



On Wisconsin!

BY BASSAM Z. SHAKHASHIRI

Madison has been my adopted home since I first joined the faculty of the University of Wisconsin–Madison as an assistant professor of chemistry in 1970. I was sworn in as a U.S. citizen in 1974 by U.S. District Court Judge James E. Doyle, the father of our current governor. I remember the occasion well, especially the moment when Judge Doyle urged us to enjoy our freedoms. In 1984 I took a leave of absence to serve in Washington as National Science Foundation assistant director for science and engineering education, returning to UW–Madison in 1990. At the NSF I helped set the annual education budget on a trajectory from \$23 million to its current level of over \$900 million. Before, during, and after my service with the federal government, I declined other opportunities to take faculty and high administra-

tive positions elsewhere. My proudest professional achievement is my tenured appointment at UW–Madison.

I love Wisconsin because our people are friendly, hospitable, have good values and wonderful traditions, and because our state has always been progressive. I love the Wisconsin Idea, one of the earliest expressions of the obligation of a great university to serve all the people of the state and, by extension, all the people of the world. Our state has a remarkable 160-year history of supporting the University of Wisconsin. I cherish the tradition of “sifting and winnowing” in making decisions and I’d like to see Wisconsin practice it more often.

Over the years, I have advocated increased awareness of the role that science plays in our daily lives. We live in the most advanced scientific and technological society in history. New discoveries have led to personal and societal enlightenment, to improvements and benefits in our daily lives, but also to new societal problems. Basic research in science has greatly increased our understanding of nature, expanded frontiers of inquiry, shown us how little we know, triggered creative waves of invention and innovation, and prompted technological breakthroughs that were inconceivable just a few short decades ago.

Yet, many people around the world are still insulated from much of the modern advancement in such fields as agriculture, medicine, healthcare, housing, communications, transportation, and are thus deprived of their benefits. The wide gap between those of us who flourish because of advances in science and technology and those who do not is deeply disturbing. It

is astonishing that 1.1 billion people in the world live on less than \$1 a day, as reported by the World Bank. Science and technology can affect the quality of life around the globe and we must be *wise* in the use of technology everywhere.

Advanced technology has given us many wonderful things, but it has also given us deadlier weapons and global climate change due mostly to the burning of fossil fuels. Worse, the nature of our interactions and dealings with each other as human beings and as nations has been little changed by our progress in science and technology—except in warfare. Indeed it has been said that one major difference between modern society and the Stone Age is the sophistication of our weapons. I believe that in everything we do we must be always humane and humanitarian. It is unconscionable that we, as enlightened people, approve and tolerate the use of napalm, cluster munitions, phosphorus bombs, land mines, and nuclear bombs on fellow human beings.

Such moral questions as these emphasize the fact that the world is increasingly dependent on science and technology. This is why it is essential that all citizens gain *science literacy*. By *science literacy* I mean an appreciation of science, an understanding of the benefits of technology, and the potential risks associated with advances in both. It is important to make a distinction between *science literacy* and *scientific competence* or *scientific expertise* when we discuss what science is capable of achieving and what it cannot accomplish.

Achieving science literacy is necessary for the democratic process to work. Science literacy enlightens and



Photo credit: Stephanie Judge/UW–Madison University Communications

Bassam Z. Shakhshiri, a native of Lebanon, is a professor of chemistry and the first holder of the William T. Evjue Distinguished Chair for the Wisconsin Idea. He directs the Wisconsin Initiative for Science Literacy (scifun.org) and was inducted as a Wisconsin Academy Fellow in 2005. Beginning next fall, he will mark his 40th year at UW–Madison with 40 celebratory presentations in Wisconsin and beyond.

enables people to make informed choices, allowing us to be skeptical, to reject shams, quackery, unproven conjecture, and to avoid being bamboozled into making foolish decisions where matters of science and technology are concerned. The level of science literacy in any society is a measure of its values. Science literacy is for everyone: scientists, artists, humanists, all professionals, the general public, youth and adults alike. Science literacy can enhance our daily lives in many ways. Perhaps the cultural addiction in Wisconsin to brats, beer, and brandy will change if we accept scientific findings about obesity and alcoholism.

Our natural curiosity and delight in discovery should be nurtured, especially in children, because science can be personally rewarding as well as beneficial to society. For some, knowledge is an end in itself. For others, it is the basis of inventions and new products that stimulate the economy and create new markets. For all of us, knowledge is the source of an improved quality of life that we can enjoy at all ages. What we learn and what we invent must be used for the improvement of the human condition and the betterment of society. Our rapidly changing world requires leadership with vision, enthusiasm, care, respect, and focus on societal progress. Solving the challenges the world faces in the 21st century requires effective collaboration between scientists, enlightened policy makers, and a science-literate public that understands the benefits of scientific and technological progress. By far the most critical ingredient for creating this type of collaboration is education, and it needs to be a top priority for all nations and their component institutions.

But we need better education in all areas, not just in science. In a democracy educated people can make *wise* decisions regarding science and tech-

Bassam Shkhashiri and special guest Bucky Badger experiment with dry ice and hot water to produce fog during his "Once Upon a Christmas Cheery in the Lab of Shkhashiri" program, an annual holiday version of his "Science is Fun" program.

The level of science literacy in any society is a measure of its values. Achieving science literacy is necessary for the democratic process to work.

nology, ensuring they are used to further personal and societal well-being. In our daily lives we must always act with integrity and be respectful of each other as human beings, regardless of differences of opinion and belief. Our lives will be enriched if our interactions are based on respect, adherence to the rule of law, mutual trust, and confidence in the values of our societal institutions. Society will benefit if all of us take personal and collective responsibility for our actions and their consequences. Let us be honest and responsible in all our personal, professional, and social dealings.

Currently we face a colossal national and global economic collapse that threatens our societal institutions—and even our ideals. The loss of confidence in our financial institutions and the lack of trust in their managers have demoralized us and diminished our security. The actions of some intelligent and highly skilled professionals suggest serious character flaws and shocking disregard for society. Proficiency or technical skill does not ensure responsibility and stewardship in any society.

In a free and civil society, people should be virtuous as well as skilled. The grim financial market condition is not only an economic failure; it is the failure of families, schools, colleges and universities, government, private, and religious institutions.

We seem to have failed in educating ourselves not only to learn the difference between right and wrong, but to behave accordingly. The future of our free-enterprise economy is greatly threatened and recovery will require strong self-confidence and renewed trust in our institutions. People and institutions must prove that they are *trustworthy* before they can earn our trust, and we must be patient and thoughtful on the long and arduous road to recovery. We should always exercise *good* judgment. The economic problems are fixable. On this, my faith in our *ability* is unwavering; it's our *will* to act wisely, both individually and collectively, that is in doubt.

Education must be among the highest priorities for Wisconsin. Learning is perhaps the most important part of education, but acting on what we learn



Photo credit: Stephanie Judge/UW-Madison University Communications

is just as important. Education occurs at home, in school, in the work place, in recreation areas, and everywhere in our daily lives. All citizens and groups must work together thoughtfully and with conviction in our ability to transform ourselves and our state to be productive and prosperous, healthy and happy, fair and responsible, honest and trustworthy, and to promote free-enterprise and serve the common good. To ensure progress toward reaching our goals, our strategies should be coherent and harmonious. But we must always allow for dissonance. We should be accountable and develop indicators of progress to help improve the next steps, as goals and strategies are dynamic and will change over time.

For immediate action in our state, I propose the following initiatives. The necessary steps needed to pursue these suggestions are to be taken by all stakeholders committed to improving the quality of life in our communities. This means all citizens; elected offi-

ciala at every level and in particular the governor and legislature; business, civic, religious, and community leaders in urban and rural areas; public and private education institutions and their leaders; and philanthropists:

- A new ten-year initiative that provides four-year undergraduate scholarships at public and private colleges and universities for recruiting and educating 200 new teachers every year. Upon graduation each new teacher will be employed by the Milwaukee Public School system for a period of five years. During every school year and in the summer these teachers will participate in professional development activities conducted jointly by MPS and the institutions that granted their degrees. This will require committed support from MPS and our universities, but would give back many folds the effort it requires.

- A new initiative called “Wisconsin Science and Engineering on the Road” in which science and engineering take to the road in a vehicle stocked with chemicals, equipment, and instruments, and staffed by teaching personnel. The purpose of this collaborative partnership between the private sector and colleges and universities is to bring modern science and engineering education to inner city neighborhoods, suburbs, and small rural communities in Wisconsin. Twenty five vans are to be donated by the private sector and colleges and universities are to provide equipment and staff for each.

- A new initiative called the Wisconsin Science Festival. The purpose is to showcase the talents and creativity of our people, their scientific and commercial contributions, and the diversity of our culture to everyone across the state. The Festival is to be a series of public events held year round across Wisconsin and a three-

day event held in alternate years in Madison and Milwaukee. Festival events will aim to inspire exploration and encourage innovation in science, technology, and culture. The “Wisconsin Initiative for Science Literacy,” which I direct, is exploring the formation of partnerships among science, technology, business, and culture groups both public and private to draft plans and to secure financial support for launching the Festival—hopefully—in 2010.

- A top priority for Wisconsin is to support research and development in modern science, encourage creativity and innovation, and foster collaboration in order to ensure a healthy economy. Explorations for alternative, renewable, and sustainable sources of energy to meet the demands of modern society should be supported by business and government. Let us continue to live the Wisconsin Idea by supporting incubators for technology transfer and open innovation at research parks in strategic locations across the state.

- The mission of our public colleges and universities should be reevaluated. We need to identify and nurture their strengths while selectively increasing efforts in the areas of research, teaching, and public service. This challenge must be carefully pursued with sincere cooperation between the UW System, the technical colleges, the state government, and the people of Wisconsin.

- The state standards we set for science and mathematics education must be dynamic and should be continually reviewed by experts, policy makers, and the general public. We should ensure proper content of science courses and exclude what some erroneously call “science.” Wisconsin is a leader in researching how we learn, and therefore in finding new ways to teach. The recent research

Academy Evenings at MMoCA: Jo Handelsman

Microorganisms: Calamity and Salvation for the Earth and Its Residents

**Tuesday, May 5, 7–8:30 pm
Lecture Hall, Madison Museum of Contemporary Art**



Microbes run essentially every process on the planet. How do they do it, and what happens when the process is disturbed? UW–Madison plant

pathology professor Jo Handelsman’s lab aims to explain the structure and function of microbial communities and, in particular, to understand the nature of community robustness. Her presentation focuses on discovery of novel antibiotics derived from bacteria, and on how these antibiotics affect communication and stability in microbial communities.

of my UW–Madison colleague Jo Handelsman on *scientific teaching* is an example. We can use these results to improve our teaching strategies at all educational levels.

- Our elected officials, business and community leaders must be kept frequently and properly informed about scientific advances and their consequences. This should be not only the responsibility of scientists to inform, but also of these leaders to inquire. And both scientists and these leaders should openly engage in raising the science literacy level of the general public.
- Wisconsin has a rich heritage of caring for and about our environment, led by men like John Muir and Aldo Leopold. Teaching our students to contribute to this heritage should not be relegated to a single unit during a single year of their education, but should be threaded throughout every grade level and beyond to college. We must make a concerted, daily effort to be “green.” We are the stewards of our communities and environment and we should do everything humanly possible to protect both.

- We need to keep in mind that ethical issues often arise from scientific endeavors. Thus, scientists and all citizens should always engage in meaningful and respectful dialogue in areas such as biomedical research, nanotechnology, climate change, water quality, and product safety. In all areas, we should be accountable for decisions we make and for the funds we use to ensure wise use of resources and to avoid waste.
- Science and technology are the engines that drive our economy. Especially because we are in what could possibly be the deepest recession in modern times, we must remind and lobby our elected federal officials and national business leaders to maintain the national research and development budget at 3% of the gross domestic product.

While I have chosen a host of areas in which to make specific suggestions, I am open to further discussion and eager to help implement these initiatives. Let us be bold and innovative in shaping our immediate future. On Wisconsin! ✨