 21st century to be the age of Asia's economic ascendancy. The largest technology markets and technological workforces will soon be in Asia. Our wages and health care costs are higher than those of our global competitors. And rather than dominating the world's major inventions, we can expect to produce only one of every four or five of them. 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. 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.

Two years ago I took a boat trip up the Columbia and Snake Rivers in the Northwest, retracing part of the route that Lewis and Clark took on their historic cross-country journey, and as I went I read their journal. That trip helped me to understand what a rich history the United States has of exploration, discovery, and risk-taking. Beginning with the earliest pioneers, Americans have always looked for new frontiers and imagined a better future. Today, those new frontiers are in the realm of ideas, and they lie before the feet of our scientists and engineers.

As a nation, we have been known for entrepreneurism and finding ways to implement new ideas and new developments that are on the cutting edge. It is our nature and our culture to be innovative, and we are better at it than any other nation. But we now have many imitators, and to continue to lead in the 21st century, we need to step up the pace of innovation.

We also need innovation to solve the great challenges of our time, from finding enough energy from new and renewable sources to meet world demand, to finding enough fresh water for a growing global population, to preventing the damage and devastation of natural disasters like hurricanes and earthquakes. And society will be turning to scientists and engineers to provide the technology that will enable us to meet these challenges.

As you can see, the opportunities for those with talents and education in math, science, and technology are not only exciting, but are growing more and more important to the health and well-being of society and the world. Here at Georgia Tech, we are educating scientists and engineers who can see their work in its larger social context and understand its human dimensions. We are educating scientists and engineers who also have communication skills and teamwork skills… who have conducted research and studied abroad. In short, we are educating scientists and engineers who are not only well- grounded in their academic studies, but are also well-rounded with the skills they need to become leaders.

We are looking for bright, talented students like you who have a passion for math, science, and technology… who are curious and creative and have an insatiable thirst for learning… and who are not intimidated by challenges, but roll up their sleeves and dig in. And we are educating them to be the leaders of the future. We hope to welcome many of you back to campus as Georgia Tech students in the future. And if you decide that Georgia Tech is not the place for you, we hope you will pursue your interest in math, science, and technology at another fine university. There are incredible opportunities ahead of you, and we stand ready to do our part to help you become the innovators and leaders of the future.

"The concept of mathematics being purely objective is unequivocally false, and teaching it is even much less so," the document for the "Equitable Math" toolkit reads. "Upholding the idea that there are always right and wrong answers perpetuate objectivity as well as fear of open conflict." The ODE, led by Colt Gill, confirmed the letter to Fox News.Â One of them instructs educators to "identify and challenge the ways that math is used to uphold capitalist, imperialist, and racist views." Teachers at posh NYC school release 8-PAGE anti-racism manifesto, spark uproar: report. The newsletter surfaced amid a broader uproar over critical race theory and diversity training sessions in government entities. The National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology (NCSSSMST) is an alliance of specialized high schools in the United States whose focus is to foster, support, and share the efforts of STEM-focused schools whose primary purpose is to attract and academically prepare students for leadership in mathematics, science, engineering, and technology. The Consortium supports unique professional development programs for STEM teachers and unique learning experiences The University of Louisville is thrilled to host the 2014 National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology Summer Student Conference. The University of Louisville is premier and national recognized metropolitan research university, established in 1798, and situated in the heart of Louisville, KY.Â NCSSSMST 2014 Parental Consent for Student Participation Form NCSSSMST 2014 Student Research Conference Information Packet NCSSSMST 2014 Teacher/Chaperone Information NCSSSMST 2014 Schedule We Will Attend Form. Check out some of our favorite aspects and treasures found in the city of Louisville, coinedPossibility City. National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology. December 19, 2013. Share.Â NCSSSMST is an alliance of secondary schools and programs preparing students for success and leadership in science, technology, engineering, and mathematics. Its mission is to serve members' students and professionals, to foster collaborations, to inform STEM policy, and to advocate transformation in education. The consortium fosters, supports, and advances the efforts of those specialized schools whose primary purpose is to attract and academically prepare students for leadership in mathematics, science, and technology. Why have two lists, when one of them is a full list of schools in the National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology? Founding members[edit]. In the list of member institutions, the four founding members (Thomas Jefferson, North Carolina SSM, Illinois MSA, and Louisiana) should somehow be noted as such. This information is readily obtained and verifiable from the NCSSSMST web site. Scott Swanson 15:46, 31 January 2007 (UTC). Apparently not