

Sigma Xi Today

A NEWSLETTER OF SIGMA XI, THE SCIENTIFIC RESEARCH HONOR SOCIETY

Judges Sought for Student Research Showcase

Sigma Xi is seeking professional researchers and science communicators to judge the Student Research Showcase, a science communication competition for high school, undergraduate, and graduate students. Judges from the following disciplines are needed April 3–10 to evaluate and provide feedback on presentation websites:

- anthropology
- agriculture, soil, and natural resources
- cell biology and biochemistry
- chemistry
- ecology and evolutionary biology
- engineering
- environmental sciences
- geo-sciences
- human behavioral and social sciences
- math and computer science
- microbiology and molecular biology
- physics and astronomy
- physiology and immunology

Each volunteer will judge up to 10 student websites that contain a research abstract, slide show, and video. Judges interact with contestants by posting comments and questions on the sites, allowing flexibility with each judge's personal schedule. No travel is required. The students compete to be named a division winner and receive up to \$500.

Sigma Xi membership is preferred, but not required, to judge. To volunteer by March 31, go to <https://www.sigmaxi.org/meetings-events/volunteer>.

The Public Can Help

Everyone can vote for the People's Choice Award winner, based on the merit of the presentation's video. The winner receives up to \$250.

Find more details at <https://www.sigmaxi.org/meetings-events/student-research-showcase>.

From the President

The Core Value of Science

It is commonplace to observe that science has lost its primacy among some people as the public knowledge that society uses for decision-making. The rigorous application of science and technology is accepted as socially useful as long as it is applied to marketable products, innovation, and elaboration of safe ideas. However, the application of more fundamental principles of science, even those that make these applications possible, are suspect to many people of faith or convictions, even though they value the fruits.

The result is not a complete rejection of science but rather an adoption of a contingent way of thinking. For these people, the thought process starts from a place different from where the idea came: The genome is separated from evolutionary biology, the fossil record is experienced as a test of faith, and climate change is redefined as weather instability. Deductive thought process is cut off from premises. Causes are not examined too closely. Explanatory science is reduced to phenomenology.

Science literacy, by itself, will not change this form of contingent thinking, because the fundamental problem is not ignorance. Contingent thinking about science arises from a moral crisis. Our society pits wisdom received from trusted sources, carrying the certainty of moral authority, against difficult, uncertain, tentative, dense, arcane, interpretations of the material world offered by science. Liberal democracies place responsibility on the citizen for deciding what is true, at least for the purpose of the decision. Scientific knowledge about everything that matters is beyond the capacity of any individual and in science is necessarily a collective undertaking. Faith and moral teaching, on the other hand, are available to all and do not even require comprehension, if one simply believes.

Criticism of values-based thinking will not advance the scientific enterprise. The fastest way to harden an adversary and the surest way to wander into hypocrisy is to attack an adversary's beliefs. After all, science exercises its own form of contingent thinking: No theory is final, and every explanation is subject to falsification and elaboration. Science also rests on a form of authority, derived from consensus among the informed scientific community.

Science education will not solve the root problem, which involves particular values. In values, however, there may be room for reconciliation. Faith and moral purpose have many values. Science has but one: the primacy of demonstrable truth. This value constitutes a moral compass within science, a secular lodestone that binds every scientist in the same mission.

Science and technology empower values by guiding action on things about which we can agree matter, such as health, decent living conditions, and the proper use of power. Science cannot address conscience, values beyond demonstrable truth, and compassion. It can only fulfill or thwart them. But social and moral empowerment begins with demonstrable truth, and that is the core value of science.



President Tee L. Guidotti

Small Grants Make Big Difference



From left, Susan Walsh, Paxton Sickler, and Matt Volk work in the lab at Rollins College. (Image courtesy of Scott Cook.)

Editor's note: Sigma Xi offers Science, Math, and Engineering Education (SMEE) Grants worth up to \$2,000 each to the Society's chapters to fund innovative education programs. Susan Walsh, president of the Rollins College Chapter in Winter Park, Florida, shares the outcomes of their grant below. Chapter leaders may find application information at www.sigmaxi.org by clicking on "Chapters" and then "Officer Resource Center." The application deadline is March 1.

With Sigma Xi's Science, Math, and Engineering Education (SMEE) Grant, I was able to refine an undergraduate classroom experience that gives students hands-on opportunities to learn multiple techniques to support the same experimental conclusion. This laboratory exercise introduces 1) culturing human tissue culture cells, 2) confocal microscopy, 3) subcellular fractionation of cells into cytoplasmic and nuclear components, 4) SDS-PAGE, a technique to separate proteins, and 5) western blotting, a technique used to detect single proteins in a sample. Furthermore, this laboratory exercise permits hands-on analysis of cellular nutrient homeostasis, signaling, and subcellular localization. Finally, it can be enriched to include additional variables, thereby generating independent research projects for students to manipulate and understand these

signaling pathways in greater depth. I used SMEE grant money to purchase expensive antibodies and drugs to perform control experiments. The grant also financed a small stipend for a dedicated student, Annamarie Bryant, class of 2016, in the lab.

Bryant and Matt Volk, class of 2018, presented this project at the 2016 American Society for Cell Biology Annual Meeting (Bryant et al., 2016). Both students were nominated for Sigma

Xi membership.

"The results from this project led to a summer research opportunity that was one of the highlights of my academic career," Bryant said. "I have honed not only my laboratory skills, but also my written and oral communication abilities, and I have had the honor to work alongside the faculty at Rollins College."

Funds from the SMEE grant also provided appropriate experimental controls for students this semester, which will improve their learning experience. They will participate in a modified pre- and post-test to assess their technical understanding and application of the techniques. After seeing Bryant's good experience, students are motivated to design their own independent explorations in cell biology. We also are writing about the laboratory procedure for publication in an education journal.

I encourage others to apply for the SMEE Grant; it has enabled meaningful research opportunities for my students. —Susan Walsh

Bibliography

Bryant, A. T., M. Volk, P. S. Sickler, S. M. Ferguson, and S. Walsh. 2016. Three-Week Cell Biology Laboratory Exercise: Signaling Influences Subcellular Localization of TFEB-GFP. In *Abstracts: Poster Presentations*, supplement, *Molecular Biology of the Cell* 27:S7-S8. doi:10.1091/mbc.E16-10-0736.



GRANTS-IN-AID
OF RESEARCH
SIGMA XI

Sigma Xi Awards Research Grants to Students

The Sigma Xi Grants-in-Aid of Research (GIAR) program has been funding research by undergraduate and graduate students since 1922. In the fall 2016 cycle, the Society awarded 115 grants totaling \$91,205 to students in four countries. The Committee on Grants-in-Aid of Research, chaired by Peter J. Harries of North Carolina State University, selected 20 undergraduate students, 28 master's students, and 67 doctoral candidates to receive grants.

Students may apply for funding from the program twice each year at <https://www.sigmaxi.org/programs/grants-in-aid>. The next application deadline is March 15.

The grants are made possible by designated funds from the National Academy of Sciences and from donations. In the fall 2016 cycle, Sigma Xi funded 17.7% of the 651 applications received. More grants could be awarded in future cycles if more support is received.

Sigma Xi is committed to strengthening the GIAR program. A Centennial Campaign, which kicked off at the 2016 Annual Meeting to count down to the program's 100th year in 2022, calls for more financial support to help more students.

To donate to GIAR, <https://ecommerce.sigmaxi.org/ecom/#donate>

Learn from Sigma Xi Distinguished Lecturers

Learn about a different research topic each month by talking with a Sigma Xi Distinguished Lecturer from the comfort of your own computer. Using Adobe Connect, *American Scientist* editors moderate Q & A discussions with the lecturers. The public can participate by joining the online sessions and asking the lecturer questions about that month's topic. Live updates from the sessions are posted on *American Scientist's* Twitter account, @AmSciMag, with #AmSciTalks.

Recordings of past sessions are available on *American Scientist's* YouTube page at <https://www.youtube.com/user/AmSciMagazine>. Recorded topics include After Fukushima: Nuclear Power Programs Around the World, Searching for the Chemical Origins of Life, and Prehistoric Decisions Preserved in Artifacts. We hope you can participate in the following upcoming sessions:

March 14, 3:30–4:30 p.m. Eastern Time
How to Create Inclusive Cultures in STEM Fields



Guest: Paula Rayman, a professor of sociology at the University of Massachusetts Lowell, is a nationally recognized scholar in the field of work

organization, labor, and public policy and has been recognized for her leadership on advancing women in STEM. Her presentations have discussed how institutions can work toward diversity, equity, and innovation. Rayman is

also director of the Middle East Center for Peace, Development, and Culture; a Senior Fulbright Scholar award recipient; and the co-author of *The Equity Equation: Fostering the Advancement of Women in the Sciences, Mathematics, and Engineering*. She was the founding director of the Peace and Conflict Studies program at UMass Lowell and was the principal investigator for the National Science Foundation (NSF)-funded initiative, Project Techforce: Women and Men in Information Technology Workplaces and co-principal investigator for the NSF-funded Project WORKING WISE (Women in Science and Engineering).

Link to participate: <https://sigmaxi.adobeconnect.com/inclusive/>

April 11, 3:30–4:30 p.m. Eastern Time
Using Nanoparticles for Consumer Products and the Environment



Guest: Alexander Orlov, an associate professor of materials science and engineering at the State University of New York, Stony Brook,

is also a faculty member of the Consortium for Interdisciplinary Environmental Research, an affiliate faculty of the chemistry department, affiliate faculty at the Institute for Advanced Computational Science at Stony Brook University, and a visiting professor at Cambridge University. Orlov's principle research activities are in the development of novel materials for energy generation, structural applications, and environmental protection.

He was awarded the U.S. National Science Foundation CAREER Award and the U.K. National Endowment for Science Technology and Arts CRUCIBLE award. He was selected to the Fellowship of the U.K. Royal Society of Chemistry and to the U.S. National Academy of Engineering Frontiers of Engineering program. He was made a Kavli Fellow in 2014 by the Kavli Foundation and the U.S. National Academy of Sciences.

Link to participate: <https://sigmaxi.adobeconnect.com/nanotechnology/>

May 9, 3:30–4:30 p.m. Eastern Time
Making a Quantum Leap for Computers



Guest: Susan N. Coppersmith, the Robert E. Fasnacht Professor and Vilas Professor of Physics at the University of Wisconsin–Madison, is a

theoretical condensed matter physicist who has worked on a broad range of problems in the area of complex systems and has made substantial contributions to the understanding of subjects such as glasses, granular materials, the nonlinear dynamics of magnetic flux lattices in type-II superconductors, and quantum computing. Coppersmith is a fellow of the American Physical Society, the American Association for the Advancement of Science, and the American Academy of Arts and Sciences. She has also been elected to be a member of the National Academy of Sciences.

Link to participate: <https://sigmaxi.adobeconnect.com/computers/>

For updates about these sessions, and future sessions, go to the Sigma Xi calendar at <http://community.sigmaxi.org/events/calendar>.

Members-at-Large, Watch for a Survey

All Sigma Xi members who are not affiliated with a chapter will receive a survey by email to ask about their needs and hopes as a member of the Society. Expect to see this survey in February, 2017.

Sigma Xi Today is
 edited by Heather Thorstensen
 and designed by Justin Storms

Sigma Xi Members Become AAAS Fellows

The American Association for the Advancement of Science (AAAS) Council elected the following Sigma Xi members among its 2016 Fellows to recognize their contributions to innovation, education, and scientific leadership. Congratulations!

Section on Agriculture, Food, and Renewable Resources

Steven D. Clouse, National Science Foundation
Alice C. Harmon, University of Florida
P. V. Vara Prasad, Kansas State University
Karen-Beth Goldberg Scholthof, Texas A&M University
Wallace E. Tyner, Purdue University

Section on Anthropology

Nathaniel J. Dominy, Dartmouth College
Karen R. Rosenberg, University of Delaware
Gary T. Schwartz, Arizona State University

Section on Astronomy

Curtis John Struck, Iowa State University

Section on Atmospheric and Hydrospheric Sciences

Konstantine P. Georgakakos, Hydrologic Research Center/Scripps Institution of Oceanography, University of California, San Diego
Steven M. Gorelick, Stanford University
Cindy Lee, Stony Brook University

Section on Biological Sciences

John Howard Adams, University of South Florida
Charles D. Amsler, University of Alabama at Birmingham
José M. Argüello, Worcester Polytechnic Institute
Ian Thomas Baldwin, Max Planck Institute for Chemical Ecology (Germany)
Patricia E. Berg, George Washington University
Eleanor A. Blakely, Lawrence Berkeley National Laboratory
John E. Burris, Burroughs Wellcome Fund
Hannah V. Carey, University of Wisconsin, Madison
Robert A. Copeland, Epizyme, Inc.
John J. Ewel, University of Florida
Joel Mitchell Goodman, University of Texas Southwestern Medical School
Timothy T. Hla, Boston Children's Hospital/Harvard Medical School
Robert Dan Holt, University of Florida
Karen W. Hughes, University of Tennessee, Knoxville
Sue L. Jaspersen, Stowers Institute for Medical Research
Peter B. Moyle, University of California, Davis
Gregory M. Mueller, Chicago Botanic Garden
Ann Carol Palmenberg, University of Wisconsin, Madison
David Patterson, University of Denver
James C. Paulson, The Scripps Research Institute

Debra P. C. Peters, U.S. Department of Agriculture
Anne L. Plant, National Institute of Standards and Technology
Clifton A. Poody, Howard Hughes Medical Institute
Kathleen Postle, Pennsylvania State University
James J. Smith, Michigan State University
Carol A. Stepien, University of Toledo/NOAA Pacific Marine Environmental Laboratory
Ross A. Virginia, Dartmouth College
Donald R. Zak, University of Michigan

Section on Chemistry

James B. Ames, University of California, Davis
Mark R. Chance, Case Western Reserve University
Patrick H. Dussault, University of Nebraska, Lincoln
David Fielder Eaton, Light Insights, LLC
Hilkka Inkeri Kenttämä, Purdue University
Julie T. Millard, Colby College
Stephen L. Morgan, University of South Carolina
Thomas J. Pinnavaia, Michigan State University
Diane Grob Schmidt, University of Cincinnati
Hong-Cai "Joe" Zhou, Texas A&M University

Section on Dentistry and Oral Health Sciences

Arthur R. Hand, University of Connecticut

Section on Education

Judith Marie Iriarte-Gross, Middle Tennessee State University
Linda L. Slakey, University of Massachusetts Amherst

Section on Engineering

Chandra Mauli Agrawal, University of Texas at San Antonio
Kaustav Banerjee, University of California, Santa Barbara
Michael Bass, University of Central Florida
Gerald M. Borsuk, Naval Research Laboratory
David Darwin, University of Kansas
Peter Francis Davies, University of Pennsylvania
Philippe M. Fauchet, Vanderbilt University
James H. Garrett, Jr., Carnegie Mellon University
Chih-Ming Ho, University of California, Los Angeles
Ali Khounsary, Illinois Institute of Technology
Sidney Leibovich, Cornell University
Frank L. Lewis, University of Texas at Arlington
Carmen S. Menoni, Colorado State University
Matthew W. Ohland, Purdue University
Mohammad Shahidehpour, Illinois Institute of Technology
Yu Sun, University of Toronto (Canada)

Section on General Interest in Science and Engineering

Paul G. Heltne, Chicago Academy of Sciences

Section on Geology and Geography

Michelle Anne Kominz, Western Michigan University
Zhe-Xi Luo, University of Chicago
John W. Valley, University of Wisconsin, Madison
Herman B. Zimmerman, National Science Foundation (retired)

Section on Industrial Science and Technology

Baohua Gu, Oak Ridge National Laboratory/University of Tennessee, Knoxville

Section on Information, Computing, and Communication

Vijayakumar Bhagavatula, Carnegie Mellon University
Dmitry B. Goldgof, University of South Florida
Eugene Santos, Jr., Dartmouth College

Section on Medical Sciences

Charles J. Lockwood, University of South Florida
Christopher J. Molloy, Rutgers, The State University of New Jersey

Section on Neuroscience

Nina Felice Schor, University of Rochester Medical Center
Amita Sehgal, University of Pennsylvania Perelman School of Medicine
Leslie P. Tolbert, University of Arizona

Section on Pharmaceutical Sciences

Shyam S. Mohapatra, University of South Florida

Section on Physics

John Michael Blondin, North Carolina State University
Jerry P. Draayer, Louisiana State University
Henry O. Everitt III, U.S. Army
Berend T. Jonker, Naval Research Laboratory
Dennis K. Killinger, University of South Florida
Jay N. Marx, LIGO Laboratory, California Institute of Technology
Louis M. Pecora, Naval Research Laboratory
Hrvoje Petek, University of Pittsburgh
L. Ramdas Ram-Mohan, Worcester Polytechnic Institute
Arjun G. Yodh, University of Pennsylvania

Section on Psychology

Norma Graham, Columbia University
James Henry Howard, Jr., Catholic University of America

Section on Societal Impacts of Science and Engineering

Clinton J. Andrews, Rutgers, The State University of New Jersey
Brenda Ekwurzel, Union of Concerned Scientists

Section on Statistics

Alicia L. Carriquiry, Iowa State University
Hal S. Stern, University of California, Irvine