Striving for Excellence in Higher Education

*If it rains, let it rain. If the wind blows, let it blow.*
— Ikkyu

*All that we are is the result of what we have thought.*
— The Dhammapada

In 2005 we have certainly experienced more than our fair share of rain and wind, as well as fire, earthquake, and general devastation. These natural events are obvious to everyone, even to those not normally paying attention. Parallel winds of change have been blowing through human society for decades—however, these have been much subtler, much easier to ignore. But we are now, to our great disadvantage, experiencing the cumulative effects of change. Global monetary power is drifting rapidly away from the United States, the American workforce is unprepared to do well in the new knowledge economy, and science and math skills of American students continue to erode.

Enter higher education. The excellence we are striving for, I submit, is not solipsistic or self-referential. Rather, excellence in our colleges and universities will ultimately be measured by how well our graduates are addressing critical issues—middle-class standards of living, needs of the poor (nutrition, healthcare, housing, education, opportunity . . . ), integrity of the environment, full participation of women and traditional underrepresented groups across the range of socioeconomic activities, and technological invention and enterprise.

We can meet the challenges of the 21st century if we are paying attention and take meaningful action. We will fail if we continue doing what we’ve been doing, which is, essentially, not much. On October 14th, 2005, Thomas L. Friedman reported in the *New York Times* that “. . . in Germany, 36 percent of undergrads receive degrees in science and engineering; in China, 59 percent; in Japan, 66 percent; and in America, only 32 percent.” Mr. Friedman notes “. . . U.S. 12th graders recently performed below the international average for 21 countries in math and science. . . . The world is racing us to the top, not the bottom, and we are quietly falling behind.”

The National Academy of Sciences, The National Academy of Engineering, and the Institute of Medicine have recently released “Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future”, a 500-page report. The report notes, “Research, innovation, and economic competition are worldwide, and the nation’s attention, unlike that of many of its competitors, is not focused on the importance of its science and engineering enterprise. . . . We must act to broker a new, collaborative understanding among the sectors that sustain our knowledge-based economy—industry, academia, and government.”

Brent Staples adds, in the November 21st, 2005, *New York Times*, “The United States will become a second-rate economic power unless it can match the educational performance of its rivals abroad and get more of its students to achieve at the highest levels in math, science, and literacy.” He adds, “. . . school systems and colleges of
education have no idea how to generate changes in teaching that would allow students to learn more effectively.”

How to fulfill this reformulated mission for higher education? William G. Bowen, President of The Andrew W. Mellon Foundation, in the 2004 Thomas Jefferson Foundation Distinguished Lecture Series, described excellence as “educating large numbers of people to a high standard and advancing and disseminating knowledge”. Also, Dr. Bowen noted “A central purpose of higher education . . . is to prepare talented young people to assume leadership in their societies.”

To be blunt, we have been abrogating our responsibilities to our students, our communities, our nation, and our global neighbors. Dr. Robert Watson, Senior Scientist with the National Resources Defense Council, was quoted in the November 2, 2005 New York Times: “We are not the only source of innovation on the planet. . . . We are clutching our past with these tremulous hands, and everyone else is vigorously grasping the future.”

The rate-of-change of knowledge creation is itself accelerating. As President Franklin D. Roosevelt observed in 1944, “New frontiers of the mind are before us . . . We can create a fuller and more fruitful employment and a fuller and more fruitful life.” Sixty years later, President Roosevelt’s timely and, also, prescient comments represent a powerful call to action.

It’s a science-and-math world. The widely touted field of nanotechnology will impact every area of our daily living. Future treatments for cancer, Alzheimer’s disease, heart disease, and spinal cord injuries are being developed using the tools of nanotechnology. Sustainable and renewable energy sources, including solar power and hydrogen, will become available in our lifetimes, thanks to nanotechnological breakthroughs. The abilities to mitigate the effects of global warming, as well as to provide clean air and water, will likewise depend on new science flowing from research at the nanoscale. Fulfilling our new National Space Policy: Moon, Mars, and Beyond will depend on novel engineering solutions provided by nanotechnology.

What is this magical, all-powerful field? Nothing more, and nothing less, than the confluence and collaboration of physics, engineering, chemistry, biology, and computer science. So, yes, we need to be training many more students to do the work. And yet, facility with experimental design protocols, genetic algorithms, and distributed networks is not sufficient. Dr. Carlo Montemagno, Chairman of the Department of Bioengineering at UCLA, recently noted, “The most important characteristic in a member of my research team is good communication skills. The ability to communicate is more important than the ability to solve a wide variety of partial differential equations. Having strong verbal and written skills are critical to a scientist’s long-term success.”

Graduating students not only literate in science-and-math, but also literate in literacy! Not possible? This is exactly what colleges and universities used to do, in the 1950s and 1960s. We were able to put men on the moon in eight years! As a society,
Americans are used to successfully solving crises. It’s time to face our educational crisis boldly, and bring to bear all our renowned skill, expertise, and flair for leadership and innovation.

How to begin this demanding and rewarding journey? First, we need to resist our instinct to circle the wagons. As “Rising Above the Gathering Storm” points out, the world of the 21st century is collaborative. Both industry and government should be welcomed as our partners. And, it’s critical for higher education to address industry’s needs in terms of workforce preparation and readiness. Manufacturing has pretty much gone away. American workers can no longer compete, on an hourly wage basis, with similarly skilled workers in developing countries such as China and India. Our workers need to be retrained to provide service and support for research and development activities in the life sciences, engineering, and information technology.

Historically, the United States has been the locomotive of the world’s economy. Dr. Meyya Meyyappan, Director of the Center for Nanotechnology at NASA Ames Research Center, observes, “We can continue to lead in the areas of our traditional strength—innovation and knowledge creation. We can continue to compete by generating intellectual property, and creating revenues by converting these patents into new manufacturing enterprises and jobs.” We must keep knowledge-based jobs here, and it’s up to higher education to graduate students who can fill these positions.

How will we measure the excellence we’re striving to achieve? Many institutions have implemented outcomes assessment strategies, based on principles of total quality management. I propose these tools be extended beyond the metrics of student and faculty performance to include “customer satisfaction surveys”. In other words, are we meeting and exceeding the requirements and expectations of our customers—our students? Quality medical facilities—private practices, laboratories, and hospitals—routinely request such feedback from their customers—their patients. Higher education exit surveys focusing on faculty and courses might request feedback on what worked, what didn’t work, what new features might be implemented, what tools and assets the student now possesses that weren’t present before, and so on.

Finally, our best efforts will have minimal impact if our nation’s K-12 teaching continues its dismal performance. “Rising Above the Gathering Storm” states, “The critical lack of technically trained people in the United States can be traced to poor K-12 mathematics and science instruction. Few factors are more important than this.” Effective teacher training is required, utilizing core program components of “strong content knowledge, practical pedagogical training, ongoing mentoring and education, and incentives”. Two innovative programs include UTeach, at the University of Texas at Austin, and California Teach, offered at the ten campuses of the University of California.

The challenges to higher education are insistent and immediate, and reflect the challenges we face as citizens. Our way forward will require embracing the moving target of pervasive and persistent change. Our courage, pragmatism, and adaptability will help us continue to succeed.
1 Friedman TL: “Keeping Us in the Race”, *The New York Times*, October 14, 2005
3 Staples B: “Why the United States Should Look to Japan for Better Schools”, *The New York Times*, November 21, 2005
5 Ibid, p. 3
9 National Academy of Sciences, *op. cit.*, pp 5-9