

Sigma Xi Today

A NEWSLETTER OF SIGMA XI, THE SCIENTIFIC RESEARCH SOCIETY

Join us in Atlanta

Registration for Sigma Xi's 2016 Annual Meeting and Student Research Conference is open through August 1. This year's events will be held November 10–13 at the Hyatt Regency Atlanta in Atlanta, Georgia, USA. A celebration of research, these events bring together students and professional researchers from a variety of disciplines together to share their work and to discuss critical issues in science. Sigma Xi membership is not required to participate.

Professional researchers are invited to share a poster about their research in the new Sigma Xi Research Symposium. The symposium also includes sessions on the following topics:

- science communication
- science policy
- finding and being a mentor
- science entrepreneurship
- careers in science
- diversity in science

The second new event is the STEM Mixer, a dedicated time for networking between students and professional researchers.

The Student Research Conference—a poster presentation competition for high school, undergraduate, and graduate students—includes a graduate school and career fair. Students who present a poster will receive feedback from judges and are invited to join Sigma Xi, the 130-year-old, multidisciplinary honor society for scientists and engineers.

A ceremony will be held during the meeting to induct new members into the Society.

Attendees will get to see a special viewing of Part Two of the PBS documentary, *The Truth About Trees*, as well as science talks at venues around Atlanta and lectures by Sigma Xi's award winners.

For more information, and to learn how to become a meeting sponsor or exhibitor, go to <https://www.sigmaxi.org/meetings-events/annual-meeting>.

From the President

Warning! Dangers Ahead for Science

Back in 2014, I was asked “What are the most important scientific issues facing the world and the most important issues facing the scientific community?” I answered as follows and plan to write about many of these points in greater detail in the coming year:

1. Science is rapidly losing its standing as the source of “public knowledge” (knowledge used to establish the facts) for resolving disputes and making decisions.
2. Science is increasingly considered by others within academe as a non-objective social construct, fundamentally conservative, protective of the status quo, fraught with biases and self-justifying.
3. Science communication is generally poor and sometimes counterproductive. The best scientists are usually capable of explaining their work clearly. Alas, most are not.
4. Science literacy is frighteningly weak in the U.S., the country that sets the science agenda.
5. Science is valued as providing a cornucopia of economic benefits, rarely as a way of knowing the world.
6. Explanatory science is being crowded out by approaches that emphasize association over causation, which is the essence of science; we should not confuse phenomenon and association with explanation and mechanism.
7. Misbehavior by scientists is discrediting us in the eyes of the public but like much crime it is rewarded most of the time unless, and until, the perpetrator gets caught.
8. Science is moving from a model of unfettered exploration to a model of “professionalization” without managing or even recognizing the transition, which may lead to many unintended consequences.
9. Diversity in science is dealt with too narrowly, as a problem of access for the community and not a problem of the integrity of science.

Sigma Xi, in partnership with other generalist science organizations such as the American Association for the Advancement of Science (AAAS), can address and make progress on these problems in several ways:

- Prepare scientists to communicate more clearly and effectively (a skill that must be learned and practiced).
- Prepare some scientists to act as advocates for public policy in support of science.
- Put responsive and well-prepared scientists together with decision-makers and shapers of public policy.
- Articulate sound and evidence-based interpretations of science that are accessible and useful in public discourse.
- Further the “civic culture” of science that values integrity and rigor.
- Promote a society in which science is appreciated and considered a pillar of the culture and intellectual life.

This last point is critically important. Science is integral to our culture, not an add-on or the concern only of scientists. It is a “way of knowing” that grounds our culture in objective truth, celebrates the search for verifiable knowledge, and rewards skepticism. Our culture needs science and we need to be in the mainstream of our culture. The mission of Sigma Xi has never been more important.



President Tee L. Guidotti

A handwritten signature in black ink, which appears to read "Tee L. Guidotti".

Results of the 2016 Student Research Showcase

Sigma Xi challenged students to present their research online in its 4th annual Student Research Showcase. In this science communication competition, approximately 40 high school, undergraduate, and graduate students submitted websites that contained abstracts, videos, and slideshows about their projects. To help the students learn how to change their presentation styles based on their audience, each component was intended for an audience with varying levels of technical expertise. Presentations came in from across the United States and as far away as Ukraine.

In April, 70 Sigma Xi members volunteered to judge the websites. The judges left comments and questions on the websites and then picked the top presentations in the High School, Undergraduate, and Graduate divisions. Each will receive \$500 from Sigma Xi. Judges also selected the top winners in each research area. All participants

receive judges' comments, a certificate, and an invitation to become associate members of Sigma Xi. High school participants are invited to submit a research paper to Sigma Xi's journal for pre-college research, *Chronicle of The New Researcher*. Congratulations to all participants!

The deadline to submit a website for the 2017 Student Research Showcase is March 22.



Student Research SHOWCASE

2016 Division Winners

High School Division

A Greener Cleaner: Investigating a Potential Biosorbent for the Removal of Heavy Metals from Aqueous Solutions
Ananya Karthik, Saint Francis High School, Mountain View, California

Undergraduate Division

Mounting Evidence of the False Consensus Effect in Male Bodybuilders
Bryan S. Nelson, Andre Nakkab, and Ward Pettibone, New York University

Graduate Division

Drying Without Dying—Resurrection Fern, *Pleopeltis polypodioides*
Susan P. John, University of Louisiana at Lafayette

People's Choice Award, \$250

Development of a Novel Antiseptic Combination to Target MRSA and Pseudomonas
Janie Kim of Scripps Ranch High School, San Diego, California

New Leadership Elected

In late 2015, Sigma Xi members elected new Sigma Xi leaders. The Sigma Xi leadership team appreciates efforts to nominate and select these generous volunteers.

President-elect

Stuart L. Cooper will serve as president-elect from July 1, 2016, to June 30, 2017. He will be Sigma Xi president from July 1, 2017, to June 30, 2018, then, he will serve as past president from July 1, 2018, to June 30, 2019.

Dr. Cooper is a professor of chemical engineering at Ohio State University. As Sigma Xi president, he plans to aggressively promote membership, especially to underrepresented groups in the science and engineering community. His other key priorities will be retaining current members and approaching former members



Stuart L. Cooper

about rejoining the Society. To attract members, the Society needs to emphasize "the value of Sigma Xi's programmatic activities in areas such as ethics, entrepreneurship, diversity, and science communication," Dr. Cooper wrote in his candidate statement.

Directors

These directors will serve three years, beginning July 1, 2016.

North Central Region

Carlo U. Segre, Illinois Institute of Technology

Southwest Region

Paul Marc Stein, University of California, Irvine

Comprehensive Colleges and Universities Constituency

Steve W. Martin, Iowa State University

Area Groups/Industries/States and Federal Labs Constituency

George Edw. Seymour, San Diego

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

Associate Directors

These associate directors will serve one- to three-year terms, beginning July 1, 2016.

Northeast Region (3 years)

Eugene Santos Jr., Dartmouth College

Southeast Region (1 year)

Lori G. Eckhardt, Auburn University

Committee on Nominations

The following elected committee members will serve three-year terms, which began at the conclusion of the election on November 24, 2015.

Northwest Region

Tammy A. Maldonado, University of Colorado

Southeast Region

Michael C. Madden, University of North Carolina at Chapel Hill

Membership-at-Large Constituency

Elie Antoine Sehnaoui, Membership-at-Large

Learn more about these members and read their candidate statements at <https://www.sigmaxi.org/about/leadership/society-elections/2015-results>.

Sigma Xi Supports the Innovative Spirit of Students

Olivia Hutley, 16, of Australia was at NASA's Kennedy Space Center Visitor Complex in April, holding an ancient-looking book just given to her from the personal library of astronaut Pete Conrad. She was so proud of it that she knew she would always keep it. After traveling half way across the world, she had overcome her nerves to give a presentation with her classmate, Kelsey Matuschka, 16, about a mobile app they had developed with two other classmates. Hutley learned how to use computer code to develop it.

They were competing at the 2016 Innovation Summit, the finish line of the Conrad Spirit of Innovation Challenge. The challenge is an eight-month entrepreneurial contest run by the Conrad Foundation. The contest asks high school students to design products or services that would benefit humanity.

Sigma Xi, The Scientific Research Society has supported the Conrad Spirit of Innovation Challenge since its beginning 10 years ago. The Society is one of the program's technology sponsors, and its members represent the largest group of judges who evaluate the teams' projects before the summit.

More than 90 high school teams came to the summit, whittled from 140 teams that submitted projects. They competed in one of four categories: aerospace and aviation, cyber technology and security, energy and environment, and health and nutrition. Before arriving, teams created portfolios with business and technical plans for their

products. Some even made prototypes.

Soon after the summit kicked off, the top five finalist teams in each category were announced based on the merit of their portfolios. The finalists then gave Power Pitches, which are presentations they might give to investors, on stage in front of more than 300 students, parents, and coaches with the hope of qualifying for the top prize: being named a Pete Conrad Scholar. The scholars receive a market research assessment, a plan to continue product development, a medallion, legal services worth \$5,000 to file a patent application, and one year of dues paid for an associate membership in Sigma Xi.

Additionally, teams that did well in a preliminary Power Pitch round were invited to give their presentations on stage for the chance of winning certificates and trophies.

In between Power Pitches, speakers told the teams that their talents were needed for future missions to Mars and in the medical industry, how to leave positive impressions, and the importance of being open for—and preparing for—future opportunities. Students were invited to have a voice in their own education.

"You can actually affect the world," said Nancy Conrad, chairman and founder of Conrad Foundation, which runs the challenge in honor of her late husband, astronaut Pete Conrad.



Nancy Conrad, left, stands with Pete Conrad Scholars Dongyoon Shin, 18, and Dongsei Park, 17, of South Korea. Shin and Park logged more than 1,000 hours on making an improved space helmet and presented their plans at the 2016 Conrad Spirit of Innovation Challenge's Innovation Summit. On the right is Bob Cabana, former space shuttle commander and director of NASA's Kennedy Space Center.

She gave Hutley the book from Pete's library after Hutley's team was named the Power Pitch winners for the health and nutrition category. Their idea was a smartphone app that uses color to encourage a user to have better sleep and moods.

"We can go so much further, we believe in the product," said Hutley.



The summit's masters of ceremony were sisters Shannon and Mikayla Diesch, who were named Pete Conrad Scholars in 2010 for a nutrition bar they made for astronauts. The bars actually went into space.



Kelsey Matuschka, left, and Olivia Hutley of Australia were the Power Pitch winners for the health and nutrition category. The summit was held in April at NASA's Kennedy Space Center Visitor Complex.

Serving Sigma Xi's Mission

Plant pathologist for the U.S. Department of Agriculture by day and Sigma Xi super volunteer by day and night—Cristina Gouin-Paul does a lot for the Society. She is president of the District of Columbia Chapter, director of the Mid-Atlantic Region, chair of the Committee on Qualifications and Membership, and photographer for the Annual Meeting. To recognize her outstanding volunteer service to Sigma Xi and its mission, the Society is honoring her with the 2016 Evan Ferguson Award. Heather Thorstensen, manager of communications, spoke with Gouin-Paul about her dedication to Sigma Xi and what it's like to be on the board of directors.

Thorstensen: Why is it important for you to be a part of the Society?

Gouin-Paul: The ethics and public outreach holds me in. You go on Facebook or get emails about stuff on the Internet that's not true. It's great to be able to

pick up the phone and call somebody—somebody who you know through Sigma Xi—and ask, “OK, can you explain this to me? Because they're not doing this right, but I can't explain it any better,” then learn another piece of information. Sigma Xi allows me to interact with other people whose work may represent a small aspect of what I do, but you never know where a good idea is going to come from when you talk to somebody in science. A light bulb goes off.

Thorstensen: What do you want members to know about what it's like to be on the board of directors?

Gouin-Paul: I think members think the board is there to run the Society. They don't understand that they need to talk to us and tell us what they want the Society to do. I send an email to the Mid-Atlantic members asking, “Do you have ideas of what you think the



Cristina Gouin-Paul is the 2016 recipient of the Evan Ferguson Award for Service to the Society.

Society should be doing or shouldn't be doing?” Being on the board allows me to have a say in how we can change and improve.

To read what Gouin-Paul has learned from being a chapter president, go to <https://www.sigmaxi.org/programs/prizes-awards/ferguson-award/award-winner/cristina-gouin-paul>.

Innovation Award Winner Sculpts New Ideas

Akhlesh Lakhtakia was picking up his daughter from her friend's house when he noticed a mineral on a table, and it sparked an idea.

“I picked it up and I was immediately floored,” he said.

The mineral was ulexite, a crystal containing fibers that run in one direction. Lakhtakia could see through the crystal only when he looked in the same direction as the fibers.

The next day, Lakhtakia, who at that time was a Pennsylvania State University associate professor of engineering science and mechanics, called his colleague, Russ Messier. Messier had experience in making thin films. Lakhtakia asked if a material could be made in the lab that had a fibrous structure like the crystal. Also, could the film be deposited on a rotating substrate, so that the fibers in the film can be twisted? If so, the film could be an optical filter, allowing only light with the same twisted polarization state to pass through.

Research showed that the films could be made in a lab in a way

Lakhtakia and Messier wanted the films to function optically: whether as a filter of light based on polarization, wavelength, or both. Polarization filters, for example, are used on cameras and in sunglasses to reduce the intensity of light entering eyes.

This research resulted in sculptured thin films (STF), a nanotechnology, which has fibers as small as 30–50 nanometers in diameter.

STF applications have expanded into a coating technique called bio-replication. Lakhtakia's team, for example, used STFs made of nickel to coat the top of a female emerald ash borer to form a mold, then used that mold to create hundreds of decoys so detailed that they trick males better than freshly sacrificed females, disrupting the invasive species' mating cycle. His research also explored applications for solar energy and forensic science, and he is investigating larger microfibrillar films for biomedical uses.

Lakhtakia is the 2016 recipient of Sigma Xi's 2016 Walston Chubb



Akhlesh Lakhtakia will receive the 2016 Walston Chubb Award for Innovation.

Award for Innovation, due in large part to his leadership role in developing STFs. He will receive his award, and give a lecture, at Sigma Xi's Annual Meeting and Student Research Conference in Atlanta this November.

To see a video with Lakhtakia discussing various uses of STFs, visit <https://www.sigmaxi.org/programs/prizes-awards/walston-chubb/award-winner/akhlesh-lakhtakia>.