

Sigma Xi Today

A NEWSLETTER OF SIGMA XI, THE SCIENTIFIC RESEARCH SOCIETY

Get Updates from Kansas City

Scientists, engineers, and students will convene in Kansas City, Missouri, October 22–25 for Sigma Xi's 2015 Annual Meeting and Student Research Conference. If you aren't attending, you can follow both events on Facebook, Twitter, and Instagram using #SigmaXimtg.

The Annual Meeting includes leadership development workshops for chapter officers, a professional research poster session, caucus meetings, governance decisions, and a breakfast to welcome new members to the Society. The Student Research Conference is an opportunity for high school, undergraduate, and graduate students to present their research for evaluation by professional researchers and to network with graduate school recruiters and potential employers. Side-by-side with professional researchers, students attend lectures by Sigma Xi's award winners, career development workshops, and Science Cafés. Students who rank as superior presenters in the conference receive a nomination to join Sigma Xi and are inducted at the conclusion of the meeting.

For more information, visit <https://www.sigmaxi.org/meetings-events/annual-meeting>.



From the President

How to Invite Colleagues to Join Sigma Xi



President Mark E. Peeples

A couple of months ago, I agreed to be the outside-the-college faculty member for a student dissertation. The student had studied the history, location, and movement (generally northward) of native Ohio plants over the past century. Her dissertation and presentation were both excellent, and she easily passed. When she returned to the room to hear the committee's decision, I said that I was so impressed with her work and her potential that I was going to nominate her for membership in Sigma Xi. She was pleased and accepted. Her advisor and another committee member said that they had been meaning to join for a long time. I sent both the nomination form and a letter describing what we do. Another committee member said that she had joined just last month.

Sigma Xi is a membership-driven organization. Surprisingly, at least to me, our membership has continued to decline. One reason for the decline is that we have neglected to nominate our colleagues for membership. It may seem difficult to ask a colleague to do one more thing but think about the benefits. Sigma Xi enables us to honor, encourage, and support the next generation of scientists and engineers, to reach out to the public and school students to tell them what we do and why it's important, and to bring together scientists and engineers from different disciplines around our passion for science and problem solving, providing the opportunity for collaboration.

How do we ask a colleague to join Sigma Xi? It takes preparation. I start by making a list of all of the things that our national organization and my local chapter does. It's an impressive list that I have made into a one-page letter for our chapter. I use it to remind myself of all the great programs we sponsor and to prepare my "elevator pitch."

My pitch is more of a conversation, like this: "I'd like to nominate you for membership in Sigma Xi." *What's Sigma Xi?* "It's 'Scientists Supporting Science.'" *How do you do that?* "We support new scientists with awards (Team Science and Evolutionary Science at the State Science Fair) and Grants-in-Aid of Research (undergrad and grad students; both local and national awards). The competition encourages development of writing skills, winning builds confidence, and the support helps the advisor, too. And we work to strengthen the public's understanding of science through Science Cafés and our Meet a Scientist program in the schools. In addition, we bring local scientists together at our annual banquet."

I do this recruiting when I see a colleague on the way to the parking garage or when I sit next to one before a seminar. Most agree immediately to join. I email them a nomination form and the chapter letter that describes what we do. It often takes a reminder or two, or even a visit to help them fill out the form. One thing I have learned is that a blanket email does not work; personal contact does.

I've been fairly successful in the past several years, adding 30 new members to our chapter, many of them colleagues. With more members your chapter can be more effective at accomplishing our mission to *enhance the health of the research enterprise...for the purpose of improving the human condition*, and it can be more fun, too.

Seeing Through the Retina

David Williams has a vision: to develop technologies that will help understand how we see and assist in curing blinding eye disease. For his progress so far, he receives Sigma Xi's William Procter Prize for Scientific Achievement on October 24 at the Annual Meeting and Student Research Conference.

Your research in human vision is incorporating technology from astronomy. How so?

When astronomers are trying to look up at the stars through their telescopes, they use a technology called adaptive optics. I realized I could take that same technology, modify it slightly, and not correct the aberrations that occur in the atmosphere, which is what plagues ground-based astronomy, but instead correct aberrations in the eye with unprecedented accuracy.

We figured out how to measure these aberrations very accurately, and we use adaptive optics technology to correct these aberrations. It allowed us to do two things. It allowed us to improve people's vision by measuring and correcting more aberrations than what was possible before. And it allowed us to look inside the eye with much greater clarity than we've ever been able to do before. Now we can resolve single cells in the back of the eye with the special kinds of ophthalmoscopes that we've been developing over the last two decades.

What impact is this having in correcting vision problems?

Essentially, everybody who has LASIK these days, whether they know it or not, is using this wavefront sensor that we helped to develop, or a variant of it, in order to improve the outcome. This technology has improved the design of contact lenses and it's also used for intraocular lenses [artificial lenses used when cataracts form] ... even spectacles, to some extent, are being improved.

On the other hand, if we're looking into the eye with an ophthalmoscope that's equipped with adaptive optics, we use a mirror called a deformable mirror. We use the aberration measurements to adjust the shape of that

mirror in just the right way so as to correct the aberrations. Once you have a deformable mirror in your instrument for taking pictures of the back of the eye, you can collect a microscopic view because you no longer have the blur that is normally present when you look into somebody's eyes.

"I think in the next decade or two we'll produce major inroads in our ability to cure blinding eye disease."

What are you working on now?

We have been working for almost two decades to develop improved cameras that use adaptive optics to take pictures of the inside of the eye. By combining a technology called optical coherence tomography with adaptive optics, you get an improvement in resolution in all three special dimensions and that allows you to see the three-dimensional volume of the retina. At University of Rochester, we've been combining adaptive optics with fluorescence imaging so we have the opportunity to study the retina in a novel way. Also, we and our collaborators around the country have been working over about a 10-year period to develop new methods to stabilize the image so we can freeze eye motion and capture even sharper images.

What are the ultimate goals of your research?

We would like to understand why the retina is organized the way it is. The second aspect of our research program will be working more closely on using this technology to improve cures for eye disease. Thanks to molecular biology, there are a host of new technologies on the horizon that are not yet ready for human use but that are under development. I think in the next decade or two we'll produce major inroads in our ability to cure blinding eye disease, especially diseases that affect the outer retina—diseases that damage the rods and cones like macular degeneration.

We're positioning our adaptive optics camera to accelerate the development of



David Williams is University of Rochester's dean for research in the School of Arts, Sciences and Engineering, the William G. Allyn Professor of Medical Optics, and director of the Center for Visual Science. (Image courtesy of David Williams.)

those technologies. These diseases kill cells, and if you're going to rapidly determine what works and doesn't work in the way of therapy, you need to be able to view those cells in living eyes. Our group at Rochester has a partnership with three other institutions: an investigator at Harvard and University of Wisconsin and also in Basel, Switzerland. We're working on three different approaches to curing blinding eye disease of the retina, using our high-resolution camera.

To watch the full interview with David Williams, visit <https://www.sigmaxi.org/programs/prizes-awards/william-procter/award-winner/david-williams>.

Sigma Xi Today is edited by Heather Thorstensen and designed by Spring Davis.

A Career of Forestry Research

On November 26, Frank H. Wadsworth will have his 100th birthday. Wadsworth, who has been a forester in Puerto Rico since 1942, was elected into Sigma Xi membership in 1943, and is known as a pioneer in tropical forestry. He remains active and recently lectured at the Sigma Xi Puerto Rico chapter. Some of Wadsworth's writings are available through his blog at frankwadsworth.wordpress.com and through the Forest History Society at foresthistor.org. Wadsworth reflected on his career with American Scientist managing editor Fenella Saunders.

How would you describe the purpose of the field of forestry?

Forestry is not just cutting down trees. Forestry is responsible for sustainable protection of forests. We don't deny that we're using the forest. But the details of how to make trees grow and how to plant and care for them, I consider still the heart of what we're trying to do.

What attracted you to Puerto Rico?

Tropical forests are more interesting than many others. We have more species in the national forest than I think in all the rest of [forest types] put together.

It's really a complex thing to have to study, and learning what each one does teaches you that they're all different.

What scientific achievement of yours do you think had the most impact?

Learning the relationship between tree spacing and growing. One of the last papers I published showed that in the immediate surrounding of a tree, the density is related to different growth rates. If you know this, you can manage a forest and accelerate its growth.

You recently lectured at the Sigma Xi Puerto Rico chapter. What did you talk about?

I spoke to them about the importance of forests in their future. We have a mountainous island that is normally rainy, and when the island was deforested many years ago because we had agriculture, we had reservoirs that were mostly sedimented. Many of the trees have come back and now the sedimentation is much less. But there's a very strong lesson there in that if you don't have trees on the mountains, you don't have any water and you're going to have to leave the island.



Frank Wadsworth is a former director of the Tropical Forest Experiment Station of the USDA Forest Service within what is now the El Yunque National Forest in Puerto Rico. This picture was taken during an international tropical forestry training course that he led sometime between 1955 and 1970. (Image courtesy of Caribbean Foresters.)

Citizen Science Opportunity

SciStarter, an online resource featuring more than 1,000 citizen science projects, is reaching out to Sigma Xi members and chapters for help finding participants or leaders for a project in their local areas. This project, presented by NASA and the Global Learning and Observations to Benefit the Environment (GLOBE) program, involves collecting soil moisture data worldwide to validate and calibrate readings by the Soil Moisture Active Passive (SMAP) satellite. The data from the satellite will be used to improve weather forecasts; detail Earth's water, energy, and carbon cycles; monitor droughts; predict floods; and assist crop productivity.

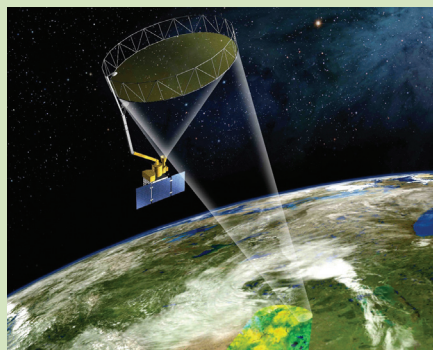
There are four ways for Sigma Xi member and chapters to get involved:

- 1) As participants
- 2) As team leaders and hosts for the instruments required for this activity

- 3) As mentors to a local team or individuals (SciStarter will work with Sigma Xi members to find others who need a mentor or you can mentor/lead a team of your choice such as a scout troop, sports team, classroom, or even your own family)
- 4) As community lab space to help train, mentor, and host citizen scientists involved in SMAP

Members who are interested in getting involved can sign up at <http://bit.ly/1UYQoVi>. To learn more about the project or if you're not a Sigma Xi member, visit <http://scistarter.com/SMAP>.

There is no deadline to join but equipment from SciStarter is limited. SciStarter will sell and loan kits of equipment needed to do the project, such as a heat lamp and graduated cylinder. Anyone interested in the kits should sign up as soon as possible. Teams or individuals can start once they receive training.



An artist's conception of SMAP taking data from orbit. (Image courtesy of NASA/JPL-Caltech.)

At press time, 24 Sigma Xi members had registered, with 15 signing up as team leaders and two as community lab spaces. More than half of the members volunteered to share or loan equipment with other teams and individuals, and even more expressed interest in participating in a lending library.

Ways to Improve Science Communication with the Public

Members of Sigma Xi joined science communicators, educators, high school students, and interested citizens from across the country August 10–11 in Durham, North Carolina, for the Communicating Science for Policy Workshop. Hosted by the Institute on Science for Global Policy and organized with Sigma Xi, the workshop focused on finding actionable steps that could improve how science is communicated with the public.

It's important to share research findings with the broader society so that citizens and policy makers can understand science. It also helps them decide how to appropriately incorporate it into public- and private-sector policies.

Debates, stemming from papers written by three speakers, kicked off the workshop. Each speaker had five minutes to make introductory remarks and then participants debated each speaker's ideas for approximately 85 minutes.

The first speaker was Arthur Lupia, a professor of political science at University of Michigan. He discussed how science must improve its communication efforts to increase its public value. Liz

Neeley, executive director at The Story Collider, argued that training scientists in narrative persuasion and storytelling is an effective way to improve science communication. The final speaker was William Hallman, professor and chair of the Department of Human Ecology at Rutgers University and chair of the Risk Communication Advisory Committee of the U.S. Food and Drug Administration. He argued that training is needed so the next generation of scientists becomes better communicators and that scientists should be rewarded for effectively communicating with the public.

Next, participants moved to small group discussions to decide what they could and could not agree on as actionable steps to improve effective science communication. The next day, the whole group came back together to build the overall consensus. Debate summaries will be published by the Institute on Science for Global Policy by mid-November.

For a recap of this event, see <https://storify.com/SigmaXi/communicating-science-for-policy-workshop>.



Liz Neeley, center, takes her turn on the debate floor during the Communicating Science for Policy Workshop.



Vote in Sigma Xi's Virtual Elections

It's time to prepare for Sigma Xi's 2015 elections. All dues-paying or life Sigma Xi members are eligible to vote online starting at 8 AM EDT on October 26. Eligible voters will receive an email from elections@vote-now.com on that day with instructions. Voting closes at 11:59 PM EST on November 24.

Voters will decide who will be Sigma Xi's future president. This position involves a three-year term on the board of directors: a year each as president-elect, president, and immediate past president. The chosen candidate will serve as president from July 1, 2017, to June 30, 2018.

Each Sigma Xi chapter is assigned to a specific region and constituency. Members may vote for the open positions in their region and constituency; those who are not in a chapter will vote for open positions in the membership-at-large category.

Voting for directors: North Central Region, Southwest Region, Comprehensive Colleges and Universities Constituency, and Area Groups/Industries/States and Federal Labs Constituency.

Voting for associate directors: Northeast Region and Southeast Region.

Voting for their representative on the Committee on Nominations: Northwest Region, Southeast Region, and Membership-at-Large.

Candidate information is available at <https://www.sigmaxi.org/about/leadership/2015/society-elections>.