

SNO letter

NEWSLETTER OF THE SUSTAINABLE NANOTECHNOLOGY ORGANIZATION



**Sustainable
Nanotechnology
Organization**

Research | Education | Responsibility

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Join SNO at
www.susnano.org

SNO Newsletter Submissions

Please send news, conference announcements, job postings, letters to the editor, and other contributions to the newsletter to Drs.

Sadik or Karn
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The next newsletter will be released in Fall 2014.

Edited by:
Kyle Doudrick
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Message from the President

Three new initiatives keep us moving forward

SNO newsletter is one way of keeping our members informed of what is going on in the organization. In this August 2014 edition, we are pleased to announce three new initiatives to keep us moving forward. Our success over the past 3 years has led to an increase in membership—now at about 250, including international participants and partnerships. During this period, we have published two special issues in *ACS Sustainable Chemistry and Engineering* containing over 20 papers in each issue. We also had an exhibition booth and a full technical program at the 3rd US Science and Engineering Festival held in April 2014 in Washington, DC. At the moment, we have a continuously growing pool of industrial sponsors. In addition, SNO has been very supportive of the student members through travel grants and awards to demonstrate its commitments to the next generation of researchers that will advance the concept of Sustainable Nanotechnology.

I am pleased to announce three new initiatives: SNO has partnered with the Royal Society of Chemistry to offer our members a free access to their journal, *Environmental Science: Nano*. Members can access this journal at <http://pubs.rsc.org/en/account/register>. We are currently embarking on the publication of a monograph series. Lastly, our progress in the next few years will be measured in terms of our ability to forge strategic partnerships to advance sustainable nanotechnology in the global sector. These partnerships will provide our members with a broader perspective and unique opportunities that will enable us realize our visions and future goals. As a result, we are partnering with two large European Commission-sponsored research centers to hold our first European conference from March 9 – 11, 2015 in Venice, Italy. These centers are *EU FP7 Nanosafety Projects SUN* and *GUIDENANO*. The European meetings will provide perspectives by leading experts in EU and USA on the implications and applications of nanotechnology. We hope to foster new, multi-sector collaborations in nanotechnology as a result of these partnerships.

Finally, I commend the tireless efforts of my co-founder/Executive Director, Dr. Barbara Karn and all of our volunteers for making these past few years such an exhilarating success. Words are not enough to describe the energy and competence of these groups of people in making SNO achieve a very early success. Notable among these individuals are Drs. Arturo Keller, Jackie Isaacs, Philip Demokritou, Vinka Craver, Paul Westerhoff, Kyle Doudrick, Katrina Varner, Andre Nel and several others too numerous to mention. We have a lot of work to do, but I'm confident these initiatives will advance us on our path to becoming the one organizational "home" for this interdisciplinary research community that promotes the research, education and responsible development of nanotechnology.



Wunmi Sadik

INTRODUCTION



Greetings SNO Members,

We are gearing up for our annual meeting in November and looking forward to seeing everyone. This year's meeting will be held November 2-4 at the Hyatt Regency in downtown Boston, MA. More information can be found on www.susnano.org. The chairs of this year's session are Dr. Jackie Isaacs of Northeastern University and Dr. Philip Demokritou of the Harvard School of Public Health. Please be sure to have your abstracts in by the extended deadline of **August 11**, and also reserve your hotel by October 1st to ensure you get the SNO rate.

Our meeting will cover a wide variety of sessions related to nano and sustainability including: risk, toxicity, environmental applications, medicine, education, society/policy, fate/transport, manufacturing, LCA, and legal. We have plenary guests Mike Roco, Clayton Teague, Mark Weisner, Dave Resjeski, and Lynn Bergeson. Watch the web for more info on the plenaries as well as general conference updates.

Joining us for our recurring Q&A session are Ms. Lynn Bergeson from Bergeson and Campbell law firm and Prof. Peter Vikesland from Virginia Tech. For our second "Industry Spotlight" installment, we feature Wyatt Technology Corporation.

sus·tain·a·ble

1. able to be maintained at a certain rate or level.
2. able to be upheld or defended

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (Brundtland Report, 1987)

SNO Q & A SESSION



MS. LYNN BERGESON
Owner, Bergeson & Campbell, P.C.

(Doudrick) Lynn, it is a pleasure having you join us. What role does B&C play when it comes to regulation, compliance, and safe use of nanomaterials?

(Bergeson) Bergeson & Campbell, P.C. (B&C[®]) institutionally contributes significant “sweat equity” to the nano community in terms of volunteering time and energy in analyzing rules, and providing commentary and analysis on nano policies and regulatory developments. We offer our thoughts on how to comply with regulations and do the right thing in protecting employees and managing nanomaterials in ways that diminish releases and protect the environment. We produce a blog (<http://nanotech.lawbc.com/>) that is open to the public that reports on domestic and international regulatory and policy developments. Our website (<http://www.lawbc.com/>) offers significant, substantive commentary, and analysis on nano developments.

(Doudrick) How can we use science/policy so that nanotechnology has a more sustainable impact?

(Bergeson) Science needs to support all decisions regarding emerging technologies, including nanotechnology. By allowing science to guide decision-making, we can be assured that nanotechnology will be sustainable and that unintended consequences will be avoided.

(Doudrick) How is the United States improving the regulatory framework for nanomaterials?

(Bergeson) Through the National Nanotechnology Initiative (NNI), federal agencies are able to pool re-

sources and coordinate policy initiatives in addressing research and governance issues pertinent to nanotechnology. From my perspective, the U.S. Environmental Protection Agency (EPA), U.S. Food and Drug Administration (FDA), and other agencies have done an excellent job of using their existing legislative authorities to develop a domestic governance framework that both addresses potential risks from nanomaterials, while fostering the commercialization of nanomaterials that offer the promise of safer, more efficient, and more sustainable products. This development is science-based, ongoing, and amenable to change based on new information and technological development.

(Doudrick) Currently, do you think we are appropriately investigating nanomaterial risk?

(Bergeson) If the question is are we appropriately addressing the potential for risk from nanomaterials, the answer is yes as there is tremendous emphasis on identifying, quantifying, and mediating the potential risk from nanoscale materials. If the question is are we appropriately testing nanomaterials, the answer is probably no as neither the public nor private sectors has adequate funding capacity to test all types of nanomaterials in all possible media and environments to develop a comprehensive profile of nanomaterial risk. Greater use of alternative testing strategies, 21st Century testing methods, computational toxicology, and other approaches is needed to get the job done.

(Doudrick) How do you define sustainable nanotechnology?

(Bergeson) The development and deployment of nanotechnology that is deliberate and calibrated to preserve the environment, protect human health, and have no adverse impact on biological organisms or the economy.

SNO Q & A SESSION



DR. PETER VIKESLAND
Professor, Virginia Tech

(Doudrick) Peter, thanks for joining us. Can you please tell us a little about why you are interested in SNO?

(Vikesland) In general, my research interests lie in sustainability, and for SNO in particular I am interested in how nanotechnology can help global sustainability. We want to make sure that we address sustainability challenges as a whole and meet the natural resource needs that we have.

(Doudrick) How do you envision nanotechnology contributing to the idea of sustainability?

(Vikesland) I think nanotechnology is a good opportunity to rethink the way we do things in environmental engineering and science. If we can rethink the way we approach problems and educate students then we can develop things like nanotechnology enabled sensors and improved water treatment process. These nano-enabled technologies can preserve materials more efficiently compared to some of our old-school water quality approaches.

(Doudrick) What is the most important thing we can do to ensure that nanotechnology has a minimal negative impact on the environment?

(Vikesland) Most of the nanomaterials we have studied haven't really shown an alarming toxicity to a point where we should halt manufacturing and research all together. A lot of these studies have looked at the acute effects, I think we need to be thinking more about chronic effects. There are a lot of chemicals that we use that are high-risk but we find a way to use them responsibly. With nanotechnology and its impact on humans and the environment I think we should take a similar approach. We need to be thinking about what the receptors are and what the exposure pathways are, and then try to determine what are the likely endpoints and how can we stop nanomaterials from entering these compartments. With this approach we can reduce the hazard side of things and reduce the overall risk.

(Doudrick) You've done a lot of recent work on using nanotechnology to develop more sensitive methods for detecting pollutants in water. How has nanotechnology made this technology more sustainable and do you see these new devices being used in the near future at a municipal level?

(Vikesland) When we first started working on sensors, sustainability wasn't really a part of the equation, but as we become more aware of the importance of sustainability we began focusing more on how we could make these materials to have a lower impact. We still use depleted resources such as noble metals, but now we are figuring out what is the most efficient way of using these materials so that they have a minimal negative impact on sustainability. For example, sensors enabled by nanotechnology can have a smaller footprint, and this will minimize the amount of materials that are needed to be efficient.

The sensors are extremely sensitive and good at detecting compounds, so there is a good chance they will be commercially available in 5 to 10 years, but I don't see them only at the municipal level. Where I see them being most valuable is at the individual point-of-use or the personal-use level. Given their small size, these could be included in current consumer electronics or as something that is worn on the individual to alert them in the presence of a harmful compound.

(Doudrick) What would you change (if anything) about SNO to make it a stronger and more influential organization?

(Vikesland) For a young organization, I think the group is growing fairly organic, and there seems to be a good buy-in from the community. If we keep getting the word out, I think we will continue to grow positively. One suggestion would be to get more nano manufacturing and medicine people involved. I think that research being done in the nano medicine field is very similar to what's being done in environmental and both can benefit from each other.

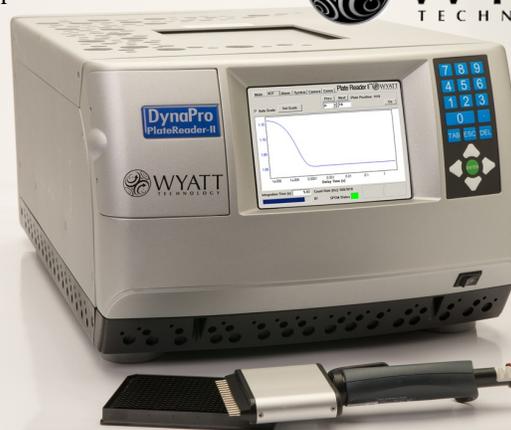
Industry Spotlight

For this issue's "Industry Spotlight," we have **Wyatt Technology Corporation** out of Santa Barbara, CA. Wyatt specializes in providing light-scattering instrumentation and services for determining the properties of nanoparticles.

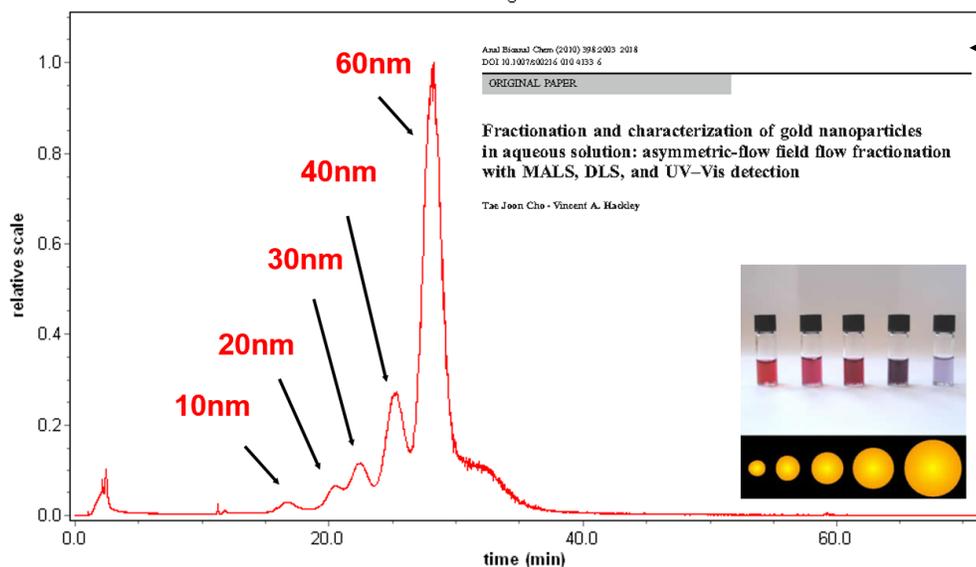
Field flow fractionation + multi-angle light scattering for separation + size determination



Dynamic light-scattering with well plate reader



chromatograms



Separation of gold NPs 10, 20, 30, 40 and 60 nm in diameter on Wyatt's Eclipse Asymmetric-Flow Field-Flow-Fractionation (AF4) system. Downstream size analysis by MALS and DLS are independent of AF4 retention time calibration which can be subject to a high degree of uncertainty.

Why is Wyatt interested in Sustainable Nanotechnology?

Wyatt Technology Corporation offers unique instrumentation for characterizing nanoparticles to determine distributions of size, zeta potential, shape and composition. These basic physical properties are essential for understanding how nanoparticles interact with containers, living tissue, solutions and with each other. Thanks to the ingenuity of our users we have found that our products can make important contributions to studies of sustainable nanotechnology in several key areas including assessments of nanoparticle product variability, biodegradability, transport and life cycle in the environment.

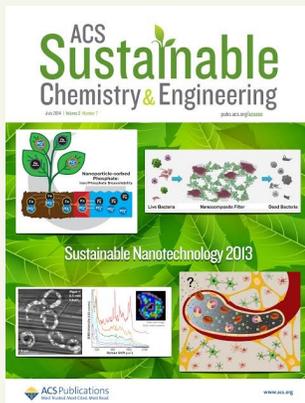
Wyatt Technology is proud of collaborating with researchers and scholars around the globe who are engaged in assessing the impact of the nanomaterials on the ecosystems. Wyatt is providing analytical tools that can detect and characterize nanomaterials in the environment. This could help industries design products that would be renewable and safer.

SNO NEWS

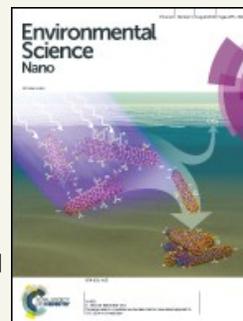
SNO Special Issue Publication is out

“Contributors to this issue truly reflect the critical elements and the challenges we face as nanotechnology transitions from the research laboratories to the society at large” – Sadik, Karn, and Keller, ACS Sus. Chem. Eng. Editorial

Twenty-one papers from the second SNO Conference were published in *ACS Sustainable Chemistry and Engineering*, July 7 (Volume 2, Issue 7, Pages 1543-1932). SNO officers **Wunmi Sadik**, **Barbara Karn**, and **Arturo Keller** served as guest editors. The papers represent a further coalition of the knowledge base that forms sustainable nanotechnology. The research presented focuses on both applications of nanotechnology to aid in sustainability and implications of possible risks. These two areas are nearly equally divided among the papers. Topics include green synthesis of nanomaterials, green energy and catalysis, methods and analytical tools, sustainable nanomanufacturing, nano life cycle assessment, environmental applications, and fate and transport of nanomaterials. Congratulations to SNO members on another exciting issue.

**SNO Journal Partnership**

SNO has partnered with the Royal Society of Chemistry to offer our members the new journal, *Environmental Science: Nano*. The first issue is now online, and the first two articles were published by SNO board member, **Philip Demokritou** and SNO member **Silvana Andreescu**.



<http://pubs.rsc.org/en/Journals/JournalIssues/en#!issueid=en001001&type=current&issnprint=2051-8153>

SNO member, **Vicki Grassian**, is Editor in Chief while other editors and board members are associated with SNO. Please sign up for your free subscription by registering for an RSC Publishing Personal Account at:

<http://pubs.rsc.org/en/account/register>.

Welcome to our newest Silver Level sponsor - BERGESON AND CAMPBELL!

**BERGESON &
CAMPBELL PC**

*Your Global Business Partner for
Chemical Law and Science™*

Bergeson and Campbell, P.C., a D.C. law firm that, among other things, specializes in nanoscale product regulation and approval matters. See this issue's Q&A featuring Lynn Bergeson (page 3).



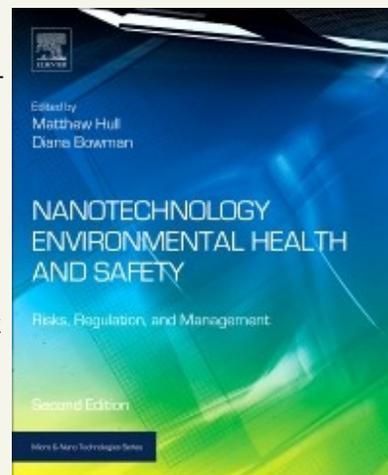
SNO leaders **Phil Demokritou** and **Barbara Karn** partnered with Wendel Wohlleben and Chuck Geraci to organize three successful sessions on sustainable nano at the NSTI Nanotechnology Conference in June. Over 4000 attendees came to the Gaylord in Washington DC. SNO president **Wunmi Sadik** and members **Greg Lowry**, **Igor Linkov**, **Georgios Sotiriou**, and **Rob MacCuspie** were among the presenters and authors. Follow link below for abstracts:

http://www.techconnectworld.com/Nanotech2014/sym/Sustainable_Nanotechnology_Environmental_Apps_EHS_Implications.html

SNO NEWS

New Nano EHS Book Edition is out

SNO member **Matt Hull** and Diana Bowman have published the second edition of *Nanotechnology Environmental Health and Safety--Risks, Regulation, and Management*. The book presents a compendium of our nanoEHS knowledge over the last decade. Sustainability is a thread through many chapters with specific emphasis on a regional case study incorporating its environmental, societal and economic aspects. Practical information is extensive, ranging from how to build a nano laboratory to how best to characterize nanomaterials for EHS to which products contain nanomaterials to practical ecotoxicology. Legal, insurance, business perspectives are well-represented, as well as newer initiatives in nanoinformatics and a nano registry. The book serves as an up to date snapshot of the risks, regulation and management of nano EHS and will remain a useful reference in years to come. – **Barbara Karn, SNO Co-Founder**



SNO Participation at the 3rd USA Science and Engineering Festival



SNO student volunteers from URI, Laura Schifman, Colleen Grinham and Varun Kasaraneni prepare for the Festival

On April 25-27, SNO had an active participation in the 3rd USA Science and Engineering Festival in Washington, D.C.

On Friday, SNO organized a Nanocommunications workshop in which Pat Rizzuto, Chemical Reporter at Bloomberg BNA, and Dr. Jason Dwyer, Assistant Professor at the University of Rhode Island, shared their experiences about the reporting and communicating topics related to nanotechnology. Stay tuned for the video and transcript of this activity that will be posted on the SNO website.

On Saturday and Sunday, SNO, with the help of Virginia TechCenter for Sustainable Nanotechnology and Rhode Island Sustainable and Environmental Technology Lab, ran a booth at the science fair with several hands-on activities for families to learn more about nanotechnology. Hundreds of families stopped by our booth; while the little ones had fun learning surface area concepts with play-dough and beads, the adults visited our consumer



Colleen Grinham teaches a child about surface area

products and reading selection display at the booth. We would like to specially thank the VTSUN and Riset graduate students that volunteered to make this a successful event!

If you are interested to use our consumer product and reading display for your outreach activities, **do not hesitate to contact us!** SNO will be back in DC next year for the Sustainability Festival.

ANNOUNCEMENTS

SNO Workshop III—NanoEHS: Fundamental Science Needs

A WORKSHOP SPONSORED BY
THE NATIONAL SCIENCE FOUNDATION AND SNO
SATURDAY, NOVEMBER 1, 2014

Vicki H. Grassian, Workshop Chair
Amanda J. Haes, Workshop Co-Chair

The development of NanoEHS and the field of sustainable nanotechnology must be backed by solid scientific underpinnings. One grand challenge includes a greater understanding of the size and shape dependent properties of nanomaterials from a fundamental chemistry and physics perspective and then applying this understanding to environmental health and safety issues associated with nanomaterials. A National Science Foundation Sponsored Workshop focused on identifying and highlighting fundamental science needs in NanoEHS research will be held in association with the 2014 SNO annual meeting. See www.susnano.org for more information.

SUN-SNO-GUIDENANO Conference

March 9-11, 2015 in Venice, Italy

More info at <http://www.susnano.org/conferenceOverview2015SNO-SUN-GN.html>

Annual SNO Meeting

November 1-3, 2015

See everyone there!

**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)

SNO has gone social! You can now find us on Twitter (<https://twitter.com/susnanotech>) and Facebook (<https://www.facebook.com/susnanotech>).

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