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From the President



Honor the Past and Look to the Future

This has been an exciting year at Sigma Xi—from a celebration of our 125th anniversary to the election in which, for the first time, all members had a vote. I am both thrilled and honored to have experienced these milestones while serving as the Society's president.

As part of Sigma Xi's 125th festivities, we celebrated not only the rich history and significant impact of our Society but also generations of members and the chapters that together are the essential elements for success in furthering our mission. We invited our members and chapter leaders to identify the Society's outstanding "fresh faces" and "distinguished members," and the response was remarkable. These exceptional members were acknowledged in *American Scientist*, and their profiles are posted on the Sigma Xi website. We also invited younger members to interview more established members—exploring the passions and achievements in their research careers. Their reflections were colorful and inspiring, and represented the best aspects of our Society.

We also implemented steps to create a history book of our first 125 years—from our founding at Cornell University by a junior faculty member and a few students to the international honor society of 50,000 members that we are today. With the help of our widespread network of chapters, Sigma Xi has, since its founding, launched a great number of initiatives, programs and benefits to serve our members and educate the public at large. One of the clear messages that emerges from our history is that the founding values of our Society continue to be our core values: honor, ethics, collaboration, mentorship and integrity.

Indeed, the Society encouraged its members to think deeply about research integrity in 2011. Following on the ethics theme of our 2011 Annual Meeting, each issue of *American Scientist* included a column on ethics in scientific publication. The essays were compiled into the booklet *For the Record*, which was distributed at our annual meeting and can be downloaded as a PDF from the Sigma Xi website. This volume is the third in our series of ethics booklets, which also include *Honor in Science* and *The Responsible Researcher*.

As our mission states, Sigma Xi is an honor society of leading research scientists and engineers focused on improving the human condition. It has become clearer and clearer that that goal is rarely accomplished by the lone researcher. Sigma Xi has long sought to foster collaboration among scientists of different disciplines, and the Sigma Xi white paper "Team Science: Heaving Walls & Melding Silos" (included in the November–December 2011 issue of *American Scientist*) articulated the potential of team science to solve the complex problems that society faces. *American Scientist* has always included articles that reflect interdisciplinary or transdisciplinary research, but this white paper was the first in what will become a series of articles through which Sigma Xi will promote team science in its flagship publication.

Finally, I was delighted to be part of Sigma Xi's first all-member leadership election. During the 2010 Annual Meeting, the bylaws were amended so that the election of Society officers, directors, associate directors and members of nomination committees would be open to all active (dues-paying) members and associate members. Previously, only the designated chapter delegates who attended the annual meetings were allowed to vote. The first all-member voting occurred right after the 2011 Annual Meeting, and more than 5,500 members participated. For a first-time electronic ballot, the turnout was very impressive—a testament to the interest and involvement of our membership.

I thank all of my fellow members for giving me this opportunity to serve as your president for the past year. Although we accomplished an enormous amount, we have much more to achieve. I know that I leave this Society in the very capable "global hands" of our international members and chapters, along with our incoming president, Kelly O. Sullivan.

Michael Crosby

Marye Anne Fox to Receive 2012 McGovern Award



Renowned chemist and administrator **Marye Anne Fox** believes in changing careers every 10 years or so. “You have to be inventive and inspired,” she says. “You give your best contributions

in the first half or two-thirds of any period.” That approach has worked for Fox, who is the recipient of Sigma Xi’s 2012 John P. McGovern Science and Society Award. Each year, the award honors a prominent spokesperson for the public understanding and appreciation of science—a role Fox has adopted throughout her varied career.

Fox currently serves as chancellor and distinguished professor of chemistry at the University of California San Diego, where she has supervised one of the university’s largest periods of growth. Since her appointment as chancellor in 2004, the university achieved an ambitious \$1 billion campaign goal, established new research and partnership ventures and increased student enrollment by about 5,000.

Before accepting her appointment at San Diego, Fox served for six years as chancellor and distinguished university professor of chemistry at North Carolina State University. There she oversaw expansion of the university’s Centennial Campus, a facility

that promotes innovation through university-industry partnerships. During Fox’s tenure, the campus supported 62 start-up companies and founded a magnet middle school as well as a biotechnology training facility.

“As the first woman to serve as the chancellor of North Carolina State University, Dr. Fox also served as a role model for woman researchers and, indeed, women in general,” a colleague noted in nominating Fox for the McGovern Award.

Fox began her career as a chemist, coauthoring her first peer-reviewed publication in 1971, based on work she conducted as an undergraduate. She was drawn to the field by “the idea of making molecules that never existed before and studying their properties,” she says.

After completing her Ph.D. in chemistry at Dartmouth College in New Hampshire, and a postdoc at the University of Maryland, Fox developed an independent research program as faculty at the University of Texas at Austin. Her work, in the field of physical organic chemistry, focused on how light activates organic molecules—especially those on surfaces—making them conductive. The results have led directly to improvements in applications such as solar cells and self-cleaning hospital paints.

Fox’s administrative career also began at the University of Texas, where she was appointed Waggoner Regents Chair in Chemistry in 1991 and Vice President

for Research in 1994. During the same period, she served on the National Science Board; as its vice chair, she helped convince congress in 1995 to rethink the National Science Foundation’s budget, turning a proposed cut into a 7 percent increase.

These and other wide-ranging accomplishments have been recognized through Fox’s election to membership in the National Academy of Sciences and the American Philosophical Society, and to fellowships in the American Academy of Arts and Sciences and the American Association for the Advancement of Science. She has been a member of Sigma Xi since 1998, and served as president of the society from 2001 to 2002. In 2010, Fox received the National Medal of Science, the highest honor bestowed by the United States government on scientists, engineers and inventors.

Fox plans to make her next career move in June 2012, when she will step down as chancellor of the UC San Diego. Her next target: “Science education in the United States is increasingly challenged,” she says. “We don’t have a good platform on which to build interrelationships between scientists and science educators.” In the spirit of keeping her ideas fresh and inspired, she plans to not only resume her chemistry research, but also address science education—from kindergarten through college—on a national level. •

Procter Prize Grant Awarded to Behtash Behin-Aein

Anyone whose laptop gets too hot to hold has encountered the problem of the leaky transistor. These minute switches, of which there are millions in any laptop or smart phone, lose energy as heat. That’s the issue that drives the research of **Behtash Behin-Aein**, a senior engineer at Globalfoundries in Sunnyvale, California, and the winner of Sigma Xi’s \$5,000 2011 Procter Prize Grant-in-Aid of Research.

“Thirty years ago, you could put 5,000 switches on a chip,” Behin-Aein says. “Now we can put 2 billion.” The miniaturization of transistors contributes to the increasing power and complexity of electronics, but each imperfect switch still loses heat. “The power dissipation problem is bothering us more and more,” Behin-

Aein says. Not only is it inefficient, it risks melting the computer chips themselves.

At Globalfoundries, a company that manufactures chips, Behin-Aein is a “computational theory guy,” he says. Using models and simulations, he develops better transistors by varying their structure and composition. You won’t find evidence of his work in your next laptop, but he expects his results to make a difference in five to ten years.

Behin-Aein’s Ph.D. research, which he completed in 2010 at Purdue University in Indiana, was even more futuristic. As part of the university-industry consortium known as the Nanoelectronics Research Initiative, Behin-Aein joined in the search for “the next switch”—technology that could supplant the transistor entirely.

With his adviser and colleagues, Behin-Aein played a key role in proposing an all-spin logic device. Unlike today’s devices, which perform operations by switching the charge of transistors using charge currents, an all-spin device would switch the polarization of magnets using spin currents. A computer based on these devices should be more efficient—and generate less heat—than one based on transistors.

Behin-Aein was selected for the Procter Prize Grant by his Ph.D. adviser Supriyo Datta, a physicist, engineer, and winner of Sigma Xi’s 2011 Procter Prize. •



Thomas Acker Becomes 2012-2013 President-elect

President emeritus of Wheeling Jesuit University, Thomas Acker (SX 1959) received his Ph.D. from Stanford University in 1961 before being ordained as a Jesuit priest. In 2010, he was elected president of Sigma Xi's Greenbrier Valley Chapter and last year was voted president-elect designee of the Society. He is a Collaborating Scientist at the Center for Conservation Biology in Stanford University's Department of Biology. The following article is based on his candidate's statement and a telephone interview.



Thomas Acker says that human environments of need and struggle are his calling. He has

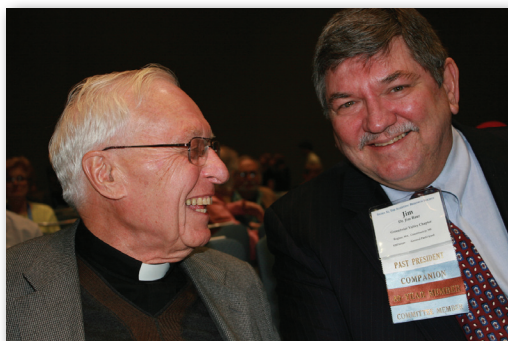
an extensive background and success in managing growth and revitalization projects.

"Sigma Xi must recognize the continuously evolving atmosphere in which science and engineering research is supported and conducted and must refocus to remain viable and relevant and reach 150 years in 2036," he says.

Coordinated science and engineering are the stuff of Sigma Xi. "The community of scientists needs Sigma Xi as a leading promoter for a robust and coordinated science and engineering approach to the world's myriad technical needs," he notes.

"I know of no other similar scientific organization that fits this role so aptly," he continues. "The Society's members, so diverse in disciplines, gender, age, culture, career stage and accumulated knowledge, present a unique resource of understanding and influence."

Acker says his background has prepared him to implement a continuing effort to refocus and evolve Sigma Xi in the shifting and challenging science environment. The world today doesn't have the resources to compete. "We need to build a spirit of cooperation—to be companions in



Thomas Acker laughing with James Baur, past-president, at the 2011 Annual Meeting.

zealous research as our motto proclaims." And he continues that he means not just cooperation with Sigma Xi members, but with all scientists and engineers.

"I think about all that the late Norman Borlaug accomplished. No one specialty can make it work. You need multiple partners to bring scientific discoveries to action. It could be a good focus for Sigma Xi—to develop active partnerships for the betterment of people and the planet."

His appointment years ago to Nepal as a Fulbright Professor led him into working with struggling groups. He was asked by the vice-chancellor of Tribhuvan University to recast the higher education biology curriculum for the country and convince the professors to adopt and embrace the improved program. "This project required three creative and persuasive years," Acker says, "and became the successful front runner for similar academic shifts in other disciplines in Nepal."

When he accepted the post of president of Wheeling College, most people assumed he was there to close the institution. Enrollment was plummeting, the buildings were decaying and the school had a deficit budget and no endowment.

He left after 18 progressive years with the highest enrollment in the school's history, seven new buildings and eight buildings rebuilt, positive budgets for 17 years and an endowment of 18 million dollars. Now

named Wheeling Jesuit University, it was the only higher-education institution in West Virginia listed in the top category in any classification by *U.S. News and World Report*.

U.S. Senator Robert C. Byrd encouraged Acker to relocate to southern West Virginia, one of the poorest and educationally starved regions of the country. He became CEO of Forward Southern West Virginia and Chairman and CEO of The Higher Education Foundation. In these roles he built a new public higher education campus and convinced four public college presidents to take up educational residence. "In addition we obtained 30 million dollars of (major grants) for a health clinic in rural West Virginia and a transportation center in Beckley.

"Over the years I oversaw successful capital campaigns and raised more than 250 million dollars. My developed style of deep personal participation and active solicitation of willing coworkers has been successful in the chapter and all my previous management assignments. These leadership and management posts have prepared me for an imminent new assignment, which is to help energize the faith and hope of the community in Youngstown, Ohio, a city still reeling from the loss of its steel industry."

What of Sigma Xi's future? "Sigma Xi must clearly redefine and state its niche, address retention, grow in membership and resolve its financial burden. The key to success is to complete a few critical tasks well, not advance many issues half way.

"I want to work with the Society leadership and staff," he continues, "to focus consistently for three years at a time on essential features for vibrant growth. It is important for Sigma Xi to prosper. Together we can energize a key association in service to our members' nations and to our planet through the coordinated communities of science and engineering." •

National Academy of Engineering Elects 34 Sigma Xi Members

Thirty-four Sigma Xi members were among the 66 new members and ten foreign associates elected in February to the National Academy of Engineering.

New Members

Michael I. Baskes (SX 1966), adjunct professor, department of mechanical and aerospace engineering, University of California, San Diego. For contributions to the embedded atom method for predicting the structure and properties of metals and alloys.

Barbara D. Boyan (SX 1987), professor; Price Gilbert Jr. Chair in Tissue Engineering; associate dean for research, College of Engineering, Georgia Institute of Technology. For engineering implant technologies for bone and cartilage repair.

Max William Carbon (SX 1944), professor emeritus of nuclear engineering, University of Wisconsin, Madison. For establishing engineering educational programs for nuclear reactor design and safety.

Jared L. Cohon (SX 1988), president and professor of civil and environmental engineering, Carnegie Mellon University. For contributions to environmental systems analysis and national policy and leadership in higher education.

James J. Coleman (SX 1975), Intel Alumni Endowed Chair in Electrical and Computer Engineering, professor of materials science and engineering, and director of the Semiconductor Laser Laboratory, University of Illinois, Urbana-Champaign. For contributions to semiconductor lasers and photonic materials.

Louis Anthony (Tony) Cox Jr. (SX 1985), president, Cox Associates, Denver, Colorado. For applications of operations research and risk analysis to significant national problems.

Supriyo Datta (SX 2011), Thomas Duncan Distinguished Professor of Electrical and Computer Engineering, Purdue University. For quantum transport modeling in nanoscale electronic devices.

William P. Delaney (SX 1957), Director's Office Fellow, MIT Lincoln Laboratory, Lexington, Massachusetts. For contributions to radar systems for national defense.

Elazer R. Edelman (SX 1979), Thomas D. and Virginia W. Cabot Professor of Health Sciences and Technology, Massachusetts Institute of Technology. For contributions to the design, development, and regulation of local cardiovascular drug delivery and drug-eluting stents.

James R. Fienup (SX 1975), Robert E. Hopkins Professor of Optics; professor, University of Rochester. For development and applications of phase retrieval algorithms.

Peter W. Glynn (SX 1984), Thomas W. Ford Professor and chair, management science and engineering department, Stanford University. For contributions to simulation methodology and stochastic modeling.

Steven M. Gorelick (SX 1980), Cyrus F. Tolman Professor, department of environmental earth system science, Stanford University. For optimization techniques and transport models for groundwater and remediation of contaminated aquifers.

Richard Hogg (SX 1971), professor emeritus of mineral processing and geoenvironmental engineering, Pennsylvania State University. For contributions to the science and engineering of coagulation and flocculation in particulate systems.

Ray R. Irani (SX 1957), executive chairman, Occidental Petroleum Corp., Los Angeles, California. For leadership in the petrochemical industry and processes for applications of particulate systems.

James W. Jones (SX 1978), distinguished professor, department of agricultural and biological engineering, University of Florida. For contributions to understanding climate change, environmental impacts, and sustainable agricultural systems.

Mujid S. Kazimi (SX 1971), TEPCO Professor of Nuclear Engineering, Massachusetts Institute of Technology. For contributions to technologies for the nuclear fuel cycle and reactor safety.

Richard Wilker Kormeyer (SX 1982), senior research fellow and head of business development and licensing for pharmaceutical sciences, Pfizer Inc., New London, Connecticut. For contributions to drug delivery formulations and medical devices.

Helmut Krawinkler (SX 1978), John A. Blume Professor Emeritus of Engineering, Stanford University. For development of performance-based earthquake engineering procedures for evaluating and rehabilitating buildings.

Henrique S. Malvar (SX 1986), chief scientist and distinguished engineer, Microsoft Research, Redmond, Washington. For contributions to multiresolution signal processing and multimedia signal compression and standards.

Tobin J. Marks (SX 1970), Charles E. and Emma H. Morrison Professor of Chemistry, Northwestern University. For innovation in electronic, photonic, and photovoltaic materials and catalytic polymerization.

Diane M. McKnight (SX 1977), fellow of the Institute of Arctic and Alpine Research and professor of civil, environmental and architectural engineering, University of Colorado, Boulder. For elucidating the interrelationship between natural organic matter and heavy metals in streams and lakes.

Antonios Georgios Mikos (SX 1985), Louis Calder Professor of Bioengineering and Chemical and Biomolecular Engineering, Rice University. For advances in tissue engineering, regenerative medicine, biomaterials, and drug delivery, including development of biodegradable polymers.

Richard K. Miller (SX 1975), president and professor of mechanical engineering, Franklin W. Olin College of Engineering. For establishing a new paradigm for undergraduate engineering education and establishment of Olin College.

Babatunde A. Ogunnaike (SX 2005), interim dean; William L. Friend Chair of Chemical Engineering, University of Delaware, Newark. For advances in process systems, process engineering practice, and systems engineering education.

Leonard Pinchuk (SX 1979), cofounder, president, and chief executive officer, Innovia LLC and Related Companies, Miami, Florida. For development of biomedical polymeric materials for angioplasty balloons, drug-eluting stents, and other devices.

Andrea Prosperetti (SX 1973), Charles A. Miller, Jr. Professor of Mechanical Engineering, Johns Hopkins University. For contributions to the fundamentals and applications of multiphase flows.

Scott J. Shenker (SX 1978), professor, electrical engineering and computer science department, University of California, Berkeley. For contributions to Internet design and architecture.

Christine A. Shoemaker (SX 1971), Joseph P. Ripley Professor of Engineering, Cornell University. For development of decision-making optimization algorithms for environmental and water resources problems.

Robert E. Skelton (SX 1974), Daniel L. Alspach Professor of Dynamic Systems and Controls (emeritus) and director, Structural Systems and Control Laboratory, University of California, San Diego. For contributions to robust control, system identification, and methodology for control-structure interaction.

David A. Stahl (SX 1977), professor, department of civil and environmental engineering, University of Washington, Seattle. For application of molecular microbial ecology to environmental engineering.

Michael S. Waterman (SX 1966), University Professor, USC Associates Chair in Natural Sciences, and professor of biological sciences, computer science, and mathematics, University of Southern California. For development of computational methods for DNA and protein sequence analyses.

K. Dane Wittrup (SX 1988), C.P. Dubbs Professor of Chemical and Biological Engineering, Massachusetts Institute of Technology. For developments in protein engineering, protein expression, and quantitative pharmacology.

Steven J. Zinkle (SX 1985), UT-Battelle Corporate Fellow and director, Materials Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee. For advancing understanding of radiation damage in metallic and ceramic components.

New Foreign Associate

Chao-Han Liu (SX 1963), distinguished visiting scholar, Academia Sinica, Taipei, Taiwan. For contributions to ionospheric research and international leadership in atmospheric remote sensing. •