It is an honor for me to welcome you to Georgia and our capital city of Atlanta. Many of you came a day early for EAC and TAC meetings about accreditation issues in engineering and technology, and we hope that was helpful. This morning we open the ABET annual meeting for the year 2000, and we are very pleased to be your hosts here in Atlanta. I hope you have a chance to take in some of the sights of the city while you are here, and we welcome any or all of you to visit our campus, which is right in the heart of the city along I-75/85 a few miles south of here.

I grew up in the small town of Douglas in rural South Georgia. Neither of my parents was able to go to college, but they understood the value of an education and were determined to send their children to college. And so I headed for Georgia Tech after high school with the goal of getting a bachelor’s degree. It was my professors at Georgia Tech who saw my potential and encouraged me to continue on to graduate school.

Looking back, I was fortunate to have been taught engineering, first at Georgia Tech then at U.C. Berkeley, by many faculty who were committed to the learning process while at the same time engaged in high-level research. The opportunity for a student to learn from a professor who is engaged in research and the creation of knowledge and who brings the excitement of this venture into the classroom, is one of the bedrock values of engineering and technological education that deserves preservation in the face of the turmoil of our rapidly changing world.

As an engineer, I am concerned about my profession. As an engineering educator of some 30 years, I have a vested interest in ensuring that the opportunities I experienced are available to other generations. As the president of a university that graduates the largest number of engineers in the nation, I feel a heavy responsibility for the more than 2,000 engineering graduates that leave Georgia Tech each year and the growing number of engineers who return to us to renew their knowledge and skills. And I believe we are at a critical moment in the life of engineering and technology education.

Everyone in this room today is concerned about accreditation issues, and that is important. But we have to be careful not to view engineering and technology education simply as the sum of their curricular parts.

We require students to study the essential math and sciences that form the knowledge base for engineering and technology. They also take the humanities and social sciences courses that comprise the core of any higher education curriculum. Then we teach theory, design, and hopefully some elements of practice, in engineering and technology. Our discussions tend to focus on how to squeeze an adequate amount of each of these ingredients into the four-year time framework of a conventional bachelor’s degree program. The goal of the discussion is usually to negotiate a compromise relative to hours of credit among the champions of these various parts of the curriculum.
But when you step back and look at the larger picture, the perspective changes dramatically. The real question confronting engineering and technology education today goes beyond how to juggle credit hours. It is a question of how to do teaching and learning in the midst of an era of revolutionary new technology, and how to fulfill the new demands that a fast-paced economy is making of us.

That larger picture is reflected in the theme of this annual meeting: “The Knowledge Triangle: Partnerships in Education.” And the year 2000 is a good time to stop and consider the relationship between higher education, private industry, and government. Our well-being as a society in the coming century depends on strengthening the partnerships in the knowledge triangle. But at the same time, life has changed for the three partners that make up the triangle and for the relationships they have with each other.

During the course of my career I have had the opportunity to live and work in Silicon Valley, the Research Triangle Park, and Seattle. All of these locations have vibrant high-tech economies, and while there are some differences in why they are successful, the common factor in each case is the presence of strong research universities that reach out to the community. Such institutions are the source of research, of talented graduates and knowledge workers, and of innovation, which today are the drivers of our economy.

As we enter the 21st century, the nature of the economic development process has changed dramatically. During the 20th century, many states, particularly here in the South, followed a simple formula for economic development. They sought to attract companies from other states or countries by offering simple, bottom-line inducements – tax breaks, freeports, subsidies, and site-specific incentives like water and sewer lines, access roads, and rail sidings. The goal of this policy was to attract “big industry,” and while it had its merits, it was based on a premise whose time is now past.

Economic development now requires that we pay as much attention to growing companies as to attracting them – something we are only beginning to understand. After all, Silicon Valley did not attract Hewlett Packard or Cisco with government-funded inducements. It home-grew them. Seattle did not bring Microsoft in from some other location. The company developed and grew there. To compete successfully in the economic world of this new century, a region must be capable of growing a company like HP, Cisco, or Microsoft.

Economic development by this definition is much more complicated, and government can no longer do the job by itself. What now drives the best of industry is innovation, and innovation comes from the best talent. We are surrounded by a knowledge-based economy that rewards quality education – for individuals, for businesses, and for communities. The place with the best ideas, the largest supply of talent, and the conditions that make talent want to stay, has the key ingredients to grow or attract any business, large or small.

But we have not quite come to grips with the need for a skilled technological workforce. The National Council on Competitiveness says that the United States now ranks 10th in the world in its percentage of 24-year-olds who hold science or engineering degrees. During the 90s, the
The percentage of growth-company CEOs who report the lack of skilled workers as their top barrier to growth has increased from one-third to two-thirds.

Beyond talent, another key to innovation is funding for research and development, and once again the landscape has changed. Following World War II, the federal government began to invest seriously in R&D, and it was the principal source of funding until the early 1990s. Much of that money went to defense research, but it generated many innovations that filtered out into the broader economy and had a significant impact on important fields like electrical and computer engineering. Computer networks, for example, began as a defense tool, and it was ARPA and the National Science Foundation that provided the funding in the late 60s and 70s to create the Internet from which we have gained so much today.

In the heyday of defense research, the federal government was providing 70 percent of national R&D funding. Today the federal government supplies just over 30 percent. Today, federal funding for R&D has fallen below 1 percent of the Gross National Product, its lowest level since the 1950s.

Much of the slowing of federal support for R&D can be attributed to the end of the Cold War. Without an enemy to motivate us, only health problems are a sure thing, and the National Institute of Health has tripled its research budget over the past decade. At the same time, the budget for the National Science Foundation held about constant and research funds for the Department of Defense declined. This approach will not work in the long run, since NIH research is dependent on that of basic science and engineering.

This decrease in federal funding for research comes at a time when industry’s demand for research is increasing. The paradigm of the 1980s was to be competitive. Similar companies made similar products, and the winner was the one that consistently delivered the best quality at the lowest price. During the late 80s and early 90s, American companies adopted “faster, better, cheaper” as their watchwords, and we did a good job of meeting the challenge of Japan Inc.

Being a tough competitor is still important, but today’s winners are the companies that are also nimble and know how to build alliances in the world of competing technologies. The key to success in today’s economy is being first to create a new product, then getting it to market before the other guy. Even the biggest companies must have an entrepreneurial mindset. It is now industry standard to produce three or four new computer models a year, and Hewlett Packard reports that 60 percent of their sales come from products developed in just the last two years.

Today we live in a fast-paced, technology-dominated world in which research, innovation, and entrepreneurship are the name of the game, and an educated, skilled workforce is crucial to economic success. It is a world that demands stronger alliances between higher education, government, and industry.

We have been working on building those alliances in Georgia, and I want to tell you about a few of them this morning. The largest and oldest is the Georgia Research Alliance, which was created a decade ago. This three-way partnership brings together all elements of the Knowledge Triangle. It includes Georgia’s six research universities, both public and private, state
government, and three high-tech industries – advanced communications, biotechnology, and environmental science and technology. These industries were targeted at the outset because of their tremendous potential for future growth and because Georgia already had a foundation of university expertise and private industry to build on.

The goal of the Georgia Research Alliance is high-tech economic development – funding, promoting, and coordinating university research and innovation that generate start-up companies as well as attracting high-tech companies. To date the Research Alliance represents an investment of about a billion dollars. About $300 million has come from state government, which is used as seed money to attract federal and corporate investment. The state puts up the first half of the money needed to create endowments for research chairs at the six universities, providing leverage to raise matching private funds. The Alliance recruits internationally known scholars to hold the chairs, and they help us capture research funding, attract top-quality graduate students, lure high-tech companies, and spin off new start-up companies. Beyond endowed chairs, the state investment also helps provide equipment and even labs and buildings, which are important assets in attracting well-known scholars.

The governing board of the Research Alliance includes the presidents of the six research universities, but its majority is industry executives from the three fields it addresses. This keeps its efforts focused on producing results. One of the ground rules for funding is that research projects must involve collaboration between at least two member universities. And intellectual property rights are shared.

The Research Alliance works closely with the Advanced Technology Development Center, which is part of Georgia Tech’s Economic Development Institute. This center, which we call ATDC, was created 20 years ago as the nation’s first university-based technology business incubator, and today it ranks first in the nation. The Advanced Technology Development Center operates three high-tech incubators in Atlanta, one in central Georgia, and we will soon have one in Savannah on the coast.

The ATDC helps researchers harden their ideas into marketable products, assists with management and marketing, and incubates start-up companies in its facilities. The companies “graduate” when they have reached certain benchmarks in earnings and size, or have been acquired by another company which will take over the job of guiding them.

This incubation process makes it easier for start-ups to procure venture capital, because investors know that ATDC has kicked the tires and looked under the hood to make sure that the company’s idea has real-world market potential, and that ATDC will give the company the business assistance it needs to succeed.

ATDC also helps “landing parties,” which come from larger corporations that are spinning off a new, high-tech subsidiary. When corporations are looking for locations for these new spin-offs, the services of ATDC make Georgia a very attractive place to put them.

Since its creation in 1980, ATDC has incubated more than 110 companies and graduated more than 70. Last spring a record 19 new graduates were recognized. Together these 19 young
companies attracted more than $300 million in investment from venture capital, mergers and acquisitions.

The newest ATDC incubator is at a facility that represents another partnership. EmTech Bio is a commercial research and development center for biotechnology formed and administered jointly by Georgia Tech and Emory University, and is just one piece of the close working partnership that exists between these two universities. It is a partnership that allows Georgia Tech, which has an engineering college but no medical school, and Emory University, which has a medical school but no engineering program, to be leaders in the emerging field of biomedical engineering.

In addition to incubating start-up biotech companies, Georgia Tech and Emory also conduct joint research and participate in a joint National Center of Excellence for the Engineering of Living Tissues, funded by the National Science Foundation. And we educate students in a joint academic department of bioengineering, which is a rare occurrence between a public and a private university.

Georgia Tech’s Economic Development Institute does more than serve young high-tech companies. There is no such thing as a low-tech company anymore. These days every industry needs advanced technology to survive. So EDI has a network of 18 economic development offices around the state, staffed by experienced industrial engineers assisted by Georgia Tech co-op students. These EDI offices give Georgia’s small and mid-sized companies access to the resources of Georgia Tech to improve productivity, reduce costs, plan expansions, start new operations, and implement proven manufacturing technologies. The EDI offices also advise local communities and development authorities around the state on their economic development plans. In the course of a year, the EDI will assist as many as 1,500 Georgia industries and 100 communities, as well as training hundreds of economic developers.

The most valuable economic development tools we can have in the 21st century are a platform for research and innovation that will drive leading-edge technology, and a skilled workforce. Universities are the source of both of these tools. But to develop and use them well, a closer and more complex relationship is essential among universities, government and the private sector.

For all of our universities, entering more fully into the relationships of the Knowledge Triangle provides a wonderful opportunity to get involved with the entrepreneurial business world and to become more practice-oriented in the experiences we offer our students. It is an opportunity not only to participate in the discovery of knowledge and innovations, but also to join with our partners in putting those ideas to work in the service of society. And if we step forward to fully engage in these opportunities, the value of our universities to the world and the importance of our contribution will be restored and renewed.