

What's happening in the CSN?

April 10, 2017

Volume 2, Issue 7



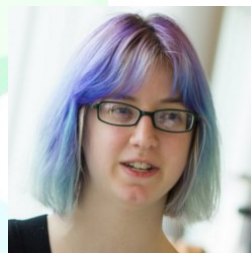
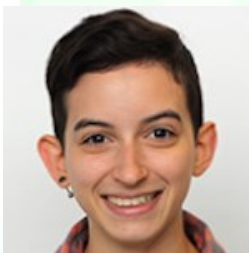
Supporting the CSN

Do you, or perhaps relatives or friends, have an interest in financially supporting the activities of the CSN? While our research activities are supported by the National Science Foundation, many important activities cannot be paid using federal funds, making gifts from donors particularly impactful. Donations are tax-free and all aspects are professionally managed by the UW Foundation, UW-Madison's official philanthropic foundation. To give specifically to the CSN, go to the [UW foundation's donation site](#) and enter "Fund #112220006, Center for Sustainable Nanotechnology" in the box.

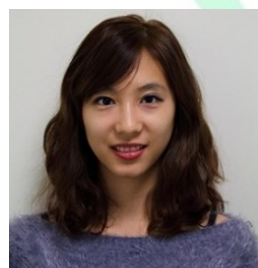
Celebrations

Milestones and awards

The CSN made a big splash in the 2017 NSF Graduate Research Fellowship Program! Graduate students **Liz Laudadio (Hamers group)** and **Natalie Hudson-Smith (Haynes group)** were awarded NSF Graduate Research Fellowships and

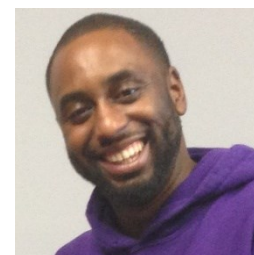


Nicholas Niemuth (Klaper group) received an honorable mention. Congratulations Liz, Natalie, and Nicholas (shown left to right)! The NSF Graduate Research Fellowship Program was also highlighted in a UW-Madison Graduate School press release that included quotes from Liz and Bob, which you can read [here!](#)



Kelly Zhang (Hamers group) was accepted into 3M's intern program for this upcoming summer. Kelly will be working with Mark McCormick to analyze nanoparticles using NMR. Congratulations, Kelly!

Donald White (Curry group) won 1st Place in the Nanoscience Oral Presentation Session at the Emerging Research National Conference on STEM hosted in Washington, DC. The title of his presentation was "A Facile Method for the Suspension of Nanocellulose." Congratulations, Donald!



Congratulations to **Alicia McGeachy (Geiger group)**, who won the 2017 Northwestern University Graduate School Student Diversity Award!



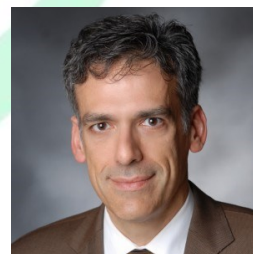
Tian "Autumn" Qiu (Haynes group) won a Mary Haga Travel Award from the Xi Chapter of Graduate Women in Science to support her travel to the 253rd ACS National meeting in San Francisco, where she presented a talk entitled "Growth-based Bacterial Viability (GBV) assay for interference-free and high-throughput nanotoxicity screening." Congratulations, Autumn!

Congratulations to former **Geiger group** member Dr. **Julianne Troiano**, who was awarded a Beckmann Postdoctoral Fellowship to work in the lab of Gabriela Schlau-Cohen at MIT!



ScienceSeeker.org chose two CSN blog posts as editor's picks last month: **Margy Robinson's (Hamers group)** "[How Do Skis Ski, and How Do Nanomaterials Make Skiing More Fun?](#)" and **Christy Haynes'** "[What is the 'Matilda Effect,' and How Can We Improve Recognition of Women Scientists?](#)" Congratulations, Margy and Christy!

Congratulations to Professor **Rigoberto Hernandez**, who was awarded the 2017 Herty Medal by the Georgia Section of the American Chemical Society! The medal recognizes outstanding work and service by a chemist in the Southeast. Read more about the award [here](#).

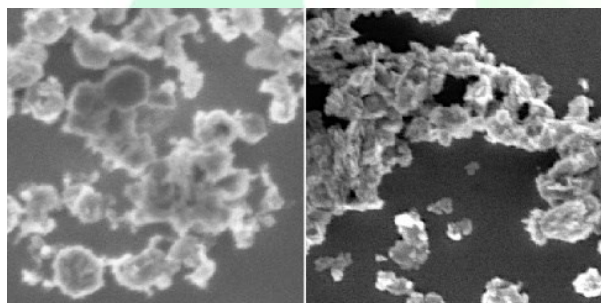
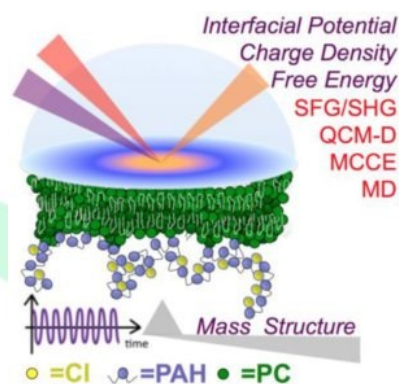


The Humboldt Foundation has awarded **Franz Geiger** the 2017 Friedrich Wilhelm Bessel Prize, which is named after the famous 18th century mathematician and astronomer. The award allows Franz to work on interfacial charge density problems relevant to the CSN. Congratulations, Franz!

CSN Productivity

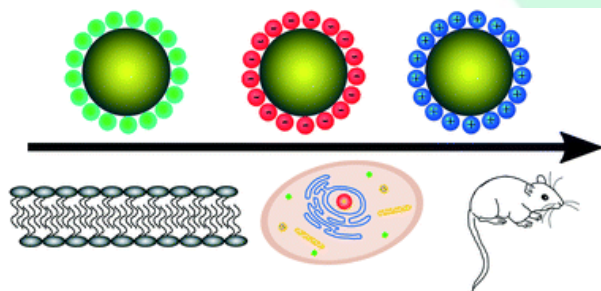
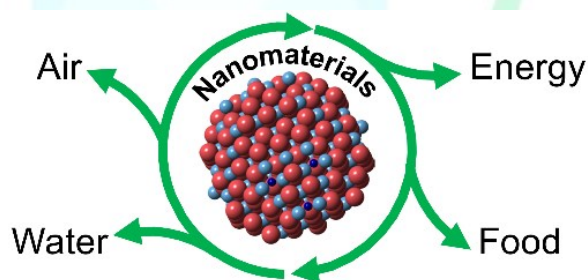
See the [CSN Google Scholar](#) page for a complete list of publications

Juli Troiano's manuscript, entitled "Quantifying the electrostatics of polycation-lipid bilayer interactions," has been accepted by the *Journal of the American Chemical Society*. Congrats to Juli and coauthors **Alicia McGeachy, Laura Olenick, Dong Fang, Dongyue Liang, Jiewei Hong, Tom Kuech, Emily Caudill, Joel Pedersen, Qiang Cui** and **Franz Geiger**! Read the online version of the paper [here](#).



Jared Bozich's manuscript, entitled "Core chemistry influences the toxicity of multi-component metal oxide nanomaterials, lithium nickel manganese cobalt oxide and lithium cobalt oxide to *Daphnia magna*," has been accepted by *Environmental Toxicology and Chemistry*. Congrats to Jared and coauthors **Mimi Hang, Bob Hamers** and **Rebecca Klapar**! You can read the online version of the paper [here](#).

Bob Hamers' paper, entitled "Nanomaterials and global sustainability," was published in *Accounts of Chemical Research*. The Commentary was featured in a special "Holy Grails in Chemistry" issue of ACR, which you can read [here](#).



Caley Allen's (Hernandez Group) Highlight, entitled "Research highlights: Investigating the role of nanoparticle surface charge in nano-bio interactions," has been accepted by *Environmental Science: Nano*. Congratulations to Caley and the rest of the Highlight's co-authors, **Autumn Qiu, Sunipa Pramanik, Joe Buchman, Miriam Krause, and Cathy Murphy**. You can read the published paper [here](#).

Lab Exchanges

Meagan Stettinisch (Klaper group) from UW-Milwaukee visited the **Carlson lab** at the University of Minnesota, where she learned about mass spec techniques and metabolomics from **Stephanie Mitchell** and **Emily Tollefson**. **Liz Laudadio (Hamers group)** drove south on I90 to visit the **Geiger lab** at Northwestern, where she learned about Sum Frequency Generation from **Laura Olenick** and **Merve Donangun**. **Alicia McGeachy (Geiger group)** drove north on I90 to visit the **Pedersen lab** at UW-Madison to work out lipid preparation procedures with **Emily Caudill** and **Izzy Foreman-Ortiz**.

Bo Zhi (Haynes group) flew east from Minnesota to spent time in the **Rosenzweig lab** at UMBC, where he worked with **Ricky Brown** and **Zheng Zheng** to develop chromatography techniques for separating carbon dots. Bo also shared his protocols for synthesizing and characterizing carbon dots with the Rosenzweig lab. **Denise Williams (Rosenzweig group)** flew west from UMBC to visit the **Haynes lab** at Minnesota, where she worked with Bo and **Sunipa Pramanik** to learn about flow cytometry and ran toxicity assays to determine how quantum dots impact bacteria.

Jaya Borgatta, Natalie Hudson-Smith, Christy Haynes, Bob Hamers, and Mike Schwartz took a break from entering information into the annual report so they could visit the Connecticut Agricultural Research Station. They learned about Eudicots from **Jason White** (the CSN's first external seed grant recipient) and **Wade Elmer**, who is officially collaborating with the CSN (he dosed some lucky egg plants with nanoparticles a few days after the visit)!

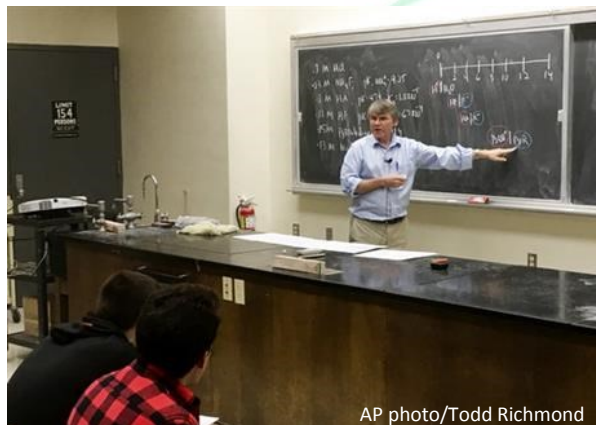


New CSN Capabilities

Rigoberto Hernandez has been awarded an XSEDE allocation for “Nonequilibrium Molecular Dynamics Simulations, which allocates a very precise 5,428,986 service units valued to the penny at \$205,794.50! Congrats, Rigoberto!

New CSN Presentations

Christy Haynes was featured on a recent episode of the *People Behind the Science* Podcast: Tiny Technology with Big Impacts: Nanoparticles for Medicine, Energy, and the Environment. You can read the summary and listen to the interview [here](#).



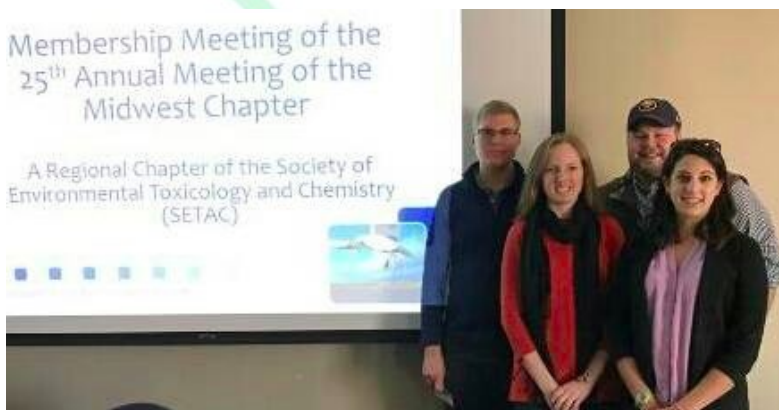
Bob Hamers was featured in an Associated Press story where the reporter tagged along to see a “typical” day in the life of a faculty member. The [AP story](#) ended up being picked up by several major news sources, including the New York Times, the Washington Times, and the Daily Mail (making it an international story!).

The CSN was well represented at the 253rd National ACS Conference in San Francisco, with 32 presentations and posters! CSN presenters included **Joe Bennett, Erin Carlson, Becky Curtis, Mike Curry, Howard Fairbrother, Vivian Feng, Bob Hamers, Rigoberto Hernandez, Kyle Johnson, Rebecca Klaper, Miriam Krause, Joshua Kuether, Jo Machesky, Sara Mason, Cathy Murphy, Nicholas Niemuth, Joel Pedersen, Rodrigo Tapia Hernandez, Donald White, and Bo Zhi.**

Fun!

Membership Meeting of the
25th Annual Meeting of the
Midwest Chapter

A Regional Chapter of the Society of
Environmental Toxicology and Chemistry
(SETAC)



Left to right: **Nicholas Niemuth, Becky Curtis, Sualkcin Nihtrider, and Meagan Stettinisch** of the **Klaper lab** at the Society of Environmental Toxicology and Chemistry Midwest Chapter in Minneapolis.

Social Media from San Francisco



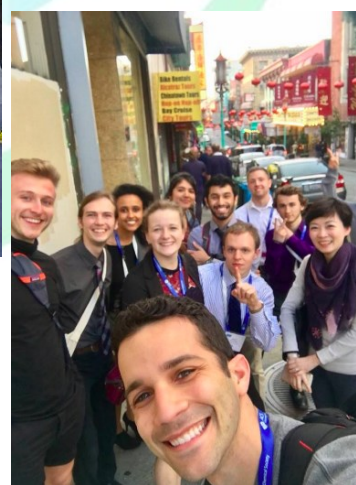
Tweet from @UChemSEM (**Sara Mason**), also featuring **Miriam Krause**: "Bumped" into fellow @SustainableNano member Miriam for a very tasty lunch for 4.



Tweet from @EverywhereChem (**Rigoberto Hernandez**), also featuring **Christy Haynes**: Celebrating @WBTolman for the win! But he's nowhere to be found. @ChemProfCramer @Marcel_Swart @hernandez_lab @SustainableNano #ACSSanFran



Facebook posts from **Vivian Feng**, including CSN members **Joshua Kuether**, **Kyle Johnson**, **Hilena Frew**, **Rodrigo Tapia Hernandez**, and **Autumn Qiu** (Haynes group). The Managing Director can't help but ask, "How many moles of have fun did you have at the ACS?"



CSN Nature Walk photo competition results are in!

Congratulations to the winning photo of the 2017 Nature Walk photo Competition, "*The South Carolina Angle Oak Tree*", submitted by **Caley Allen (Hernandez group)**! Second Place goes to "*I had been hiking a fair while*" by **Fred LaPlant**, who is a member of the CSN Innovation Council from 3M. Finally, **Franz Geiger** is our third place winner, while **Becky Curtis (Klaper lab)** and **Natalie Hudson-Smith (Haynes lab)** both received honorable mentions. Thanks to everyone who submitted photos!



The South Carolina Angle Oak Tree

Caley Allen

First Place

This striking subject displays a perfect middle gray in the shade. The pair of legs, presumably belonging to a couple taking a photo, appear to be one of the several supports to the tree itself. From the photographer: "The Angle Oak is a Southern live oak (*Quercus virginiana*) located in Angle Oak Park on Johns Island near Charleston, SC. The Angle Oak is one of the oldest trees in the country, estimated at approximately 500 years old. According to the plaques at the park, the tree stands about 66 feet tall, and roughly 30 feet in diameter. The longest branch on the tree is over 180 feet long."



I Had Been Hiking A Fair While

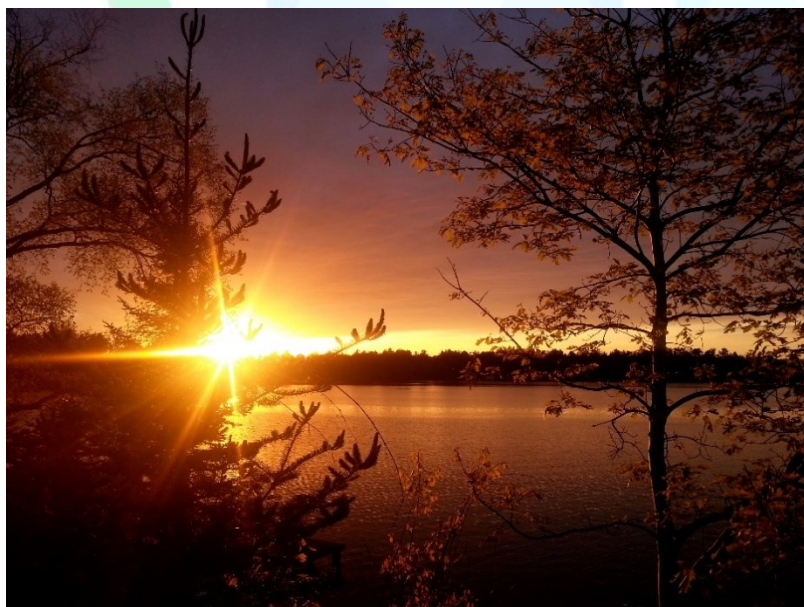
Fred LaPlant

Second Place

Beautifully framed with never ending subject matter, this image captures the true essence of the nature walk.



The Snowscape Outside of Castle Ringberg in the Bavarian Alps, January 2017
Franz Geiger
Third Place



MINOCQUA BREWING CO
Becky Curtis
Honorable Mention



ICE
Natalie Hudson-Smith
Honorable Mention

Latest from Sustainable Nano

See sustainable-nano.com for all the CSN blogs and podcasts

CSN Blogs

- What is the “Matilda Effect,” and How Can We Improve Recognition of Women Scientists? – blog post by Christy Haynes ([link](#)) . Chosen as a ScienceSeeker.org Editor’s pick!
- From Plants to St. Patrick’s Day, It’s Hard to Avoid the Color Green - blog post by Dan Hofmann (peer editor Mimi Hang) ([link](#)).
- Friday Recommended Readings - blog post by Miriam Krause ([link](#)).

CSN Podcasts

- Communicating About Science with ‘Lab Girl’ Author [Hope Jahren](#) - podcast episode 13, interview by Natalie Hudson-Smith ([link](#)).
- What Does Nanotechnology Have to Do With Renewable Car Tires?- podcast episode 14 ([link](#)).
- The Art of Beehives, Foam, & Bubbles: An Interview with [Peter Krsko](#) - podcast episode 15 ([link](#)).

Questions from blog readers

We’ve had several recent questions come in through the blog. Some would make for good blog posts themselves, but others could use a simple email with suggested resources for finding the answer. If you are able to respond to any of the questions below, please email Miriam!

- I was wondering if it would be possible to make lipid nanoparticles with a beta-galactoside coat? Or are there only a few lipid types that can be used? Also, when it comes to drug delivery, are gold cores necessary? Or are they just preferable? Also, where exactly do the drugs go? Within the core itself? Lastly, how expensive is it in general to set up bottom-up and top-down approaches to create nanoparticles? Is there a big difference in cost? And is there a company which one could ask to outsource designer-nanoparticles?
- I'm interested in making CBD nanoparticles that would allow me to mix into water without clumping together. What is the process? Does it have to be performed at a lab?
- Is there a chart that shows atomic composition of diamond and carbon in a chemically defined formula?
- is it possible to extract the lachrymatory factor cysteine sulfoxide or propanthiol from onions and have it stored in pure form?
- Are there specific reasons behind ionic crystals having different number of molecules of water of crystallization in their lattices ? for example, CuSO_4 has five while Na_2CO_3 has ten and so on.
- why does ethanol form an azeotrope with water upon fractional distillation, that too for a particular composition? Are there thermodynamic reasons behind this?
- How can I change normally occurring sand into nanoparticles of sand? Are you aware of any clinical research on using nano sand particles in human skin conditions, i.e. eczema?
- In ionic crystals, the type of unit cell adopted by the substance goes by radius ratio rules.in crystals like those of sucrose or urea or diamond or of inert gases or metals, what decides the basis of unit cell adoptions viz of bcc or fcc or the likes?
- What is the thermodynamic drive for the rusting process of iron? Going by the chemical equation, the entropy of the system appears to be decreasing. How does it still proceed spontaneously? Is it possible to explain without going into the details of an electrochemical cell at work and hence the Gibbs criterion of spontaneity?
- Are there specific reasons behind ionic crystals having different number of molecules of water of crystallization in their lattices ? for example, CuSO_4 has five while Na_2CO_3 has ten and so on.

A question posed by our Managing Director

One of the goals of the CSN is to use computational chemistry as a tool for linking atoms to organisms. Based on a recent email exchange with **Caley Allen (Hernandez group)** that may or may not have been about the feasibility of computational creatures or critters, our Managing Director asked the question “How many atoms could there be in a frog, anyway?” Though a response was not expected, one came a few minutes later, nonetheless:

According to Wiki, a tree frog is about 2 cm x 1 cm x 1 cm = (3 cm³). Can we assume our tiny friend is like 70% water (I am not a biologist!), and the rest is carbon...cause that makes things easy?!?! [MD: Yes, but we have to neglect the Au and Ca₃Fe₂Si₃O₁₂ eyes]

Water: 18 g/mol (density is 1g/cm³)

Carbon: 12 g/mol (density is 2 g/cm³)

Volume (cm³) * Avagadros number (6.02214 x 10²³) * 1/MW * density

$$= 3 \text{ cm}^3 * 6.02214 \times 10^{23} * (1/18) * 1 = 1.00369 \times 10^{23} * 0.70$$

$$= 7.02583 \times 10^{23}$$

$$= 3 \text{ cm}^3 * 6.02214 \times 10^{23} * (1/12) * 2 = 3.01107 \times 10^{23} * 0.30$$

$$= 9.03321 \times 10^{23}$$

So, ~1.61 x 10²⁴ atoms.



Carbon frog with Au and Ca₃Fe₂Si₃O₁₂ eyes from [Beladora](#). Some of our favorite materials, but too big and too pricey for Center-wide distribution. Water content may vary.

While a number like that makes the tiny tree frog feel pretty big, it's probably too many atoms for a computational model, even if it is coarse-grained. Of course, that also begs another question – How many moles of tree frogs would it take to fill up the Milky Way Galaxy?

CSN Themes

As you probably know by now, we have reorganized projects to move away from an RFA-based structure to a theme-based structure. There are currently 6 themes (**Theme leaders** in parentheses):

Theme A: Analytical Tools & Methodology (**Galya Orr** and **Rigoberto Hernandez**)

Theme N: Nanoparticles (**Bob Hamers**)

Theme G: Green Chemistry (**Howard Fairbrother**)

Theme T: Transformations and Impact on Biological Systems (**Christy Haynes**)

Theme M: Model Cell Surfaces (**Joel Pedersen**)

Theme D: Diversity of Molecular Interactions in Organisms (**Rebecca Klapser**)

Individual projects have been named to reflect the new theme structure rather than RFAs. The numbering system will include reference to Theme and Lab (PI's initials), with numbers being based on consecutive projects within the same lab. For example, “M.VF.01” would be Modeling Cell Surfaces project #1 in Vivian's lab. You can see the new project numbers in the online [Projects Percent Effort](#) sheet. However, it is important to note that the naming does not mean a project is limited to one theme. All projects have elements that touch on multiple themes, so you should think of the naming as organizational more than a definition of the science.

Opportunities

WGBH is launching the Rita Allen Fellowship for Science Communication (Information & application details [here](#)). From the website: “The Rita Allen Foundation and WGBH Boston are pleased to announce the Rita Allen Fellowship for Science Communication. This new program will provide a year's support for one fellow to study the field of science media, experiment with successful media formats and work to expand science literacy in the general public. The fellow will embed at WGBH, one of the pre-eminent science media producers in the US and home to the flagship public media science series NOVA.” **Applications due June 30.**

Looking Ahead

CSN Site Review (May 6-9, Madison, WI)

Logistical information will be posed through the following link as it becomes available: [CSN Site Visit 2017 Logistics](#). The [CSN Google Calendar](#) will have the most current schedule and deadlines. These links and other useful information will be posted on the [Center Resources](#) page of the [CSN website](#).

ACS webinars

April 19, 2017 (12:30 pm CST): New Method for Accurate Nanoparticle Size and Concentration Measurements. From the ACS announcement: “This webinar discusses a novel implementation of nanoparticle tracking analysis (NTA) that addresses these challenges. Like conventional NTA, this new method tracks the motion of each particle in the sample to determine size. Significant advancements in the optics compared to conventional NTA will be described that allow particles with varying sizes in the same sample to be visualized and accurately quantified. This particle-by-particle detection allows exquisite resolution in determining size distributions along with particle count and, therefore, concentration. Furthermore, the system provides visualization and analysis of nanoparticle kinetic processes, such as dissolution, aggregation and crystallization.” More info and registration [here](#).

May 18, 2017 (1-2 pm CST): Nanomaterial Design Guided by the Principles of Green Chemistry. From the ACS: “How can green chemistry be applied to nanotechnology to achieve the high performance needed for advanced applications while preventing or reducing health and environmental impacts? Join **James Hutchison** (*Prof. Hutchison is a member of our EAB*) from the University of Oregon as he discusses the foundations for greener nanotechnology and presents a case study that uses nanomaterial product innovation guided by green chemistry.” More info and registration [here](#).

Lost in Cyber-Space?

HOME ABOUT US OUR TEAM NEWS EDUCATION & OUTREACH WORKING WITH THE CSN PUBLICATIONS RESEARCH MEMBERS

Links to frequently requested CSN documents and information sources

For these documents and more, visit the [Center Resources page](#) on the [CSN website](#) (requires login though Members page, contact [Miriam](#) if you need help).

Newsletter submissions (awards, highlights, lab exchanges, publications, FUN, etc.): [link](#)

CSN Documents and Downloads

- CSN calendar (RFA, All-hands, professional development): [link](#)
- CSN Operations Guide 2.3: [link](#)
- CSN participants list (Names, group, and email addresses): [link](#)
- CSN Projects Documents (Spring 2017 version): [CSN Projects](#) - [% Effort sheet](#)

CSN Reporting Forms

- Report lab exchange activities: [link](#)
- New CSN Publications: [link](#)
- New CSN Presentations: [link](#)
- Report Outreach Activity: [link](#)
- CSN Safety Verification form: [link](#)
- Nanoparticle availability (Listing of NPs available center-wide): [link](#)

CSN Feedback Forms

- Requests for the Executive Committee (meeting agenda): [link](#)
- SuggestionOx (completely anonymous comments/suggestions to CSN staff):
Director (Bob): [link](#)
Associate Director (Christy): [link](#)
Managing Director (Mike): link (temporarily inactive)
E/O Director (Miriam): [link](#)

Find the most recent list of all our publications on the [CSN Google Scholar](#) page.

