

Sigma Xi Today

Will You Be a Mentor?

Sigma Xi, The Scientific Research Society, is seeking professional researchers to guide students through the process of publishing research. Those who volunteer will be mentor-reviewers for pre-collegiate students who submit research manuscripts to Sigma Xi's new journal, *Chronicle of The New Researcher*.

Chronicle is an online, open-access journal exclusively for pre-collegiate students to publish their research results.

The time and effort of mentor-reviewers will make a difference in the careers of these students. Mentor-reviewers will help them understand how to use experimental methods, document findings, write in a way that is appropriate for scientific publication, and use feedback.

If you are interested in becoming a mentor-reviewer, please e-mail ctnr@sigmaxi.org. Membership in Sigma Xi is not required.

Chronicle of The New Researcher is supported with generous funds from DIRECTV.



Chronicle of
**The New
Researcher**

From the President



A New President, a New Partnership

As I prepare to assume my duties as president of Sigma Xi on July 1, I want to open an ongoing dialogue with the chapters and membership of Sigma Xi. First, I would like to share a perspective on the historical importance of Sigma Xi and then reflect on its current status and potential future. The year I spent as president-elect has provided me with numerous opportunities to learn about many aspects of Sigma Xi history and to develop a perspective on its future.

While much has been done to maintain Sigma Xi as a respected honorary scientific society devoted to supporting research, it must be acknowledged in candor that the relevance of Sigma Xi in the professional lives of its membership, both established and newly inducted, has diminished significantly. The decreasing number of members financially supporting Sigma Xi seriously challenges the viability of its programs, and even its future existence. While the causes for decreasing interest remain under discussion, it is evident that interest and commitments have declined. It is essential that Sigma Xi pursue new approaches to ensure its mission remains relevant to today's community of research scholars.

The Sigma Xi Board of Directors recently revisited the effectiveness of the Sigma Xi mission and decided to establish a new relationship with the Institute on Science for Global Policy (ISGP), a not-for-profit organization committed to improving communication between scientists and policy makers. The ISGP was launched in recognition that many of the most significant issues facing increasingly global 21st-century societies are connected to the rapid and profound scientific and technological advances of our time. Unfortunately, many decisions, both in the public and private sectors, are made without an accurate understanding of the credible scientific and technological options available or their potential long-term consequences. Informed communities such as Sigma Xi are increasingly responsible for helping to accurately identify credible options for policy makers and for the public writ large. The prosperity and security of societies depend on not only their access to scientific and technological options, but as importantly, their capability to rationally decide which options to embrace and which to reject.

The ISGP has successfully pioneered programs using debates and caucuses to help policy makers and the public identify the areas of consensus and practical next steps needed to reach actionable decisions based on scientifically credible information. The current 18-month ISGP–Sigma Xi relationship is designed to explore how the ISGP programs might be of value to Sigma Xi and may help reformulate Sigma Xi's mission to promote the public's understanding of science.

It is, of course, critical that we engage the Sigma Xi community in these efforts. I encourage all those engaged in Sigma Xi to directly communicate with me regarding how they view these programs. A demonstration of ISGP debates is planned for the November Assembly of Delegates in Arizona. I certainly look forward to helping lead this exciting and potentially transformational time for Sigma Xi.

George H. Atkinson

Dr. Atkinson's presidency will run July 1, 2014–June 30, 2015. His biography was published on page 157 in the March–April 2014 issue of American Scientist:
<http://sigmaxi.org/about/news/SXT14MApg157.pdf>

Researching Materials on a Nanoscale Level

Not everyone spends their day looking at how a material's macromolecular components behave at the scale of one one-thousandth the width of a human hair. Dr. Thomas H. Epps III is the Thomas and Kipp Gutshall Professor of Chemical and Biomolecular Engineering at the University of Delaware. By diving into that nanoscale level, Epps and his research group use polymer physics to understand how materials are structured, which can have meaningful effects on designing materials that can help people. Epps is Sigma Xi's 2014 Young Investigator Award winner and will speak at the Society's Annual Meeting in November.

What would you say it is about polymer physics that interests you?

One of the things that interests me is the ability to help improve society. One of the ways we accomplish that in polymer physics is understanding the behavior of polymer systems for applications ranging from drug delivery to membranes, whether that is for separations or energy storage and energy generation, catalysis to produce greener systems, or even composite materials such as those you find on next generation aircraft. What really interests me in all of those [areas] is really probing down, in our case, to looking at the nanoscale level, and trying to understand how macromolecules actually arrange on that nanometer scale, and how that ultimately results in the macro scale properties that you see: flexibility, elastic nature, ability to deform, and recover.

What is an example of how people would interact with polymer physics?

Many of the clothes you wear that are, for example, polyesters or nylons—

those are polymeric materials, and we can design materials that either fit better or are lighter weight. Other examples are things like car tires, which are made of rubber and are composite materials. Really understanding how a polymer works allows us to design better tires for more fuel-efficient cars but also allows us to maintain properties like the traction and stability that are necessary from a safety standpoint.

What are some of the bigger challenges that your field is helping address for society?

When we look at materials for batteries, fuel cells, or even solar cell devices, one of the key aspects is really understanding how we can improve the transport and efficiency of these materials, and much of that boils down to understanding [and controlling] the nanoscale organization.

Where do you think the field is going to be in the next 50 or 100 years?

I think one of the things that has been particularly unique about the field,



and where it has an opportunity to grow, is linking designer chemistry to nanoscale or materials development in terms of manipulating the physics of macromolecular materials. Additionally, the ability to link experimental methods with theory and modeling development is starting to take leaps and bounds forward and will continue to do so.

You've been active in supporting underrepresented minorities in science and engineering. What do you think will bring more underrepresented minorities to these fields?

In polymer physics, for example, the opportunity is showing how polymer physics can have an impact on daily life by exposing students and the community to the opportunities in research—in science and engineering—and in my case, in polymer physics. Showing [people] that you can do it, too—providing the mentorship and the support to allow people to accomplish their scientific goals.

I think one key aspect is to actually think about how to reach students at an earlier age such that they can prepare through their schooling to be ready [for a career] like, in my case, chemical engineering or polymer physics, or whatever avenues they choose to pursue.

Listen to a recording of the full interview with Thomas Epps at <http://www.sigmaxi.org/programs/prizes/young.epps.shtml>. Photos courtesy of the University of Delaware/Evan Krape.



Sneak Peek at New Website and Online Communities

Sigma Xi will launch a new website this fall that will have improved tools for chapter officers and more functionality for members, including a member directory. It will be a valuable asset to keep everyone informed of the organization's initiatives.

"The new website will allow for more timely updates and interaction among visitors through new, online communities and improved links," said Jerry Baker, executive director of Sigma Xi. "Features on the homepage will point users easily to the latest news from the organization as well as member and chapter information."

Chapter officers can look forward to a streamlined and user-friendly Officer Resource Center, online Chapter Annual Report, and online nomination process.



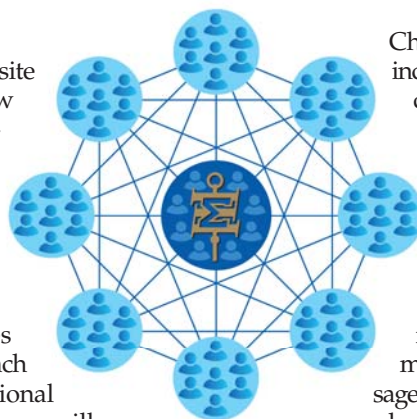
A mock-up of the new Sigma Xi website.

New Communities

The redesigned website will include a new feature: online communities. These are virtual spaces, similar to forums, exclusively for Sigma Xi members so they can interact by posting messages and responding to each other. These professional collaboration platforms will enable members to connect regardless of their geographical location.

"Sigma Xi members are leaders in their fields of research. The new communities are an exciting opportunity for them to meet online. They might never meet otherwise," said Kevin Bowen, director of Membership, Communications, and Programs for Sigma Xi. "There is great potential for professional collaboration and career support because of these communities."

All Sigma Xi members will be added to the main community with the option to change their settings. They will be able to create a user profile. Members will be able to search for other members based on location or institution.



Chapter officers will be included in a community designed exclusively for chapter leadership—to collaborate, exchange ideas, and ask questions. The goal is for all chapters to eventually have their own communities so that chapter members can post messages to their fellow chapter members containing relevant documents, information, or questions.

Other communities will be rolled out when enough activity around a particular topic in the main member community exists. For example, future communities that are anticipated relate to career advice or acquiring research funding.

What's Your Question?

Sigma Xi members can help get the conversation started by sending in a question they would like to pose to their peers. Perhaps it's about grant writing or about the state of jobs in a particular research field. Members may submit questions to memberinfo@sigmaxi.org with the subject line "A question for the new communities."

See You at Sigma Xi's Annual Meeting

After two years of virtual meetings, Sigma Xi members will gather in person November 6–9 in Glendale, Arizona, for the 2014 Annual Meeting, Assembly of Delegates, and International Research Conference.

New Session Announced: Getting the Science Right in Television & Film



Sigma Xi's Annual Meeting will include an opportunity to hear from member **Donna Nelson**, a professor of organic chemistry at the University of Oklahoma, who served as science advisor to AMC's popular show *Breaking Bad*. Dr. Nelson was selected as an advisor for the program after reading an article in *Chemical and Engineering News* explaining that the show's producer was seeking ongoing chemistry advice involving the program's main character, Walt, an organic chemistry high school teacher.

She will speak about her experiences of working with media programmers and why it is so important to get science correct in TV and film. Dr. Nelson specializes in the application and characterization of the single-walled carbon nanotube.



For more about the Annual Meeting, including a list of other speakers, visit <http://www.sigmaxi.org/meetings/annual>. Registration opens August 1.

Making an Impact

Sigma Xi participated at the following 2014 events to support students interested in science and engineering.

North Carolina FIRST Robotics Competition, Raleigh, North Carolina: Sigma Xi sponsored this regional engineering competition for grades 9–12. Executive Director Jerry Baker was a judge.

Conrad Foundation's Spirit of Innovation Challenge, Houston, Texas: Students, ages 13–18, were judged on business and technical plans that combine innovation and entrepreneurship with science, technology, engineering, and math (STEM). Members volunteered as mentors and judges.

USA Science and Engineering Festival, Washington, DC: Sigma Xi and *American Scientist* were official sponsors to help reinvigorate American youths' interest in STEM. Sigma Xi members spoke at the festival's symposium for elementary through high school students. Baker was a master of ceremonies.

Intel International Science and Engineering Fair, Los Angeles, California: Members served as judges at the largest international pre-college science competition to select winners of Sigma Xi's Special Awards. They awarded five teams a total of \$6,000.



A Maryland team at NC FIRST Robotics.

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

National Academy of Sciences Elects Sigma Xi Members



This April, Sigma Xi members were among the 84 new members and 21 foreign associates elected to the National Academy of Sciences in recognition of their distinguished and continuing achievements in original research. This class continued the trend of increased female recognition.

The academy is a nonprofit society of scientists and engineers committed to the furtherance of science and technology and its use for general welfare. It was established in 1863 by an act of Congress signed by President Abraham Lincoln that calls on the academy to provide objective advice to the nation about science and technology.

Newly elected Sigma Xi members, their Sigma Xi induction year, and their affiliations at the time of election to the academy are as follows. Those listed are NAS members unless otherwise noted.

Carolina Barillas-Mury (SX 1988); chief, Mosquito Immunity and Vector Competence Section, Laboratory of Malaria and Vector Research, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland.

Cynthia J. Burrows (SX 1976); distinguished professor, Department of Chemistry, University of Utah, Salt Lake City.

Jonathan J. Cole (SX 1982); distinguished senior scientist, Cary Institute of Ecosystem Studies, Millbrook, New York.

Patricia L. Crown (SX 1980); distinguished professor, Department of Anthropology, University of New Mexico, Albuquerque.

Daniel Eisenstein (SX 1992); professor, Department of Astronomy, Harvard University, Cambridge, Massachusetts.

Janet Franklin (SX 1989); professor, School of Geographical Sciences and Urban Planning, Arizona State University, Tempe, Arizona.

Timothy L. Grove (SX 1974); professor, Department of Earth, Atmospheric,

and Planetary Sciences, Massachusetts Institute of Technology, Cambridge.

Benjamin D. Hall (SX 1958); emeritus professor of biology and genome sciences, Department of Biology, University of Washington, Seattle.

Edward A. Hoover (SX 1982); university distinguished professor, Department of Microbiology, Immunology, and Pathology, Colorado State University, Fort Collins.

Marcia K. Johnson (SX 1982); Sterling Professor of Psychology, Department of Psychology, Yale University, New Haven, Connecticut.

Martin M. Matzuk (SX 1982); professor, Departments of Pathology and Immunology and of Molecular and Cellular Biology, Baylor College of Medicine, Houston, Texas.

Margaret J. McFall-Ngai (SX 1983); professor, Department of Medical Microbiology and Immunology, University of Wisconsin, Madison.

Jerry M. Melillo (SX 1977); distinguished scientist and director emeritus, Ecosystems Center, Marine Biological Laboratory, Woods Hole, Massachusetts.

Ei-ichi Negishi* (SX 1968); Herbert C. Brown Distinguished Professor, Department of Chemistry, Purdue University, West Lafayette, Indiana (Japan).

Helen J. Neville* (SX 1988); professor of psychology and associate director, Institute of Neuroscience, University of Oregon, Eugene (Canada).

Joseph D. Puglisi (SX 1990); professor and chair, Department of Structural Biology, Stanford University School of Medicine, Stanford, California.

Sergio Verdú (SX 1984); Eugene Higgins Professor of Electrical Engineering, Princeton University, Princeton, New Jersey.

* Denotes a NAS foreign associate. Their country of citizenship is in parentheses.

Meet Your Fellow Companion: Samelia Okpodu

Sigma Xi's motto is the Greek "Spoudon Xynones," or "Companions in Zealous Research." With that thought in mind, we like to highlight fellow companions to learn more about their work and what the honor of induction to Sigma Xi has meant for their careers. Samelia Okpodu (SX 2010) is researching how critical molecular components of the human eye affect retinal development and the downstream effects of their absence.

Tell us about your educational background including your doctoral research.

My bachelor's degree is in optical engineering and was completed at Norfolk State University in Norfolk, Virginia. I am currently working on my PhD in the Department of Physiology and Biophysics at Howard University in Washington, DC. My emphasis is on neurophysiology, more specifically the cellular and molecular aspects of retinal development. The retina is the neural component of the eye that contains the photoreceptors as well as the initial processing machinery for visual pathways.

What is the focus of your current research?

My current research focuses on the development of the retina with specific emphasis on Prickle2, a core protein of the planar cell polarity signaling pathway. Prickle2 is specifically interesting in the retina because of characteristics found in the expression profile of cone-dominated (mutant) retina.

Tell us about something we might see in our daily lives that directly correlates to your work.

Visual impairments have the ability to touch every aspect of our lives. Degradation and degeneration of the retina can lead to partial or full blindness. So my research is rooted in investigating why this happens.

Do you have a particular teacher or professor who inspired your love of science?

My love of science undoubtedly comes from my mother, who is a professor and researcher. I spent countless hours in the lab with her when I was a child racking pipette tips, which was my first foray into the scientific process. I also was fortunate to have fantastic scientific guidance in college. My mentor helped cultivate my passion for optics.

What are your thoughts on the future of STEM education?

STEM education is reaching a critical point and the potential for growth in this realm is phenomenal. If we can find a way to be more inclusive as a scientific community and make science more accessible, understandable, and relatable to the general community, I see no reason why STEM education would not continue to evolve and improve.

What has the honor of induction into Sigma Xi meant to you?

In being inducted into Sigma Xi, I joined a community which encompasses phenomenal scientists and over 200 Noble Prize laureates. That alone is enough to relish. Added to the fact that there are many opportunities for me, as a young researcher, to continue to grow and learn from other, more seasoned scientists, and the honor of induction is something to be grateful for and continues to reveal itself over time.

What books are you currently reading for pleasure?

I've recently become interested in the physiological effects of nutrition and in-



ternational studies. So the books that I am currently reading are *Eat to Live* by Joel Fuhrman and *Rise to Globalism* by Stephen Ambrose and Douglas Brinkley.

When you're not working on your research, what do you do in your free time?

In my free time I enjoy learning new languages and being outdoors.

What's your favorite movie?

Pan's Labyrinth, written and directed by Guillermo Del Toro.

What is your favorite motto?

Fall seven times, stand up eight.

What advice would you give to a young researcher just starting out in your field?

People tend to go into science because they are relatively smart and have excelled in science courses early on. However, while intelligence is a key component to success in science, scientific research is not necessarily about who is the smartest or cleverest but rather about who has the patience and focus to keep moving forward. You have to develop a thirst for the scientific process, not just for the end result.

What advances do you see in your field of research over the next 100 years?

In the next 100 years I see continued advances in the area of retinal gene therapy as it pertains to personalized health care and medical intervention and treatment related to genetic disorders that cause low vision or blindness.



Meet Your Fellow Companion: Madhusudhanan Narasimhan

Using cell culture and animal models, Dr. Madhusudhanan Narasimhan (SX 2013) is investigating how alcohol and environmental pesticides affect neurons. He is also studying how bio-ingredients from a vegetable and a spice can prevent the brain damage caused by alcohol and pesticides, and how to improve treatments of neurological complications inflicted by these toxins.

Tell us about your educational background.

I received my BS, MS, and PhD degrees in biochemistry in India. I am currently working as a senior research associate and I'm an active member at the South Plains Alcohol and Addiction Research Center, which is part of the Texas Tech University Health Sciences Center in Lubbock, Texas.

What is the focus of your current research?

I am involved in multiple, vital translational research studies designed to (a) discover the biological basis for the developmental disorders of the brain induced by alcohol and environmental pesticides such as rotenone and paraquat, (b) learn the role of microRNAs in alcohol- and pesticide-induced neuroabnormalities, (c) test natural chemopreventors present in broccoli and turmeric against alcohol- and pesticide-induced neuronal damage, and (d) identify better molecular targets to improve existing

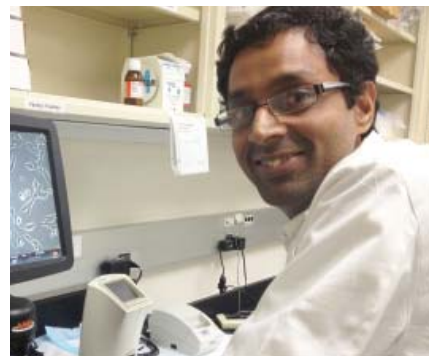
treatment strategies in pediatric neurological cancers. I test these hypotheses in cell culture and various animal models.

Tell us about something we might see in our daily lives that directly correlates to your work.

Consumption of alcoholic beverages has become customary in social situations and 70% of all American adults, including pregnant women, consume alcohol. But the main question is: Do the majority of them drink alcohol in a responsible manner? The answer is "no," and the consequences include serious physical and mental health problems. In this context, my research is devoted to finding key mechanisms/targets responsible for inducing death of neurons in a developing fetus when a pregnant woman consumes alcohol. Another topic of my research is to study how nerve cells are affected by environmental pesticides such as rotenone and paraquat, to which humans are exposed knowingly or unknowingly. My other research focus is strategic testing of the effect of nutraceutical compounds of broccoli and turmeric against alcohol- and pesticide-induced brain damage.

What has the honor of induction into Sigma Xi meant to you?

The greatest of honors one can receive in a lifetime is to be recognized and chosen by one's peers. The full membership that is conferred to me by Sigma Xi has injected enthusiasm and renewed my motivation. Sigma Xi is comprised of many distinguished personalities from the field of engineering and applied science, and thus to be a part of such an elite scientific professional society is a huge honor. Indeed, this status has heightened my sense of responsibility.



What advice would you give a young researcher just starting out in your field?

The best research discoveries have often been simple things that were ignored and unnoticed. So, pay attention to small details and be open to accommodating deviations from central dogma. Sometimes the scientific questions that we set out to address won't reveal their true secret and turn out to be boring. Try to make it interesting by opening up communication channels, getting advice from all over, and rethinking. Love your negative results as they may be a golden opportunity to find out something exciting.

What advances do you see in your field of research over the next 125 years?

With genome mapping a possibility now, in the next 125 years, we should be able to nail genes that are responsible for the rewarding and sedative effects of alcohol dependence. This can further lead to designing suitable countermeasures to block alcohol's action. With brain mapping and more advanced imaging around the corner, we can pinpoint any abnormal changes associated with intricate inter- and intra-neuronal connections in brains. Having caught these changes, suitable neurotherapeutic strategies can be devised and progression of many of the neurodegenerative illnesses could be curbed. At the same time, I am a strong believer of Niels Bohr's ideology: "Prediction is very difficult, especially if it's about the future."



Read the full interview with Madhusudhanan Narasimhan at <http://www.sigmaxi.org>. Click on "About Sigma Xi," then "News," then "Meet Your Fellow Companions."