

**Science, Technology and Entrepreneur Spirit on Both Shores of the Pacific in the
21st Century: A Global Transformation**
Keynote Speech at "IIT North Texas Alumni Group"

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Distinguished Guest:

I am honored to be invited to deliver a speech to the alumni group of great Indian Universities, the group of seven IIT's. I am assuming that you are all graduates of Delhi, Kanpur, Kharagpur, Guwahati, Roorkee, Mumbai and Chennai. I also learned not so long ago from PBS that some, or maybe all, IIT's of India are at the same level as the best in the United States.

To prepare for this talk, I studied carefully the article in BusinessWeek, entitled "The Rise of India". Basically it said that India is now essentially the global center for software, IT consulting, call centers, and chip design. It also is moving rapidly into financial analysis, industrial engineering, analytics, and drug designs. I am sure IIT is playing a critical role. This is indeed one of the best examples why it is important to have research universities, because research universities, if properly conducted, can and will be true economic and intellectual engines.

I had recently another honor of delivering a speech at a software conference in Dallas where a large delegation of software companies executives, led by one of the Directors of Science and Technology from Beijing were in town. I detected that they too have the same business aim. Personally, I must say that meeting both delegations brings out a great deal of emotions in me. Let me underscore the fact that this has nothing to do with the fact that I have a strong and deep Asian cultural heritage. Rather, the emotion is aroused because I began writing computer codes for my doctoral thesis some 30 years ago and I could kick myself now that I was so focused to be a "cocoon professor" that I never had the entrepreneur spirit or the courage to even dream that the skill I was developing could be a money making machine! As a physicist, I have not done anything which could lead to an IPO! However, in hindsight, some of the software I developed, by properly twitching, touching up and packaging them, can conceivably be something that could be commercialized. Oh well. I am therefore extremely excited to see that nowadays there are academic researchers, including graduate students, in all fields of sciences and technologies, who are immersed in the entrepreneurial issues.

For these reasons, coupled with the fact that as a Vice President for Research I am charged to promote and accelerate UTD into becoming an international economic and

intellectual engine, it would be interesting for me to leverage this occasion to talk about the overarching issue of the transformation and interactions of both shores of the Pacific and some on the role of research universities.

I am one of the many millions of individuals who existed in and benefited by this transformation. So, I decided that the following title: “Science, Technology and Entrepreneur Spirit on Both Shores of the Pacific in the 21st Century: A Global Transformation” is probably appropriate for today’s audience.

The subject matter is of profound importance to both shores of the Pacific. If my memory serves me correctly, I remember in one of my many trips to Asia in the early 1980’s, I read an article in the Far Eastern Economic review. In this article, there was a diagram which plotted the number of air passengers between Europe and North America and between Asia and North America as a function of time (year). I remember this diagram well because the two curves, with the Asia one way below the European one in the early 1960’s (just when the Boeing 707 came on line) crossed around the end of the 20th century. I do not have the data of today, but I suspect that if the prediction of the curve is not correct, it cannot be very far from the truth. With this important background, it must mean that by the 21st century, something profound is happening globally. Today, more people are crossing the Pacific than the Atlantic. It means that North America, after several centuries of being European-centric, culturally, economically and intellectually, is showing a sign of shift. It also means, both shores of the Pacific (the so-called Pacific Rim) shall assume a greater global importance: economic and intellectual, in the 21st century.

I came to the United States in the fall of 1964. My brother came to the United States a year before me, and he was probably one of the last batch of Asian students to come to the United States by boat: the so called American Presidential Lines. I was probably the first batch of students to come to the states by the then Boeing workhorse, the Boeing 707.

To truly understand our current landscape, it is probably useful for us to paint the landscape of both Pacific shores in the ‘50’s and ‘60’s.

Since the theme is “transformation of landscape,” and how any region must adapt with the transformation, let me tell you a very interesting story about Boeing 707, the type of airplane I rode to the United States in 1964. While it was one of the true workhorses of the Boeing aircrafts, the 707 apparently was not designed to traverse the Pacific nonstop. Therefore, trans-Pacific flights on Boeing 707, which began flying in the mid 1950’s, usually required a Honolulu refuel stop. Such stops meant additional economic activities for Hawaii. While Hawaii was indeed a beautiful place for vacations, because of the refuel stops, people in those period could easily construct other business reasons to go there. That made Hawaii very prosperous! Unfortunately, as soon as the trans-Pacific-enabled Boeing 747’s were delivered to commercial airlines in 1969, the economic landscape of Hawaii changed. The majority of the visitors to Hawaii since 1969 were

primarily vacationers. This made Hawaii almost a “one industry” (vacation business) state. The moral of this story is “always anticipate change”.

In the ‘50’s, ‘60’s and even part of the ‘70’s, great political instabilities and backward economies existed on the western side of the Pacific. Nearly all countries were in the Third World category (with Japan being the only exception that was emerging as a global economic power). Perhaps the saddest part of being in the Third World was the lack of confidence among the people.

The separation of India into East and West Pakistan, caused enormous hardships for the people and even today, it is still one of the unstable points in the world.

From 1962 to 1965, Indonesian Government with President Sukarno at the helm, carried out a rather aggressive policy of “confrontasi” (the Indonesian version of the word “confrontation”) with the newly independent nation of Malaysia. I can remember living in Singapore in the early 1960’s when people there were deeply concerned about the possibility of a military confrontation between Malaysia (Singapore was a part of Malaysia then) and Indonesia. I remember well that on a clear day, one could actually see some of the Indonesian islands, that’s how close they were!

The Vietnam conflict lasted nearly a quarter of a century, from 1950 to 1975. The French left the area after the 1954 battle of Dien Bien Pho. Americans departed in 1975.

Between August 1958 - January 1959, there was the Second Taiwan Straits tension, the so-called Quemoy-Matsu crises. Such crises brought the United States Seventh Fleet to that region. The tension in the Taiwan Straits lasted for many years after that.

Further north, although the Korean armistices were signed in 1953, political instabilities on both sides of the 38th Parallel did not subside. Even today, the Korean peninsular is and could still be a trouble spot.

For China, the ‘50’s and ‘60’s saw a great deal of economic hardship and political turmoil. By the time 1966 rolled around, 10 years of Cultural Revolution was initiated!

I was only in North America part of this period. I think that while the situation in North America was far more stable than the Pacific western shore, there were also uncertainties.

Perhaps the most spectacular and saddest event was the assassination of President John F. Kennedy in 1963, the year before I arrived in this country, in a place which is just 18 miles from where I am standing now, and the assassinations of Robert F. Kennedy and Martin Luther King Jr. towards the end of the ‘60’s.

Some historians in the United States refer to the ‘50’s and the ‘60’s as the age of the civil rights movement. 1954: Brown v. Board of Education; 1955: Montgomery Bus Boycott; 1957: Desegregation at Little Rock; 1960: Sit-in Campaign; 1961: Freedom Rides; 1962: Mississippi Riot; 1963; Birmingham and the March on Washington (where MLK

delivered his famous speech of “I have a dream”; 1965: Selma. The movement was monumental, but it took a lot of blood in getting it going.

Then of course, the Cold War was in full swing, so was the anti-war movement!

There is an interesting Chinese saying: wan lv cong zhong yi dian hong (among the 10,000 green vegetations, there is one red flower). Among the multitudes of terrible news, there was some good news.

Since I grew up in Singapore, I know that area best. In the ‘50’s and ‘60’s, it took 12 bloody years, in 1960, to bring closure to the Malaya jungle insurgency. The closure of this episode allowed gave the Malaya peninsula breathing space to become one of the economic miracles of Asia.

One of the most important successes of that period for the Western side of the Pacific is unquestionably the Tokyo Olympics of 1964. This was the first Olympics to be held on Asian soil. The Tokyo Olympics gave the Japanese Government an opportunity to show the world that they are now ready to play on the world’s economic stage.

Perhaps two of the most exciting developments of the Pacific Rim in the ‘60’s and ‘70’s were the intellectual and economic transformation of the South Korea and Taiwan. All of us have seen that the opportunities began to emerge in the region which allowed a significant number of scientists and technologists with entrepreneurial spirit to return to the region from North America. They brought not only their technical skills back home, but also their capitalistic skills with them as well. A majority of them became the economic and industrial backbones of not only Taiwan and South Korea, but of Asia and maybe the world. A number of them are part of the delegation of today.

So, with all these gloom and doom, why did the Pacific shores not collapse into an economic abyss? How did Asians develop a strong sense of confidence in the past several decades?

There are of course many reasons for the regain of confidence in Asians. For me personally (and for the thousands and thousands of Asians of my generation), I could point to Tseng Dao Lee and Cheng Ning Yang. Assisted by Madame C. S. Wu, they overturned one of the longest held beliefs, almost a dogma, in physics: mirror symmetry for all the forces in nature. This discovery won them the highest accolade in science, the 1956 Nobel Prize in physics. Of course, I would be remiss if I did not mention that there were other outstanding Asians who won the Nobel Prize in physics before Lee and Yang. Two came to mind were Hideki Yukawa of Japan in 1949 and Venkata Raman of India of 1930. Later on, individuals like one of my personal favorite physicists, Subramanyan Chandrasekhar of the University of Chicago, also won the Nobel Prize. Their influence and impact on the Asian landscape certainly cannot be underestimated. These great men and women instilled in the millions and millions of Asians a profound sense of confidence. Such confidence, I believe contributed to the confidence one sees today on the western shore of the Pacific.

Lee and Yang, and literally thousands of Chinese Americans like them, and people like Chandrasekhar, play another important role in the past several decades. They were one of the important bridges between the East and the West. These were people who stood firmly on the European-centric American stage and gave their fellow non-Asians a comfort level never known before in North America.

What is the Pacific Rim like in the 21st century?

There are still problems, of course. North Korea comes to mind immediately. China is still struggling with a very large population, but there is enormous growth in economy as well as the level of political maturity and stability between now and in the '50's and '60's. Taiwan and Korea are now technological powerhouses. There are now so many Japanese Nobel laureates in Japan that it almost is no longer news (I am kidding, of course). Quite recently, there is talk about 10+1 (where 10 is the 10 ASEAN countries and 1 is China) becoming a free trade zone in a decade. The economic implication of 10+1 (or 10+3) is so very dizzying!

On this side of the Pacific, despite the recent economic downturn, and despite of global uncertainties due to terrorism, the United States, and indeed all the countries in North America, have seen and continue to see unparalleled economic and technological growth. Despite of the recent SARS pandemic, traffic between North America and the Western shore of the Pacific remain intense.

With the transformation and entrepreneur sprit on both shores of the Pacific, and with more and more people leveraging the new communication tools, the gap between of the shores is never narrower.

For one thing, the world is much tighter today then merely a decade ago, never mind about three or four decades ago. I do not believe that there will be anyone here who will argue with me that in the past decade, Internet has totally changed our life, our business, and indeed, our complete existence, including our warfare.

Just imagine, merely 10 years ago, in 1993, United States was still in the "Internet Stone Age." There were more .edu's then .com's. Most people were still using the old "bitnet", where bit is the acronym for "Because It's Time." People who had home connectivity probably were connected with the 9600 "baud", or in modern terminology, 9.6 kilobits per second (kbps) rate.

Let me give you another anecdote. Eleven years ago, my colleague from Oak Ridge National Laboratory Mike Strayer and I went to Beijing to work with colleagues at the Institute of Applied Physics and Computational Mathematics there to set up the 2nd International Conference in Computational Physics in 1993. I remembered Mike and I, together with our Chinese colleagues, struggled heroically for a couple of days to find a way to connect to the bitnet. We failed. In fact, if I am not wrong, in 1993, there wasn't a single website existed in China.

Today, there is a large number of websites in China, and the rate of increase is literally dizzying and frightening. Let me quote for you a recent data.

“By the end of June, 2002, the number of Internet users in China has reached 45.8 million, an increase of 19.3 million or 72.8 percent over the same period in 2001, according to a report released by China Internet Network Information Center”

Although the number is not out yet for 2003, I would not be at all surprise that soon, within a few years, there will be close to 100 million Internet users in China. While that number is only 8% of China’s population, it is nearly the entire population of Japan and half of that of the United States. Even more amazing, in 1997, there are only 650,000 Internet users in China! So, up to now, only much less than 10% of the Chinese are linked to the Internet. It is sobering to think what that country, or the entire western Pacific shore, or for that matter, the entire world will be like if the number reaches 20%, or more!

I do not have the data from India, but I suspect that it too is rapidly becoming Internet-centric!

The connectivity world has also changed so drastically. Just a few years ago, OC3 or 155 Mbps, that is 1500 times faster than the old 9600 baud, was considered very very high speed. Now, for the Internet–2 backbone, for example, we are already talking about OC192, or 10 Gbps, or 10,000,000,000 bps! Indeed, highspeed backbones are now reaching more and more areas. Nowadays, if you are only connected via the old 56 kbps at home, like me, people laugh at you. More and more people are now connected to the “broadband”.....

I can go on and on about this, with 3G and possibly 4G wireless communication coming on line, with cyber security, with super highspeed data engines, such as the ASCI Red or ASCI Blue reaching many teraflops, and with interoperability. But I think you will all agree with me that Internet has made the world that much tighter (as opposed to “that much smaller.” Every time I fly to Asia, I wished the world is smaller...)

At the same time, every we do nowadays, whether it is business, education, defense, homeland security, ... what have you, it is all Internet related. In fact, my good friend Jack Pellicci, Group Vice President of Oracle has an interesting measurement of time, and that is “Internet year.” What used to take five real years to complete can be done in one Internet year. In other words, we do everything faster, everything more “agile.” In the age of agility, we must recalculate and reevaluate how we do things in this new paradigm on both shores. Companies that can take advantage of this new paradigm will be the successful ones in the 21st century.

Finally, let me say how research universities can play in this landscape on both shores. With the wisdom of a Monday morning quarterback, and the fact that there is some sort

of economic implosion since 2001 for the telecom industry, I think there is at least one important lesson one can learn from it. The lesson has a simple name called “churn”!

Let me explain what I mean by churn. I first learn this term from a UTD faculty member named Don Hicks and from my friend Richard Seline. Of course any confusion of the meaning is mine and not theirs.

From the outset, “churn” is intimately related to research universities. I think no one will argue with me that for the Metroplex, research institutions must be the economic focal point and the engine for producing regionally, nationally and globally competitive workforce for the 21st century. This is not a luxury but a must. The first lesson from the past decade is that research universities must mix, or “churn”, the economy. For example, when the downturn, or implosion, came around for the telcom industry, it was probably not wise to suggest to a laid-off employee of telecom company A to send his/her resume to telecom company B.

Usually that is “dead on arrival”.

It would have been much more productive if there existed platforms where a wireless expert in telecom company A could discuss with a business manager, or technologist, or both, of a medical device company 1, and come up with a novel way of combining the wireless technology with the medical device to form a new and better product. New and better product can produce better business plan, and better business plan usually has a higher probability of making money.

Now, how do research universities come into the churning equation? Well, the desired platform which I mentioned earlier is what an outstanding research university, or a group of outstanding research universities, can do, does well, and should and must do continuously. After all, such universities are always hunting for new ideas, hunting for new sciences, hunting for new technologies, hunting for other new innovations, nowadays, hunting for ways to technology transfer and spin-off such technologies, and last but not least, hunting for new ways to connect dots, these dots being new science, technology and entrepreneurial ideas, that are seemingly unconnected. To be truly successful, outstanding research universities must and should embrace the regions surrounding industries to make sure that different industries can interact in a highly mixing manner, and value add, intellectually and economically, to the business. With this, it can contribute to economic sustainability. This is what scientists refer to as “non-linear mixing”! This is the fundamental principle of churning!

Examples of such universities which have made true, enormous and fundamental economic differences to the regional intellectual and economic landscape that come to mind are the eight powerful research universities in the greater Boston area, UC Berkeley, Stanford and San Jose State University in the Bay area, UC San Diego and San Diego State University in the San Diego area and Georgia Tech and Emory University in the greater Atlanta area. And the IIT’s in India, as I mentioned earlier.

In building trans-Pacific business, let me suggest you urge your colleagues in India not to forget to collaborate closely with research universities. I am sure if properly arranged, such collaborations intellectually and economically rewarding.

Incredibly, even just after two and a half years, the 21st century is already posing serious economic, intellectual, technological, political and military challenges for the both shores of the Pacific.

I believe that the Chinese have the most appropriate phrase to describe the current global situation, and that it is embedded with “*wei-ji*”, or “dangerous opportunities.” Indeed, there are enormous and incredible opportunities in seeking solutions, and business opportunities, to these complex global challenges. Some people say that technology can solve all these problems. In my opinion, this is not true. Only people can solve problems. And to solve these problems of a global scale, one needs to find people with global thinking and global outlook. To solve these problems require bold creativities and innovations never before known to mankind.

Thank you.