# Empires of the MIND

By Shirley Ann Jackson

Throughout our country's history, U.S. colleges and universities have had a rich tradition of scholarship in service to the nation and to the world. This focus has been steady and constant.

But change is the only real constant. Our continually shifting world challenges us to refresh, to remove and replace, to modify, to alter and adjust—in effect, to dust our intellectual house for the new world order, which is flat and integrated, yet asymmetrical, and unstable.

The movement toward global integration is rooted in human motivations as old as history—the urge to explore, to discover, to trade, to gain new knowledge, and to experience new cultures. For centuries, countries have sought the means to do these things better, accelerating the movement of people, technology, information, and ideas. Advances in transportation and communications technology have greatly facilitated trade and information exchange, and have begun to truly interlink the planet.

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With the advent of fiber optics, PCs, cell phones, and wireless broadband, countries, commercial enterprises, and even individuals have gained a level of access to one another that has leveled the playing field as never before. The development of "flat world protocols"—workflow software, supply-chaining, in-sourcing and outsourcing, and seamlessly connected web applications—has opened up a universe of equality in which anyone with access and with the necessary ingenuity and motivation can compete, regardless of his or her ideology, ethnicity, gender, or geographic location.

We have made great strides, globally, since the 1960s. Average life expectancy has increased from 37 to 67 years; child mortality rates have been halved[1]; small pox has largely been eradicated and the incidence of polio greatly reduced; fertility rates have been reduced, so that today there are 3.5 births per woman in developing countries, rather than the six of the 1960s.[2]

In that same time, science has improved crop yields so that grain production has tripled.[3] Scientific discovery and technological innovation have enhanced energy production, transportation, and information technology, which itself undergirds nearly every other sector—from financial markets to national security.

The world economy has expanded by a factor of seven—except that the world is more asymmetric than ever before.

There are serious imbalances. From 1950 to 2000, the world population rose from 2.5 billion to 6 billion people, and may top 9 billion by mid-century. Water use has tripled. The demand for seafood has increased fivefold. The number of automobiles grew from 53 million in 1950 to 539 million in 2003.[4] We are just beginning to comprehend the environmental impact on the planet of this phenomenal growth.

Global distribution of wealth, consumption, and opportunity remain severely disproportionate. The wealthiest 20 percent of the population consumes 80 percent of the resources. Meanwhile, more than 20,000 people die every day from malnutrition, contaminated water, or diseases that would be easily preventable or treatable if their living standards were on a par with the developed world.[5] Half of the world's population lives on less than $2 per day.[6] One in four has no access to electricity.[7] Nearly 1 billion people are illiterate.[8] More than 850 million go to bed hungry.[9] For these individuals, the opportunities afforded by globalization and flat-world protocols have little meaning.

The convergence of technological advances, on the one hand, and asymmetric development, on the other, has produced unprecedented instability. Old rivalries and ethnic and religious tensions, which had simmered for decades, began to rise in the post–Cold War era, resulting in conflicts such as the wars in Yugoslavia and civil wars in Africa. These tensions have been made worse by poor governance practices, whatever their root, which have led to the repression of civil liberties, human rights abuses, and the breakdown of social institutions. In many cases, poor governance has exacerbated the asymmetry of living standards.

Such asymmetry, if not redressed, always will come back to haunt us.

How, then, are we to educate students for service and leadership within this environment? How do we shape our own scholarship and educate young people with an approach that will give them the motivation and capability to address the asymmetries, and begin to rebalance the imbalances? How do we sort these complexities and weigh the moral and ethical issues which arise from them?

## The Quiet Crisis

As this generation of students begins to assume the reins of leadership, they will be called upon to find the political and diplomatic solutions for global challenges. They also must find the technological solutions, the discoveries, the innovations that can rebalance the imbalances and right the asymmetries of today's world.

Innovation requires people—educated, prepared, professional scientists, engineers, and mathematicians. Maintaining our nation's capacity for innovation requires consistent investment in research and development, and consistent investment in human talent—i.e., in the "intellectual security" of a robust science and engineering workforce. There is serious concern today that the United States is failing to invest sufficiently in ensuring our own intellectual security.

The October 7, 2006, issue of *The Economist* published a 15-page special section on "The Search for Talent: Why It's Getting Harder to Find."[10] A recent issue of *The Wilson Quarterly* did the same, in a feature titled "The Global Race for Knowledge: Is America Losing?"[11]

In this rapidly expanding interactive flat world, nations are developing their economies by increasing investments in their own human talent. And so should we. There is strong evidence that we are not.

There are a variety of converging trends at work:

- The United States is failing to excite and prepare a sufficient number of young people to enter into the science and

engineering education pipeline to replace the highly skilled science and engineering professionals who were tapped in the late 1950s and early '60s and will retire in record numbers over the next decade.

- U.S. immigration policies and new opportunities abroad have slowed the flow to this country of international students, scientists, and engineers—who long have been an important source of skilled talent for the U.S. science and engineering research enterprise.
- U.S. demographics have shifted. Young women and ethnic minority youth now account for more than half of our population, yet they traditionally have been underrepresented in science, mathematics, engineering, and technology. It is from this nontraditional group—this "new majority"—that the next generations of scientists and engineers, and leaders in all fields, must also come.

These converging forces comprise what I term the "Quiet Crisis."

It is "quiet" because these are creeping trends—the true impact unfolds only gradually, over time, and therefore may be overlooked or ignored. This is impossible to correct quickly because it takes decades to educate and fully prepare a professional scientist or engineer.

It is a "crisis" because the U.S. capacity for innovation is inextricably interlinked with our economic and national security. Discoveries, inventions, and innovations create whole new industries that keep our economy thriving, and that mitigate the global scourges that make for human suffering and global instability.

## The Case for Energy Security

The impact of the quiet crisis is vividly observable in the growing need for energy security—a critical asymmetry. Our planet's 6 billion people are pressuring the world's energy supplies. As the population nears 8 to 10 billion people, their energy demands will grow proportionally.

Many speak of the United States needing "energy independence." It is critical that we instead speak in terms of "energy security." There is no energy independence, because the challenges we face are interrelated, *inter*dependent, and global. A narrow focus on U.S. energy interests alone—without regard for the energy interests of other countries—is neither practical nor productive. Energy markets, energy supply chains, and the economic opportunities and geopolitical challenges associated with the growing energy demands of rising economies are all global. The focus has to be on redundancy of supply and diversity of source. True economic opportunity and true national security are contingent upon energy solutions that can be applied globally, and require global collaboration and multilateral frameworks, whose synergies can benefit the "innovation enterprise."

Energy security may be the greatest global challenge of the 21st century. The stability that true global energy security would offer the world would be priceless. I and others have argued that energy security is the space race of this millennium. Just as a generation of scientists, mathematicians, and engineers in the 1950s and '60s were attracted by President John F. Kennedy's post-Sputnik national call to action to put a man on the moon, so too would be the response to a national call to action to solve the global energy challenge.

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True energy security will require innovation: innovation in the discovery, extraction, and transportation of fossil fuels; innovation in conservation; and innovation to develop alternative energy sources which are reliable, cost-effective, safe, and environmentally benign. Innovation, particularly on this scale, requires consistent investment in research and development, and consistent investment in human talent.

Leaders from all sectors have joined in the call for a national agenda to strengthen the U.S. capacity for innovation and to address energy security. Reports by major corporate, academic, government, and private sector

entities all warn of the consequences if we fail to strengthen our innovation capacity on the one hand and our energy security on the other.[12]

## Heeding the Call

Beginning in 2005, bipartisan coalitions in the U.S. Senate and U.S. House of Representatives introduced more than a dozen bills designed to improve America's ability to compete in the global economy and to ensure energy security. President Bush unveiled his American Competitiveness and Advanced Energy initiatives during his 2006 State of the Union address.

Leaders in the 110th Congress have pledged support for enactment of innovation legislation, bills have been introduced, and hearings are getting underway. These plans include a variety of proposals for increased support for math and science education at all levels, along with expanded support for research and improved access. However, budgetary restrictions may slow progress toward consensus.

At the state level, the National Governors Association, under the leadership of Arizona Governor Janet Napolitano, has selected "Innovation America" as its focal point for 2007.

## The Evolution of the Academy

What more is to be done? How might institutions of higher education reevaluate their aims and purposes to address both national and global challenges? How does an intellectual community respond? How do we combine and tailor our strengths, wherever we are, to meet these challenges?

How might an academic community shift and refocus its many strengths, so that it continues to lead in mitigating the great confluence of global challenges?

Revisiting the definition of the liberal arts, while re-examining strengths and challenges, may provide guidance.

The original term, *liberal arts*, derives from the Latin word *liber*, which means free. From the Middle Ages onward, this meant, essentially, freedom from manual labor—or, the freedom conferred by scholarship and the acquisition of knowledge that signified one's competence to enter any learned area, and to be freed to work with one's mind. This is why liberal arts study achieved the reputation of bestowing the status of gentility.

This freedom was accorded by study of the seven traditional liberal—or liberating—arts, which were organized into two sets. The first set—the foundation—was the *trivium*, comprised of grammar, logic, and rhetoric. This equates with achieving mastery of the thought processes, specifically the skills of communication, organization, and persuasion. Mastery of this material constituted the Bachelor of Arts degree.

More advanced study, encompassing additional content, comprised the *quadrivium*, consisting of arithmetic, geometry, astronomy, and music. These were the basic sciences of the day, with an emphasis on mathematics. Acquisition of these skills conferred the Master of Arts degree.

As education has evolved over time, and as there is considerably more knowledge to acquire to achieve mastery, scholars have moved away from a basic integration of knowledge into distinct and isolated specialties. Is this not, perhaps, to the detriment of vision and understanding? Today, some 600 or 700 years into higher education and academic study, the study of science is too quickly separated, in all of its richness and multiplicity, from the study of the humanities, arts, and social sciences.

Science is essential to a liberal education. Further, the ability to address the global challenges of a flat, but asymmetrical, world increasingly will require a leverage of strengths, an ability to bring the intersection and interaction of disciplines to bear.

The broad intellectual horizons of the liberal arts, law, diplomacy, public policy, business, medicine, and health studies—when combined with languages and linguistic studies—create a powerful preparation for leadership in the 21st century.

**How does an intellectual community respond?**

But basic science is a linchpin. It is important in its own right. It is important for both leading and animating solutions to challenges. The strengths of the traditional liberal arts, undergirded and enriched by basic science, create a powerful intellectual nexus, making worthwhile the investigation of newly interdisciplinary and collaborative courses of study.

However, underlying all collaborative ventures, and creating an imperative foundation, is the need to understand and evaluate the complex moral and ethical questions that arise across all endeavors—a focus that the world so desperately needs today, and which we in the university also must provide.

## Reflect and Revitalize

We have begun this process at Rensselaer Polytechnic Institute. When I was inaugurated seven years ago, I challenged the Rensselaer community to think in a broader way. We know that genomics, combinatorics, when married with information technology, will impact the human condition as strongly as quantum science did in the 20th century. I urged that we integrate research in the biological sciences with engineering, the physical sciences, and computation—to create a uniquely focused biotechnology agenda, with a particular emphasis at the nanostructure level. I urged Rensselaer to undertake a biotechnology initiative that would combine fundamental research and technological innovation to strengthen undergraduate and graduate education, to create new enterprises, and to enhance industrial partnerships.

Our investment has expanded exponentially, garnering federal and state commitment and collaborative corporate partnerships.

We have echoed this thrust by bolstering science requirements for all undergraduates —strengthening students' understanding of the physical and biological worlds, and with an interdisciplinary approach to biology targeted to both biology majors and non-majors. We also are infusing entrepreneurship throughout the curriculum. We have begun a major energy initiative as one of five signature research thrusts of the university.

In seven years, we have revitalized Rensselaer. Research and education potentiate each other. Discovery and innovation create new knowledge, which is shared broadly and applied practically.

We now are expanding opportunities for our students to participate in global educational experiences, and we are moving toward a requirement that all students have a cross-cultural experience—perhaps a semester abroad, or summer internship in a country other than their own—as a requirement for graduation. These changes are essential if we truly are preparing students to develop the informed perspective, the multicultural understanding, and the intellectual agility to lead effectively in the global marketplace.

We also know that, without a strong ethical foundation, our students can lose their way, especially in a world of rapid technological change, which many of them will be driving. We are creating platforms and forums to infuse an ethical perspective into the education of our young people.

The response from the campus community, from alumni and alumnae, from corporate partners, from peer and aspirant institutions has been extremely heartening.

What we are doing at Rensselaer is but one example of how it is possible to unite an institution's greatest strengths into something new and compelling—a revitalized intellectual approach that reflects contemporary challenges, and prepares students to lead.

There are untold opportunities in the complexities of our global future. I take great stock in the words of Sir Winston S. Churchill, who, speaking in 1943 at Harvard University, where he received an honorary degree, observed that "the empires of the future will be empires of the mind."[13]

We now are living the future of which he spoke. We who educate have the opportunity and responsibility to create the environments that foster the empires of the mind, and to ensure that the future leaders of our world are equipped to expand those empires globally for the benefit of humankind. ■

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