I reviewed some economic data recently, looking back over the last thousand years. For seven hundred of the past thousand years, economic growth on a global basis never exceeded 1.5 percent per year. But in the current Chinese economy we see growth of between 9 and 15 percent per year, and, according to projections, this rate of growth will continue for the next decade. At a scale of 1.2 billion people, this is an unprecedented economic transformation. And this brings me to the focus of my remarks today—how competitive is Arizona?

Arizona is highly competitive on many fronts. At an economic forum yesterday hosted by the university along with Bank One, and attended by a number of economists including the president of the Federal Reserve Bank in San Francisco, I learned that Arizona has the second fastest growing economy in the United States, and ranks fifth in the number of new jobs being added within the state. The economic situation in Arizona is as good or better in the short run than almost any other state in the nation, and surely your company feels that growth.

But at the same time, if you were to assume that Arizona can expect to enjoy the same edge in the competitive fields of the future, I would disagree with you. Let me walk you through that.

There are some industries where Arizona is very strong. Real estate and everything associated with real estate, such as construction and development, is one example. And you already know that because your company benefits from it. But we also know that real estate, as a competitive driver of the economy, is unsustainable over the long haul.

We have, believe it or not, a competitive scale of government in Arizona. We still have government in Arizona that is small and affordable. And we still have clean government in Arizona, which cannot be said of every state, and certainly cannot be said of some other countries, so we are competitive in that respect.

We have a competitive small business environment. Gazelle businesses—businesses that are not necessarily technology oriented, but are small and fast moving—have a higher
probability of being successful in metropolitan Phoenix than all but one other metropolitan area in the nation.

We have a competitive overall environment and quality of life. So many people want to live here that we struggle with where they will all live, and how companies like APS will provide basic services for them.

Tourism is another area where we are highly competitive, and we have a competitive service sector, and a competitive health care sector. In fact, at yesterday’s economic forum we were told that 25 percent of your personal income—25 percent of the economy—will in the future go towards health care. But service industries only contribute to the local economy. They do not make a state or region more competitive on a global basis.

Where are we less competitive? In our technology sector, and that is not the sector in which to be less competitive. Arizona does not have a high birthrate of new technology oriented firms, and the survival rate for those that are birthed is poor. We do not have a high venture capital investment rate or a high venture capital pool.

Some of you would say that we have done just fine without a technology sector, and point to the significant technological manufacturing that is done in metropolitan Phoenix and Arizona. To some extent that is true, but our technological manufacturing sector is not evolving.

Craig Barrett, former chairman of Intel Corporation, and current chairman of the advisory board of our Ira A. Fulton School of Engineering, was asked why he wants to build factories in metropolitan Phoenix. His answer was very simple, very blunt, and very to the point: “You are not competitive on the discovery side.” Apparently places like Ireland and China are competitive, because Intel recently built two new research labs in those countries.

When Boeing Corporation was looking for a location to build the 7E7 plane, they considered Seattle, Phoenix, Dallas, and Austin. They looked at different places where they could build a plant that would employ 10,000 to 15,000 directly, and thousands more in support positions. We did not make the cut. And part of the reason we were not selected was that we had insufficient technological diversity, an insufficient technological base, and that ASU—the research university of the metropolitan region—while good, was not yet good enough. You can be good, which we are, and still not be great. And that is why, in the tech sector, we are not as competitive as you might have thought we would be.

Why is it important to develop some robustness in that zone of the regional economy? From 1945 to 2000 between 50 and 75 percent of all economic growth in the industrialized economies on the planet, was derived through technological change. Between 1990 and 2005 more than half of all technological change was derivative of scientific discovery.

The fact is that fundamental change used to be a technological advantage. It was driven more by tinkering and adaptation of the products developed within firms, and less by the discoveries of scientists. In the past scientists would conduct research over four or five decades to develop a stock of knowledge, which would in turn be produced and consumed slowly.

Now the stock of knowledge is produced and consumed simultaneously. A new discovery is made in a laboratory relative to a molecular computer device, and technologists
begin building molecular technology computing devices almost immediately. That gap has become narrow, and this region under-performs in that narrow space.

The only way you can advance is to look where you are not competitive. Why are we as a region not measuring up?

The head of a local Honeywell division visited me the other day, and we were talking about how we can build a relationship between ASU and Honeywell. And he said, “Here’s something that you ought to keep in the back of your mind: There will be no growth for this company in the United States—none. We’ll stay at about the same number of employees in the United States that we presently have. All of our growth will be in India and China.”

How did cities like Bangalore, India, and Shanghai, China, and Taipei, Taiwan become so competitive? Well, believe it or not, in spite of all the challenges that confront those cities and regions, they became competitive through investment in education. Taiwan, for example, has instituted mandatory teaching of English from the second grade onward, and Tsinghua University in Beijing now teaches their engineering program in English.

Arizona has a non-competitive educational sector. We rank in the lower five of the states for graduation rates, the lower five in the states for investment in education, the lower five in the states in every single educational indicator.

About two weeks ago the vice minister of education of the People’s Republic of China, who had flown to New Haven, Connecticut for a meeting at Yale, stopped to visit ASU on her way back. Her job is to build one hundred research universities in China modeled on the finest American institutions. And in looking at a balance of trade sheet, you will see that China actually has the money to do that, and they are doing it now.

I know that in your business you compete against other companies, other utilities within the region of service you cover. But I do not know how often you ask yourselves, who does the region compete against? There is a kind of competition going on now between regions of the world to attract the companies that will bring new jobs, high levels of personal income, and so forth. And the criteria for attracting these companies are precisely those areas where we are not competitive.

Consider personal income: personal income in Arizona is at 80 percent of the national average. But every model that we run based on every historical trend that we have, shows that twenty years from now the average personal income in Arizona compared to the rest of the United States will be 60 percent. This is not competitive.

Here is an interesting little story from Ireland. In 1987 Ireland had the worst performing economy in Europe, and a personal income level of about 70 percent of the European average. In 2004 Ireland had a personal income level of 130 percent of the European average and the best performing economy in Europe. How did they get there? Ireland dramatically reduced taxes, which produced three times the revenue for the government, and greatly increased investment in education and science.

Now Bell Labs is building Bell Labs Europe, Intel is building research labs, and every major pharmaceutical company in the world has built factories and facilities in Ireland. The population of Ireland is only slightly more than Maricopa County: 3.9 million. Yet Ireland far outperforms Maricopa County economically.

So how did they do it? They focused on the issue of personal income, they focused on the fact that they were not competitive, and then they made investments in those things that they thought would fix the situation.
I think one area that we need to focus on is enhancing our awareness of our competitive environment. Who does metropolitan Phoenix and Arizona compete against? San Diego, Portland, Salt Lake City, Singapore, Shanghai, Hong Kong, Macao—we compete against all those regions, but that is a fact we have yet to fully understand.

More than 10,000 jobs were lost from Motorola in this county in the last seven years. Who put this kind of pressure on Motorola? Nokia of Finland was one of the companies, but there are also companies from China, companies from Korea, and companies from Japan all capable of doing the same thing. The competition is not down the street. The competition is global, and some of our attention must be focused on realizing that to be competitive we have to know the map of the playing field.

How do you build a university on the scale necessary to help facilitate a competitive region? Los Angeles, San Francisco, and San Diego each have one or more world-class research universities with other universities and colleges nearby. Here in metropolitan Phoenix we have a small number of institutions, and no world-class research university. So my focus and my obsession is compress the fifty years that it would normally take to build a world-class research university into ten years.

You might have heard about the new campus in downtown Phoenix that we are planning; the expansion of our campus in Mesa that we are going to call the Polytechnic campus; the expansion of our campus in West Phoenix that we are calling the West Campus, and the transformation of the Tempe campus. We are planning on building out the university to about 95,000 students—50,000 on the Tempe campus and 15,000 on each of the other campuses.

And we are planning on accomplishing this in a different kind of way. Schools and colleges will be clustered on campuses led by entrepreneurial deans, each responsible for the intellectual and financial bottom line of their units. The university has never been run that way before, and planning for this reconceptualization of the university has been a significant focus.

As the major research university of the region, ASU must play a leading role in developing the regional economy. To put the university into perspective, ASU was a college from 1885 until roughly 1950. It began to become a state university during the mid-twentieth century, but it wasn’t until about 1980—forty years after the Lawrence Berkeley Lab was founded at the University of California, Berkeley—that ASU decided to get into the business of research and discovery.

Until 1980 the ASU College of Engineering did not allow externally funded research, so we have been trying to establish a research university in the 25 years since 1980, and in the time frame of academic institutions that is no time at all. But to offer some indication of the rate of accomplishment, in 1994 the Carnegie Commission on Higher Education granted ASU what is called “Research I” status, classifying ASU as one of the hundred competitive research universities in the United States, which undeniably is a significant achievement in fourteen years.

But from the perspective of competitiveness, while it is the case that our athletic program consistently ranks in the top twenty of all athletic programs in the nation year after year,
ASU was ranked only the 89th most competitive research university in the United States in 2003. In 1993 we were 90th. And in that time frame we more than doubled our research, which means the competition became even stiffer.

We must advance our research enterprise to become more competitive and to build a more competitive region. Last year we won $170 million in external funding that we spent on research. The University of Washington, in Seattle, an institution in a major metropolitan region with the same mission and comparable social complexity, spent $600 on research. Some institutions spent as much as $750 million.

How are we going to build a world-class research university in ten years? We are building a million square feet of new research infrastructure. And we have ten new schools on the drawing board that are going to give us a differentiated advantage. We will not become competitive through replication, but through uniqueness. Part of the strategy to become competitive is the building of these ten new schools.

The new Biodesign Institute, to take just one example, will be focused on important new interdisciplinary research in the life sciences and engineering inspired by natural processes. We have $350 million of startup monies for the Biodesign Institute, but we need $500 million to get it off the ground, and another $500 million to stabilize it. A billion dollars just to get into the game. We want to create a research enterprise that is so competitive that our aggregate research revenue growth will be 15 percent per year.

We are also making a series of investments in the acquisition of new researchers and new teams for our new programs. We just hired Roy Curtiss from Washington University in St. Louis, for example. Roy works on genetic engineering, along with a team that consists of 45 people. In his case the investment required for one faculty member was $10 million.

We are out on every front seeking investors, and we are asking for investments, not gifts. We are looking at every possible financial mechanism that we can to raise the money that we need to become competitive at national level: private donors, corporate philanthropy, foundation philanthropy, as well as advancing the investment in the university by the state and by students and families. We are seeking co-investors in developing the physical infrastructure of our campuses, like the City of Phoenix, City of Mesa, City of Tempe, private-public partnerships where the private sector can benefit financially in the long-term from the collaborative investment in physical infrastructure.

One of the first things I noticed when I arrived in Arizona was an antipathy toward members of the legislature regarding their lack of investment in the university. I said, “Why are you blaming them for not investing in you? You obviously haven’t made the case. Blame yourselves and you’ll get a lot further. Blame yourself for having not made value propositions to your potential investors to invest in your ideas or your initiatives. Don’t blame somebody else.”

We need to start looking at the legislature as an investment committee of ninety people. What kind of case do we make to an investment committee of ninety people so that they will want to give us what we are asking for this year, which is $350 million. That is a considerable amount of money, and we ought to take that pretty seriously and operate under the assumption that it is not money that we deserve. We do not “deserve” anything—we only merit what we can make the case for.
The infrastructure for higher education is about 45 to 50 years behind the population of the state. The population crept up fast on the folks here. There is still not a full realization that as a state of six million people, we have passed Wisconsin in size, and we will pass Missouri next year. Arizona will end up being one of the ten largest states in the union, maybe one of the eight largest when all is said and done. We now have three universities operating in the state, and we had three universities in 1905 when the population was around 100,000.

The three state universities of Arizona face significant challenges in becoming competitive. And we realize that we must help the citizens of Arizona fully understand what is at stake. Arizona is one of five states with no capital spending appropriations for its universities. The research infrastructure bill approved by the state legislature in 2003 providing $440 million for the construction of research facilities, of which ASU will receive $200 million, represents the first capital expenditure by the state in the building of the university ever. The university has basically been left to build itself from its operating budget, which is extremely difficult. To give you a sense of the scale of investment required to build a great state university system, North Carolina, by contrast, just invested $3 billion in the next round of enhancements to their universities.

But no state has ever built a great state university through the largesse of their tax-paying pocketbooks. The great state universities have been built by the investments of thousands of corporate stakeholders and hundreds of thousands of individuals. Over the decades General Motors has invested $500 million in the University of Michigan. And as a consequence of this investment the University of Michigan has a top-ranked engineering school. And Michigan has a top business school and a top law school, and so on, and so forth. Michigan has top programs because corporate citizens in metropolitan Detroit and the state of Michigan invest in the university.

In the last two years we have raised five of the six largest gifts in the history of the university. A $50 million naming gift for the school of engineering, a $50 million naming gift for the school of business, a $15 million gift for the International Institute for Sustainability, a $10 million gift for the creative writing program. The list goes on, but although the $90 million we received last year represents a huge effort in fundraising for ASU, the University of Michigan raised $400 million.

You may have heard the debate about tuition increases over the last several years, and there will be more tuition increases. One of the strongest advocates we have for tuition increases is the leadership of our students, because they have come to realize that the institution does not have the resources to give them what they want, and they are willing to make more of an investment in it.

There is a clause in the Arizona constitution that says that the cost of tuition for higher education will be kept as close to free as possible. But how will you pay for the construction of the infrastructure of higher education if its actual price is kept as free as possible. And that second part of the equation—who would actually pay—has never been solved.

The tuition at ASU is $4,000 per year. A heck of a deal, but that means we only have $4,000 to spend on services and infrastructure and support to give our students. In-state tuition at the University of Michigan is $8,500 and out-of-state tuition is $26,000. It may appear that we cannot afford that level of tuition, but as a consequence their financial aid budget is six times greater than what we
Michigan has more money to invest in financial aid, and more money to invest in programs and facilities and buildings. And in terms of total revenues, state appropriations supporting the University of Michigan total eight percent. At ASU that figure is 30 percent.

UCLA has about $16,000 per student to invest per year from tuition and state investment. ASU has $9,700 per student: $4,000 from tuition and $5,700 from the state. Over the last several years the state has grown, and as the economy has expanded, and as demand for other services has expanded, the state’s investment in higher education has gone precipitously down.

In 1980 Arizona invested 20 percent of its discretionary resources in higher education. In 2004 it invested 9 percent of discretionary resources in higher education. In the last five years, this university alone has taken in 10,000 students without any support from the state at all. None.

It is an immense obstacle to attempt to enroll more qualified students and to be stopped by lack of financial resources. Where will the investment come from? We have to upgrade the investment per student from the state, we have to continue to expand our tuition goals, and we have to expand financial aid for those families that cannot themselves contribute. In the past two years we have expanded financial aid by 150 percent within this institution.

When all is said and done, we must build a university that is not isolated from its community. I was speaking yesterday to a board member of Yale University that has been in New Haven for 300 years. Obviously the university and the city work in alignment with each other, but Yale has grown and become one of the greatest universities in the history of mankind, and the city has fallen down around them. That is not the outcome that we can tolerate here. We have to be a university wedded at the hip with the community in every way—socially, economically, and culturally.

Ultimately I believe that we can best serve this community and best enhance its competitiveness by building a university with two major characteristics. We must be as academically competitive, in terms of creative energy and discovery potential, as any university in the world. And at the same time we must be inclusive. We must reach deep into society, and make as many seats as possible available for as many students as we can possibly enroll, and then build a world-class research university here in metropolitan Phoenix. This is how we will take on the task of making this metropolitan area and making this state competitive.