

SNO REPORT

THE SUSTAINABLE NANOTECHNOLOGY ORGANIZATION



Sustainable Nanotechnology Organization

Research | Education | Responsibility

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SNO Report Submissions

Please send news, conference announcements, job postings, and other contributions to the SNO Report to the editor, **Kyle Doudrick** kdoudrick@nd.edu

Letters to the President may be sent to:

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Membership Renewal

Current membership is good until **September 16, 2016**. Everyone who paid the non-member conference fee will receive a membership until that date. The membership fee is tax-deductible.

President's Message

By WUNMI SADIK

In the fall of 2012, a small group of scientists and engineers organized the first conference on Sustainable Nanotechnology in Washington DC. There were 200 attendees at that meeting. Those men and women formed the core membership of the Sustainable Nanotechnology Organization (SNO) that has now grown to be close to 2,000. They have continued the dialogue about sustainable nanotechnology.

At that inaugural meeting of SNO in November of 2012, twenty graduate students won \$500 each to attend the conference based on their resumes and the relevance of their research to sustainability and nanotechnology. To date, SNO has awarded over 100 travel grants to its student members. In addition to its annual conference, SNO supports young researchers and graduate students, as well as sends out periodic newsletter of its activities. SNO also provides a neutral forum for workshops, offers publishing opportunities with its journal partners, displays information about sustainable nanotechnology at science expos, and maintains student chapters at several universities. Many of those inaugural class of SNO student members are now faculty members and staff research scientists at various universities national laboratories. Yet some are founding members at start-up companies, and others have gained employments in the other fields.

SNO also partners with other organizations. This year, a joint conference was organized by SNO and the International Nanotoxicology Congress, which took place from June 1 - 4 (<http://www.nanotoxcongress.net/>). It was a successful conference with close to 400 abstracts with multiple sponsors including NIEHS, American Chemistry Council, Bergeson & Campbell PC, NSF and the Colt Foundation. Exhibitors included NanoComposix, Malvern, Vitrocell, CytoViva, IZON Science and CH Technologies, USA. Clearly, SNO has the convening power to bring people together. The joint congress had access to the organization's diverse membership, including leaders in the field, early faculty career investigators, postdoctoral fellows, students, and industrial members. SNO also worked with the International Conference on the Environmental Effects of Nanoparticles and Nanomaterials (ICEENN) where about 200 researchers gathered to present environmentally related work in nanotechnology. In 2017, we are also planning international conferences on Advances in Nano-

technology in Guwahati, India from January 9-13, 201

Of course, we are looking forward to seeing you at SNO's 5th Annual Conference in Orlando, FL from November 10—November 12, 2016 at the Doubletree by Hilton Universal Orlando (<http://www.doubletreeorlando.com/>). Abstracts are due by September 16, 2016 (please see details at <http://www.susnano.org> under Conference). The conference co-chairs are Dr. Sudipta Seal, Distinguished Professor of Materials Science & Engineering at University of Central Florida and Dr. **Quo (Treen) Huo**, Associate Professor at the NanoScience Technology Center at University of Central Florida, Orlando. As in 2015, this year's conference sessions are being organized around selected sustainability "systems" such as air-water systems. There will be sessions on food & agricultural systems, solid waste, applications, effects and implications, analytical methods, and lifecycle aspects of nanomaterials within each system. The conference committee is putting together an outstanding technical program so please visit SNO website at www.susnano.org for details.

Also, SNO will hold its 6th annual workshop that will focus on Dosimetry workshop – Program, Wednesday, November 9, 2016 starting at 8:30am to 5pm. The Workshop Chair is Professor Philip Demokritou of Harvard University. Other instructors include Sandra V. Pirela, Glen DeLoid and Joel M. Cohen.

In this edition of newsletter, we welcome our first "where are they now" question and answer session featuring interviews from Drs. Cyren Rico and Kyle Doudrick. Dr. Rico is currently a National Research Council Fellow at the US-Environmental Protection Agency and Dr. Doudrick is an Assistant Professor in the Department of Civil & Environmental Engineering & Earth Sciences at the University of Notre Dame. Young SNO members who are just beginning their careers can read more on the reflection about how the first SNO conference jump-started their careers and provided professional development and networking, and has led to collaborations and publications in scientific journals. Also, in this edition, you will read great excerpts from last year's meeting in Portland, OR on what our members thought the word "sustainability" meant, job openings in nanotechnology, nano-education and student chapters. SNO is open to ideas and projects of its members, and is flexible in its structure. We would love to hear from you..

Where are they now? Student Award Winners Q&A

Welcome to our first “Where are they now?” question and answer session, where we will check in with past SNO award winners and see what they are up to. In this issue, Dr. Sanghamitra Majumdar, a postdoctoral research scientist at The Connecticut Agricultural Experiment Station, catches up with Drs. Cyren Rico and Kyle Doudrick.



Dr. Cyren Rico



Dr. Kyle Doudrick

(Majumdar) You were one of the SNO student award winners in the first SNO conference held in Arlington, VA in 2012. Where are you currently placed and what are you doing?

(Rico) I am currently a National Research Council Fellow at the US Environmental Protection Agency. I work with senior scientists at EPA on fate, transport, and ecological effects of engineered nanomaterials in terrestrial ecosystems. My recent work is on the intergenerational effects of cerium oxide nanoparticles in wheat, which is a continuation of the long-term study that I started during my PhD regarding the impacts of engineered nanomaterials in plants. We are also preparing for a two-time visit to the Advanced Lightsource in Lawrence Berkeley National Laboratory to investigate root/soil factors affecting uptake of nanomaterials in plants.

(Doudrick) I am currently an Assistant Professor in the Department of Civil & Environmental Engineering & Earth Sciences at the University of Notre Dame. I run the Laboratory for Advanced and Sustainable Water Treatment, where we focus on research that will generate new technologies. Current projects include the solar conversion of wastewater to energy using photoelectrochemical fuel cells, treatment of oxo-anion pollutants using solar activated photocatalysts, fundamental research on how engineered nanomaterials transport through complex matrices in the environment and living organisms, and the effects of nanomaterial surface chemistry on their toxicity.

(Majumdar) How did the SNO student award benefit you in your professional development during your graduate research?

(Rico) The first SNO conference is quite memorable to me because it was the first conference that I attended as a PhD student, and it was also the first travel award I got from a scientific conference. At this conference, I met a lot of people whose names I only read in published articles. For example, I met Dr. Jason White from Connecticut Agricultural Experiment Station, and that meeting led to future collaborations and publications. After that conference, I also got plenty of invitations to review manuscripts for publication in scientific journals. In addition, the award made an impact on my application for a post-doctoral fellow at the National Research Council.

(Doudrick) As a graduate student working in an interdisciplinary field, the SNO award was a good recognition of the work I was doing, it helped show that my research was making a meaningful impact with regards to sustainable nanotechnology. Academic jobs are very competitive, and I think any awards at the junior stage are important for obtaining further success.

Where are they now? Student Award Winners Q & A

(Majumdar) How have the sessions in the past SNO conferences influenced you as an emerging researcher in the field of nanotechnology?

(Rico) SNO conferences bring in leading experts in the field who provide insights on where the field of nanotechnology is heading. I particularly like the sessions on food and agriculture which have good discussions on food safety and agricultural productivity.

(Doudrick) Going into graduate school, I knew I wanted to work on using nanotechnology to address environmental problems that weren't being solved with current technologies. In the beginning of my studies, I was intentionally focused on just engineering the best solution, oblivious to potential consequences. What first drew my attention to the possible implications of using nanotechnology was conversations with students from Arizona State's Center for Nanotechnology in Society. They posed simple questions like "What do you do with your nanoparticle waste? For example, do you treat carbon based materials like hazardous waste or like solid waste?" These were questions I hadn't considered before and it made me think about the responsibilities I had as an environmental engineer using nanomaterials for treating contaminants. I attended the first SNO conference about midway through my graduate career, and that is where I started to really see all the various sides of sustainable nanotechnology. It led to fruitful collaborations during my graduate career, working on non-application projects such as nanotoxicity.

(Majumdar) How does your current research contribute towards sustainable nanotechnology, and where would you envision yourself in the next five years?

(Rico) My research looks at the long-term interaction between nanomaterials and plants and/or soil microorganisms. I hope to understand how these interactions influence nutrient cycling, plant physiology, agricultural productivity, and human exposure. These investigations are being carried out to provide decision-support tools to US EPA Chemical Safety for Sustainability Research Program and/or Toxic Substances Control Act. The research output can guide in improving sustainable production, use, and disposal of nanomaterials to protect human health and the environment. In the next five years, I believe I would still be doing research in this field, either in the academe or industry, to develop applications of nanotechnology in agriculture and environment.

(Doudrick) Now, as an assistant professor, my research group considers many aspects of nanotechnology, and we work to holistically include implications in our projects. For example, our research with photocatalytic fuel cells is looking at developing electrodes from more sustainable materials like carbon, even though using something like palladium would be much easier. On the flip-side, we know that by incorporating nanomaterials into products that there is a possibility that they will end up in the environment or taken up by living organisms. So, we are also investigating some fundamental aspects of nanomaterial behavior in these complex systems in order to provide others with tools that allow them to predict nanomaterial risk. Where do I see myself in five years? Well, my first thought as an AP is – hope I still have my job! Five years seems like such a short time in research, but I want to be at a place in my career where the outcomes of my projects have made a significant contribution in advancing the use of nanotechnology for water treatment. I'd also like to be able to say I was an effective, influential teacher, and that I was able to help some great students meet their career goals.

What does Sustainability mean to you?

At SNO we ask members to take sustainability seriously and to try and promote it in their nano-related research. For our meeting, the abstract application requires a statement about how one's research incorporates sustainability. We want to reiterate that for our meetings, and this organization, this question is very important and should be answered with thought and care. The abstract call explains what is required:

"Nanotechnology holds a great promise for sustainable development. The successful application of nanotechnology is contingent upon scientific excellence that provides economic, ethical and societal benefits. Each abstract should include a justification statement that reflects how the work is promoting sustainable development of nanotechnology, and/or harnessing the power of nanotechnology to provide sustainable solutions to the most pressing global challenges."

To be sure we are all on the same page, here are some great excerpts from last year's meeting (Portland):

- By understanding the science behind potential release and exposure of engineered nanomaterials across the lifecycle of a nano-enabled product, one can move forward in the direction of sustainable nanotechnology development by coming up with novel product designs that would minimize potential exposure, and hence risk.
- In order for sustainable nanotechnology to thrive, it must become part of the educational curriculum. This work will examine how that will be possible.
- This research promotes sustainability by adding new techniques and tools to increase fundamental knowledge of nitrifying biofilms which are crucial for the nitrogen cycle.
- This work promotes good policy decisions regarding emerging technologies, specifically a nanotechnology, that have the power to reduce our fossil fuel demands and lower our impact on both human and environmental health in the interim, before we make the switch to renewable energy.
- Cancer is a genetic based disease affecting millions of people worldwide. A nanoparticle platform that can deliver siRNAs to knock down culprit genes in tumors has great potential to treat cancer, thus has global health and economic benefits.
- This work will aid in the sustainable design of engineered nanomaterials (ENMs) by assessing the influence that ENM surface coatings have upon the behavior and therefore the fate of ENMs within different aquatic environments. With the findings of this work, insight will be gained regarding how future development of ENMs can be tailored to reduce the risks posed by ENMs upon release to the natural environment.
- Balancing sustainable objectives and efficiency, this work promotes the sustainable implementation of nanotechnology in photocatalysis to increase applicability in small systems drinking water treatment while diminishing potential nanoparticle release to the environment and public.
- This work emphasizes the effects of nanotechnology in edible plants. Sustainability is all about a balance in the economy, society and environment. This study provides insights into environmental implications of nanomaterials in the food chain in order to provide sustainable materials.
- This work aims to improve the sustainability of drinking water and wastewater facilities via an early (rapid) detection method that is ultrasensitive and selective for E. coli. Rapid detection of pathogens will improve the quality of drinking water and reduce the occurrence of infection, while also reducing the amount of unnecessary treatment of water that may be harmful to the environment.
- This work advances sustainable nanotechnology by questioning whether the benefit of nano-silver textiles is worth their environmental cost. Additionally, it investigates the social implications of the adoption of this new technology.

The above sentences illustrate that it is possible to explain how nanotechnology research fits in with sustainability. We hope this is useful as you prepare for the next SNO conference in Orlando.

UPCOMING SNO MEETING IN ORLANDO

SNO Promotes A Systems Approach For Its Conference

The SNO 2016 Conference will be held at the Doubletree by Hilton at the entrance to Universal Orlando. Florida should be lovely at that time of year. We meet starting on Thursday, November 10, through Saturday, November 12, 2016. The days of the week were moved to accommodate voting on Tuesday. We will again structure the sessions around sustainable nano systems in an effort to place our focused research in a greater context. Abstract submission and registration are now open on the web. Go to www.susnano.org and click on the conference tab



Orlando Pitch!

It is time to get ready for the Nano Pitch Contest 2016 at the SNO Conference in Orlando (FL). Students will be able register for the contest on-site or on the web. Each participant will be given 100 seconds (don't forget nano!) to present her/his work using one slide (without animation). Three cash prizes will be awarded. Contestants will be judged by a panel of experts. Given the enthusiasm of the participants in Portland and popularity of the contest, more participants are expected in the Orlando Conference.



SNO is Forming Student Chapters

They are finally here! Well, about to be!! Sustainable Nanotechnology Student Organization (SNSO) chapters are being planned in at least three universities in the United States. The Sustainable Nanotechnology Student Organization (SNSO) is the student body of the Sustainable Nanotechnology Organization (SNO). SNSO will be engaged in: (1) Research and development of sustainable nanotechnology, (2) Implications of nanotechnology for Environment, Health, and Safety, (3) Advances in nanoscience, methods, protocols and metrology, (4) Education and understanding of sustainable nanotechnology, and (5) Applications of nanotechnology for sustainability. SNSO chapters in different academic and research institutions will promote the objectives of SNO among students. SNSO Chapters are expected to be the professional forums for students involved in and interested in sustainable nanotechnology research, education, and practices. A draft constitution and a list of some suggested activities are now available at SNO website (<http://susnano.org>). One SNSO chapter is now active at North Dakota State University (NDSU lead faculty: Achintya Bezbaruah), and two others are planned at the University of Rhode Island (Vinka Craver) and the University at Buffalo-State University of New York (Nirupam Aich).



While it is recognized that each student chapter will plan their own activities, a list of suggested activities for SNSO chapters has been prepared and these activities include: (1) Promoting sustainable nanotechnology research and education, (2) Promoting sustainable nanotechnology among students, faculty and staff, and general public, (3) Sustainable nanotechnology competitions, (4) Attend SNO Annual Conference, (5) Promote K-12 nanotechnology education, (6) Organize annual ‘Sustainability in Nanotechnology Week’, and (7) Participate in ‘Change the World with Nanotechnology’ Contest (details being worked out).



The North Dakota SNSO Chapter has been informally active since 2013, and the chapter is formally established starting this fall. The group is mostly comprised of graduate students with a couple of undergraduates. The student leaders are working on getting the chapter recognized at the university level and planning a host of activities for fall and spring semesters as well as 2017 summer. This group had earlier conducted program in two summers for elementary and middle school students (“The Big World of Nanotechnology”), and is now planning to reach out to area schools to promote nanotechnology this academic year (2016-17). This fall the student team is helping out in planning, organizing, and conducting lab experiments for an undergraduate and graduate level course on environmental nanotechnology

(CE 471/671). They plan to visit introduction to environmental engineering undergraduate class in spring 2017, and have summer boot camps on sustainable nanotech for K-12 students. One of the most popular activities among K-12 students, so far, is the making of Nano Nail Polish where participants make their own trendy nail polishes (and forces the male participants to wear!!).

The SNO Governing Body hopes to have a multiple SNSO chapters across the world in the coming years.

Facebook: 575 likes, steadily increasing

We are revamping our Facebook efforts in order to bring SNO members and interested people “live” updates about SNO happenings and events/news relevant to sustainable nanotechnology. Please follow us at <https://www.facebook.com/susnanotech>.

Our Facebook page is administered by SNO graduate student, Illya Aidee Medina Velo (UT El-Paso). Please send her an email if you have questions or want to contribute (iamedinavelo@utep.edu).

SNO Seeks to Build Nano-Education

The Sustainable Nanotechnology Organization (SNO) has 3 focus areas—research, responsibility, and education. In order to move nano-education forward, SNO has set forth a goal: **Raise nanotechnology to an academic discipline equivalent to chemistry, physics, biology, engineering.**

SNO believes that:

- Nanotechnology remains buried in the pockets of other disciplines as a secondary topic.
- The foundations of nanotechnology itself are not completely laid out within these disciplines.
- Students do not always see the connections between the traditional sciences and nanotechnology.
- Nanotechnology can become a unifying science.
- As a new discipline, nanotechnology can be imbued with sustainability approaches.

To reach the goal is a big task ahead, but there already exist model programs and disciplines that have preceded us. **We’re interested in what you think. Please let us know—positive or negative.**

Job Opening in Nanotechnology!

**Full Time Nanotechnology Policy Analyst
World Technology Evaluation Center, Inc. - Arlington, VA**

WTEC is seeking a full-time Nanotechnology Policy Analyst to support a Federal office in Arlington, Virginia. The Nanotechnology Policy Analyst will provide support for activities to address potential environmental, health, and safety implications of nanotechnology (nanoEHS), as well as efforts to foster collaboration in the standards development community.

<http://www.indeed.com/cmp/International-Technology-Research-Institute/jobs/Full-Time-Nanotechnology-Policy-Analyst-afafd0cccbbcbb39?q=nanotechnology>



Dr. Stacey Harper leads Pre-SNO workshop on Nanoinformatics at the 2015 SNO Conference

SNO and the Royal Society of Chemistry

The Royal Society of Chemistry (RSC) includes three (and maybe more) SNO members as Fellows. This year Barbara Karn and Peter Vikesland were honored to be chosen as Fellows of the Royal Society of Chemistry (FRSC). SNO president, Wunmi Sadik, has held the FRSC title for several years. Congratulations to these SNO members as SNO continues its partnership with the RSC journal, *ES:Nano*.

UPCOMING EVENTS MARK YOUR CALENDAR



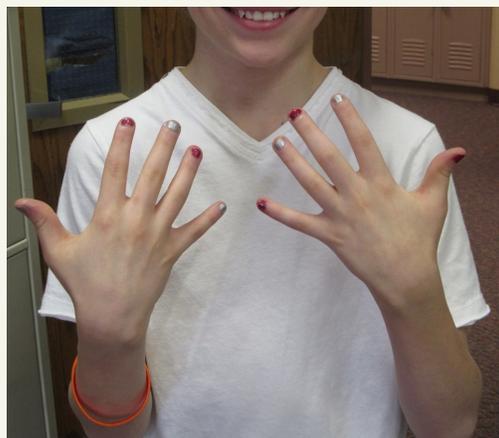
Annual SNO Meeting (Orlando, FL): November 10-12, 2016

Systems approach to sustainable nanotechnology. Abstracts due September 16.

Nanomaterials Safety: Fundamentals, Characterization, and Toxicology short course (Covilhã, Portugal, Faculty of Health Sciences, University of Beira Interior): October 31-November 4, 2016

International Conference on Advances in Nanotechnology (Assam State of India): January 9-13, 2017

Students show the joy of nanotechnology organized by North Dakota's Sustainable Nanotechnology Student Organization



WANTED: Good ideas for SNO

SNO is your organization. If you have an idea you want to implement through SNO—a workshop, a publication, an outreach activity, a new curriculum, a different session, etc.—please let us know. We are always open to great new ideas.

We also welcome members to **post ads** including news, student/postdoc openings, job opportunities, and other member related announcements. (info@susnano.org)

Join SNO at
www.susnano.org