



CHE NEWSLETTER

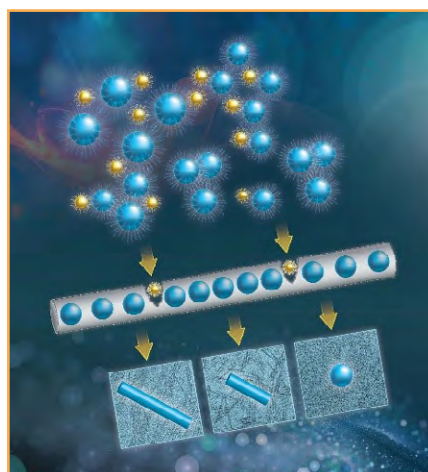
INSIDE

- 2 Update from the Division Director

- 4 Chemistry Staffing News and Recruiting
- 6 Chemistry Division Director Search
- 6 Recruiting Rotators: Would you like to join the NSF team as a rotator?
- 6 Proposal & Award Policies & Procedure Changes
- 6 Funding Opportunities
 - a. Division of Chemistry's updated Disciplinary Research Programs Solicitation (CHE-DRP)
 - b. Centers for Chemical Innovation (CCI) Solicitation
 - c. Growing Convergence Research (GCR) Solicitation
 - d. Research Experiences for Undergraduates (REU) Sites and Supplements Solicitation
- 8 ChemMatCARS Site Visit in 2019
- 8 Chemistry Outreach in 2019
- 9 2019 Chemical Early Career Workshop
- 9 CHE/DMS Innovation Lab: Learning the Power of Data in Chemistry
- 10 Chemistry Highlights
- 11 New 2019 CHE CAREER Awardees

- 19 Chemistry Contact List

FINE TUNING SEMICONDUCTOR NANOCRYSTALS



Changing the size and shape of semiconducting nanocrystals can alter their properties, but many of the processes for nanocrystal fine-tuning were developed for heavy metal containing semiconductors. Looking to fine-tune heavy metal-free nanocrystals, Anatoly Frenkel's group at Stony Brook University developed a new method to control the shape and length of ZnSe nanocrystals.

This method starts by forming magic size clusters (MSCs) of ZnSe. On their own, these MSCs can form nanowires hundreds of nanometers long. However, the addition of $[\text{Zn}_4(\text{SPh})_{10}](\text{Me}_4\text{N})_2$ to the reaction, otherwise referred to as Zn_4 , truncates the nanowire growth. As the concentration of Zn_4 in the reaction increases, the length of the nanowires decreases, forming nanorods or even nanocrystals. By raising the reaction temperature, the diameter of the nanorods and nanocrystals increases as well, leading to a change in their absorption and emission properties. Finally, adding an analogous Cu_4 compound to the reaction leads to the formation of Cu-doped ZnSe nanorods.

This method ultimately yields control over the length, diameter and Cu doping of ZnSe nanorods, allowing researchers to explore new electronic properties. This work is funded in part by CHE-1719534 and was recently published in the *Journal of the American Chemical Society* (DOI: 10.1021/jacs.8b05941).

CHE COMMUNICATION LISTSERV SIGN-UP

Stay informed with the latest news and topics of interest from the NSF Division of Chemistry: sign up for our mailing list by sending an email message with the subject line, 'Subscribe to CHE', to: cheminfo@nsf.gov. Please share this information with your colleagues!



UPDATE FROM THE DIVISION DIRECTOR

Dear Colleagues,

Before I start the Newsletter, I would first like to recognize the contributions of our long-time friend and colleague, Dr. Tyrone D. Mitchell. Ty passed away on June 2, 2019. During his career at NSF, Ty was a creative thinker, strong supporter of chemical sciences, fierce advocate for broadening participation – especially through the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE), and outstanding mentor to generations of students, investigators, and even NSF staff. Ty is fondly remembered for his zest for living – bowling, Nats baseball, jazz, and all things New Orleans (but especially gumbo, and the beignets and chicory coffee that he often shared with the Division). His greatest love was clearly his family - he was so very proud of each of them! We will miss him greatly.

The past year in CHE has been eventful and filled with change, including new partnerships, initiatives and solicitations. CHE has been actively engaged in NSF Big Ideas initiatives, with increasing activities in Quantum Leap (QL), Understanding the Rules of Life (URoL), Harnessing the Data Revolution (HDR), Mid-scale Research Infrastructure (Midscale), Growing Convergence Research, and NSF Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (INCLUDES), etc. These interdisciplinary areas of research have brought new opportunities to our investigators, postdocs, graduate students and undergraduates while strengthening our core and promote partnership with other disciplines, agencies and industries. If you are not already familiar with these Big Ideas, I strongly urge you to examine the NSF website: https://www.nsf.gov/news/special_reports/big_ideas/. If you are looking for additional avenues of support, especially for collaborative or high-risk, high-reward projects, we strongly encourage submissions to each of these topics **in addition to** the CHE Disciplinary Research Programs.

In December 2018-January 2019, NSF experienced a 35-day lapse in appropriations, putting a pause on day-to-day operations. The chemistry community's response to this shortened review cycle has been nothing short of amazing. Many thanks for your patience as we transitioned back to normal operations, rescheduled panels, made additional review requests, and work to clear-up the back logs. I also want to recognize the amazing dedication of the CHE staff – who is processing the 1300 proposals submitted to our disciplinary research programs this past cycle. While we are currently awaiting the final approval on our appropriations, information about the status of NSF and Divisional budgets can be found online at www.nsf.gov/about/budget. This site also included the Fiscal Year 2020 Budget Request to Congress; please have a look!

CHE anticipates spending more than 80% of our budget on our disciplinary research, or 'core', programs in FY 2019. These proposals were submitted as part of our new Disciplinary Research Program solicitation. For FY 2020, the solicitation has been slightly revised to clarify the submission requirements (see *NSF 19-577*, https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf19577), specifically:

- 1) For each current award or pending proposal listed, PIs must include one or more sentences addressing the relationship of the present proposal to their currently funded projects or pending proposals and explain how the work proposed under this solicitation is distinct. A separate current and pending support pdf file must be uploaded for each individual designated as senior personnel;
- 2) For all proposals submitted under this solicitation, PIs are required to upload a statement regarding revisions under Single Copy Documents. For renewal or new proposals that have not been considered previously by the NSF, a statement such as "This proposal has not been considered previously by the NSF" is sufficient; and
- 3) There is a limitation in the number of proposals submitted through this solicitation. **A proposer may only submit one proposal as a PI, co-PI, or Senior Personnel per fiscal year.**

In addition to our core research programs, CHE strives to increase our government, academic, and industrial partnerships. Internally, sustainable approaches to chemistry and chemical processes continues to be a common, high priority scientific challenge. This means an emphasis on improving the sustainability of resources while maintaining, or improving, current products and creating technologically-advanced, economically competitive, environmentally-benign and useful materials. To meet these aims, CHE has joined forces with the Directorates for Engineering (ENG) and Geosciences (GEO) to form the new Critical Aspects of Sustainability (CAS) metaprogram, information can be found online at https://nsf.gov/funding/pgm_summ.jsp?pims_id=505673. We are also working to increase international collaborations. For nearly a decade, we have encouraged supplemental funding for international collaborations through our Dear Colleague Letters (e.g., *NSF 19-037*). This method allows collaboration with almost all other countries.

The division continues the tradition of providing mentorship and training opportunity to our junior investigators. I particularly enjoyed the 2019 Chemistry Early Career Investigator Workshop, held in late May in Alexandria, VA. Our deepest appreciation goes to the organizers for this year's event: Paula Diaconescu, UCLA and Dominik Konkolewicz, Miami University who worked with our own Terek Sammakia and Ken Moloy to host almost 90 new faculty members from across the U.S. These new faculty learned about grant writing, crafted research ideas, participated in mock panels, and networked extensively with peers, faculty mentors and staff from NSF and other federal agencies. It was an exhausting but exhilarating two-days and when we catch our breath, we will start planning again for next year. Notably, this Newsletter highlights CHE's new CAREER awardees (congratulations!), several of whom have been attendees at previous Early Career Workshops.

Finally, continuing our tradition of outreach to the chemistry community, several of the Division staff will again attend the American Chemical Society's National Meeting in San Diego, CA, held on August 25-29, 2019. This year we are partnering with the Department of Energy (DOE), the Chemical Sciences, Geosciences, and Biosciences Division (CSGB), to host a booth at the Exposition on Sunday, Monday and Tuesday. Please stop by! We will be trying something a bit new this year – adding special “seminars” on the Big Ideas and other science drivers both from program staff and from leaders in the community. As always, we welcome questions on all our programs so I hope you can challenge us with your research needs and give us feedback on how we can better assist our community. Later this fall, we also participate in the annual meeting for the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCCHE), held on November 18-21, 2019 at St. Louis and the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), held on October 31-November 2, 2019, in Honolulu, Hawai'i. More details about CHE activities are in the pages to follow.

To sign up for email updates from the CHE division, please send an email to: CHEM-COMM@LISTSERV.NSF.GOV or check out the division website at:

https://www.nsf.gov/news/news_summ.jsp?cntn_id=298705&org=CHE&from=news

Sincerely,
Carol

Carol A. Bessel
Acting Division Director
NSF Division of Chemistry

CHEMISTRY STAFFING NEWS AND RECRUITING

WE ARE SAD TO SAY GOODBYE TO A LONG-TIME COLLEAGUE AND A DEAR FRIEND, DR. TYRONE D. MITCHELL.



Dr. Mitchell received his Ph.D. degree in polymer chemistry from Rensselaer Polytechnic Institute in Troy, New York. After a long and celebrated career at General Electric Silicones and later Corning Incorporated, he joined NSF's Division of Chemistry in 2000. He served as a program director in the Organic and Macromolecular Chemistry Program, and later the Research Experiences for Undergraduates (REU) and Environmental Chemical Sciences (ECS) Programs. He later moved to the Division of Graduate Education to manage the Graduate Research Fellowship Program (GRFP).

Ty is a celebrated chemist and mentor. He was a strong advocate for diversity and inclusiveness. He will always be remembered for his concern for junior researchers, in particular those from underrepresented groups and his friendly smiles.

CONGRATULATIONS TO CHE'S NEWEST PERMANENT STAFF MEMBERS!



Dr. Catalina Achim

Welcome to Dr. Catalina Achim who has accepted a permanent position as Program Director and Team Lead in the Chemistry of Life Processes (CLP) Program. Previously Dr. Achim was a faculty member at Carnegie

Mellon University. Her research interests focus on supramolecular chemistry of nucleic acids and transition metal ions with potential nanotechnology applications.



Ms. Renee Ivey

Ms. Renee Ivey has also accepted a permanent position in the Division as a Program Specialist. She works with the Chemical Catalysis (CAT) and Chemistry of Life Processes (CLP) Programs.

WELCOME TO OUR NEW ROTATING STAFF MEMBERS!



Dr. P. Shing Ho

Dr. P. Shing Ho is a Professor in the Biochemistry & Molecular Biology Department at Colorado State University. His research focuses on nucleic acid structures and functions, and biomolecular halogen bonds.

He joins us as a Program Director in the Chemical Life Processes (CLP) Program.



Dr. Robin McCarley

Dr. Robin McCarley is the Barbara Womack Alumni Professor of Chemistry at Louisiana State University. His research targets fluorescence-based molecular and nanoparticle systems that report on the presence of active proteins and small molecules within cells, to allow

for their imaging and quantification. He joins us as a Program Director in the Chemistry of Life Processes (CLP) and the Chemical Measurement and Imaging (CMI) Programs.



Dr. Walter Ermler

Dr. Walter Ermler is a Professor at the University of Texas at San Antonio. Dr. Ermler specializes in computational spectroscopy, modeling heavy-element compounds, and theoretical chemistry. He joins us as a Program Director in the Chemical Theory, Models, & Computational Methods (CTMC) and the Research Experiences for Undergraduates (REU) Programs.

**Dr. Tomislav Pintauer**

Dr. Tomislav Pintauer is a Professor at the Bayer School of Natural and Environmental Sciences, Chemistry and Biochemistry, at Duquesne University. His research focuses on atom transfer radical addition

and cyclization reactions mediated by transition metal complexes. Dr. Pintauer serves as a Program Director in the Macromolecular, Supramolecular & Nanochemistry (MSN) Program.

**Dr. Jin Cha**

Dr. Jin Cha is a Professor from the Department of Chemistry at Wayne State University. He specializes in the total syntheses of structurally complex medium-sized carbocyclic and heterocyclic natural

products. Dr. Cha serves as a Program Director in the Chemical Synthesis (SYN) and the Chemical Catalysis (CAT) programs.

WELCOMING BACK TO OUR EXPERTS!

**Dr. Thomas Rauchfuss**

Dr. Thomas Rauchfuss is a Larry Faulkner Research Professor of Chemistry at the University of Illinois, Champaign-Urbana. His research group focuses on environmentally-motivated organometallic chemistry.

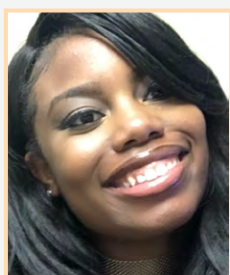
Dr. Rauchfuss joins the Chemical Catalysis (CAT) and Chemical Synthesis (SYN) Programs as a Program Director.

**Dr. Bruce Johnson**

Dr. Bruce Johnson was a Program Director for Chemistry from 2010 to 2014 and we are glad to have him back as one of our part-time, offsite Experts. His fields of interest are Theoretical Chemistry,

Mathematical Physics, Physical Chemistry, and Nanochemistry. Dr. Johnson works with the Chemical Theory, Models & Computational Methods (CTMC) and the Research Experiences for Undergraduates (REU) Programs.

A FOND GOODBYE, PATHWAYS STUDENT AND PROGRAM ASSISTANT

**Ms. Khoren Claiborne**

Ms. Khoren Claiborne joined the CHE division in June 2018 as a Program Assistant through the Student Pathway Program. She was at the time also a student at the University of North Carolina at Greensboro majoring in

Women and Gender Studies. She has recently accepted a permanent position as Program Assistant in the Division of Physics. Although we are sad to see Khoren go, we are happy to see her strengthen her career. Khoren contributions to the CHE division have been greatly appreciated and she will be deeply missed.

WE WELCOME OUR NEW PATHWAYS STUDENT (PROGRAM ASSISTANT)

**Mrs. Nancy Carey**

We welcome our new Pathways Student (Program Assistant), Mrs. Nancy Carey. Mrs. Carey attends the University of Maryland pursuing a Bachelor's Degree in Computer Networks and Cybersecurity. She

will provide administrative support to the Division Director, the CENTERS program, as well as the entire CHE division.

An updated *staff list* is available on the CHE webpage.

CHEMISTRY DIVISION DIRECTOR SEARCH

The search for a CHE Division Director continues. The Division Director manages an annual budget of approximately \$230 million and a broad portfolio of investments in research and education in Chemistry. Duties include: assessing the needs and trends in research and education; implementing an overall strategic plan; supervising technical and administrative staff; serving as a key member of the NSF senior management; teaming with the NSF Director, Assistant Directors, and other Division Directors on cross-directorate activities and interactions; and representing NSF to and fostering partnerships with relevant external groups. For more information about the position and how to apply, please visit the USAJOBS website at: <https://www.usajobs.gov/GetJob/ViewDetails/526977800?org=NSF>. The application closing date is **July 11, 2019 (by 11:59 pm Eastern Time)**.

RECRUITING ROTATORS: WOULD YOU LIKE TO JOIN CHE AS A ROTATOR?

An integral subset of our program directors are rotators - members of the chemistry community who serve at NSF for 1-4 years – then return to their home institution. Rotators bring fresh perspectives from their research community, make award and declination recommendations, and help to guide the division's portfolio balance and initiatives. CHE Rotators also have a unique opportunity to survey their field and gain a more multi-disciplinary lens, build leadership skills, and mentor the next generation of investigators. While serving as a program director at NSF, rotators may also continue their research at their home institution through the Independent Research/Development program. The Division of Chemistry needs program directors with experience in all fields of chemistry.

Most rotators join in the Fall, but it is not too early to think about next year! Maybe 2020 is the year when you would be able to come to NSF to learn about, and participate in, the other side of the grants process? If you are interested, we would like to hear from you. Please reach out to our current staff with any questions, visit the **Career Opportunities section** (https://www.nsf.gov/publications/vacancy.jsp?org=CHE&nsf_org=CHE) on our divisional website for information on how to apply, or visit the **NSF Careers home page** (<https://www.nsf.gov/careers>) for more information on being a rotator.

PROPOSAL & AWARD POLICIES & PROCEDURES CHANGES

NSF has released the revised *Proposal & Award Policies & Procedures Guide* (PAPPG, NSF 19-1), which has been effective **for proposals submitted, or due, on or after February 25, 2019**. Please review the chapter-by-chapter summary of changes provided in the Introduction section of the PAPPG for significant changes.

FUNDING OPPORTUNITIES

a. The Division of Chemistry's updated Disciplinary Research Programs Solicitation (CHE-DRP, NSF 19-577, https://www.nsf.gov/news/news_summ.jsp?cntn_id=295777&org=CHE) has been released

All proposals (other than CAREER, RUI, EAGER, RAPID, RAISE, conference proposals, and supplemental requests) to one of the nine core research programs must be submitted through this solicitation, otherwise they will be returned without review.

FULL PROPOSAL SUBMISSION WINDOWS:

September 1, 2019 - September 30, 2019 (due by 5 p.m. submitter's local time for all proposals to:

- Chemical Catalysis (CAT);
- Chemical Structure, Dynamics, and Mechanism A (CSDM-A);
- Chemical Structure, Dynamics, and Mechanism B (CSDM-B);
- Chemical Theory, Models and Computation (CTMC); and
- Chemical Synthesis (SYN)

October 1, 2019 - October 31, 2019 (due by 5 p.m. submitter's local time) for all proposals to:

- Chemical Measurement and Imaging (CMI);
- Chemistry of Life Processes (CLP);
- Environmental Chemical Sciences (ECS); and
- Macromolecular, Supramolecular, and Nanochemistry (MSN)

b. An updated CHE Centers for Chemical Innovation (CCI) Solicitation for Phase I and New/Renewal Phase II proposals is also available (NSF 19-576, <https://www.nsf.gov/pubs/2019/nsf19576/nsf19576.htm>)

The CCI Program supports larger collaborative efforts focused on long-term fundamental chemical research challenges. CCIs produce transformative research, lead to innovation, and attract broad scientific and public interest. The CCI Program is a two-phase program. Both phases are described in this solicitation. Satisfactory progress in Phase I is required for Phase II applications; Phase I proposals funded in FY 2020 may seek Phase II funding in FY 2023. Please note that you may submit to this solicitation in addition to the CHE Disciplinary Research Program (core program).

For CCI Phase I proposals:

Preliminary Proposal Due Date(s) (required) (due by 5 p.m. submitter's local time):
August 13, 2019

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

February 19, 2020 for Phase I Full Proposals, by invitation only

For CCI Phase II proposals:

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):
October 16, 2019 for Phase II Full Proposals, New and Renewal

c. A new solicitation on Growing Convergence Research (GCR) has been released (NSF 19-551, <https://www.nsf.gov/pubs/2019/nsf19551/nsf19551.htm>)

Convergence research is a means for solving vexing research problems, particularly those complex problems focusing on societal needs. It entails integrating knowledge, methods, and expertise from different disciplines and forming novel frameworks to catalyze scientific discovery and innovation. The GCR solicitation targets multi-disciplinary team research that crosses directorate or division boundaries and is currently not supported by NSF programs, initiatives and research-focused Big Ideas.

Full proposals Deadline (due by 5 p.m., submitter's local time):

February 03, 2020

For additional information, please contact the cognizant Program Director(s) listed on the solicitation. Please note that you may submit to this solicitation in addition to the CHE Disciplinary Research Program (core program).

d. The Research Experiences for Undergraduates (REU) Sites and Supplements solicitation has been modified (NSF 19-582, <https://www.nsf.gov/pubs/2019/nsf19582/nsf19582.htm>)

Please note the following changes:

- The suggested allowances for student stipends and other student costs have been increased.
- The REU Site Contacts web page (https://www.nsf.gov/crssprgm/reu/reu_contacts.jsp) provides contact information for the REU program officers in each participating NSF division. The page also lists discipline-specific REU web pages. Additional CHE-specific information, like current sites and resources, can be found on the CHE REU website at:
https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5517&org=CHE&from=home

Proposals Deadline (due by 5 p.m., submitter's local time):

August 28, 2019

For those with undergraduate students who are interested in applying for REU research opportunities, please see our map of funded CHE Research Experiences for Undergraduates (REU) Sites:

https://www.nsf.gov/mps/che/reu_awardsmap2019_large.jpg

For more information about on-going funding opportunities for the chemical sciences, please visit our division websites regularly at:

https://www.nsf.gov/news/news_summ.jsp?cntn_id=137576&org=CHE for new solicitations and
https://www.nsf.gov/news/news_summ.jsp?cntn_id=131983&org=CHE for on-going DCLs.

2019 CHEMMATCARS SITE VISIT

The Assistant Director for the Directorate for Mathematical and Physical Sciences (MPS), Dr. Anne Kinney, and the NSF team visited NSF's Chemistry and Materials Center for Advanced Radiation Sources (ChemMatCARS) facility on March 14-15, 2019. ChemMatCARS is a CHE/DMR co-funded experimental station at the Advanced Photon Source (APS) at Argonne National Lab (ANL). It is the top diffraction facility providing specialized techniques, such as small-molecule crystallography, interfacial scattering, small angle scattering, and anomalous small angle scattering, for studying the chemical and materials properties of solids, liquids and interfaces. During this visit, the NSF team listened to the presentations made by ChemMatCARS Director Matthew Tirrell and his colleagues; met with the facility users, including a few high school students and toured the facility.

Researchers are encouraged to apply for free instrument time at the ChemMatCARS facility; visit their site at <https://chemmatcars.uchicago.edu> for more information.



CHE'S OUTREACH IN 2019

CHE and CBET at the Pittcon Meeting 2019

NSF Program Officers Chenzhong Li (from the Biosensing Program in the Division of Chemical, Bioengineering, Environmental, and Transport Systems, CBET) and Kelsey Cook (from the Chemical Measurement and Imaging Program in CHE) organized a Networking Session "Face to Face Discussion with National Science Foundation (NSF) Program Directors" on March 19, 2019 at Pittcon'19. The networking session focused on funding opportunities and grantsmanship strategies. The conversation also covered topics such as conducting and funding cutting-edge research in the fields of biosensors and analytical chemistry. A broad range of attendees participated in the discussion, from graduate students to senior scientists representing academic, industrial, and government sectors.

NSF/CHE and DOE/CSGB at the ACS National Meeting in San Diego

The Division of Chemistry will attend the American Chemical Society's Fall National Meeting in San Diego, CA from August 25-29, 2019. Together with the Department of Energy's Chemical Sciences, Geosciences & Biosciences Division, CHE will have an expanded presence at the Exposition. Please visit our booth! CHE and DOE staff will be available to answer questions, participate in speed coaching, and deliver presentations on upcoming funding opportunities. See the CHE website for more scheduling information.

The International Year of the Periodic Table

This year marks the 150th birthday of Dimitri Mendeleev's enormously consequential discovery: the outline of the Periodic Table. To celebrate, the United Nations declared this the International Year of the Periodic Table, an exciting designation for chemists everywhere!! As CHE plans ways to celebrate, we encourage the chemistry community to engage with their professional societies, many of which are offering ongoing activities throughout the year or at their national meetings.

2019 CHEMISTRY EARLY CAREER INVESTIGATOR WORKSHOP

The 2019 NSF Chemistry Early Career Investigator Workshop was held on May 19-21, 2019 in Alexandria, Virginia. The workshop brought 90 junior faculty from a broad range of institutions and demographics, established investigators and staff from a number of federal agencies together. Special thanks to workshop organizers Dominik Konkolewicz from Miami University and Paula Diaconescu from UCLA, and CHE Program Directors Tarek Sammakia and Ken Moloy.

The participants discussed strategies for crafting research ideas, planning educational and outreach activities, and assessing and evaluating project goals. Please visit the below website for more information:

<https://blogs.miamioh.edu/early-career-investigator-workshop>



CHE/DMS INNOVATION LAB: LEARNING THE POWER OF DATA IN CHEMISTRY

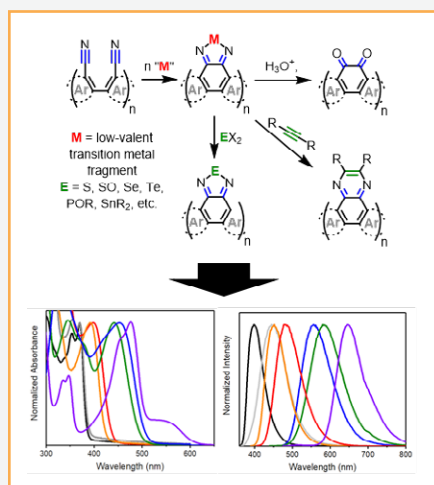
The Divisions of Chemistry (CHE) and Mathematical Sciences (DMS) at NSF jointly sponsored an Innovation Lab exploring the power of data science in chemistry on December 17-21, 2018. The purpose of this Innovation Lab was to leverage new advances in data science to address urgent challenges in chemistry, thereby advancing both fields. An Innovation Lab is a deliberate, creative process of generating novel research ideas through face-to-face meetings. It goes beyond a workshop and enables the participants from different fields to develop new research ideas at scientific interfaces that lead to strong, long-term collaborations between historically non-overlapping fields. The CHE/DMS Data Innovation Lab was organized by Professor Xiaoming Huo at the Georgia Institute of Technology and Professor Paul Zimmerman at the University of Michigan. Forty participants from many areas of chemistry, mathematics, statistics, and data science attended; six experts working at the CHE/DMS interface served as steering committee members and mentors at the event. The research ideas/teams that emerged from the innovation lab are encouraged to pursue funding opportunities offered by NSF Harnessing the Data Revolution (HDR) solicitations or through other data-driven research funding mechanisms.

CHEMISTRY HIGHLIGHTS

CHE loves hearing about our investigators' great research. Please share notable results and upcoming publications with your managing Program Director and/or forward Information to the CHE highlights email account at chemhighlights@nsf.gov. Investigators are especially encouraged to work with their institution's press office to create polished products highlighting the work. The permission form can be found at: <https://www.nsf.gov/mps/cbe/Highlights/HighlightWebpages/highlights.jsp>.

CHE highlights often make appearances on some of NSF's many social media channels, including Facebook, Twitter (@NSF and @NSF_MPS), Tumblr, and NSF's News from the Field. Many thanks to Melissa Olson, CHE's Presidential Management Fellow for coordinating these efforts!

EXAMPLE HIGHLIGHTS INCLUDE:

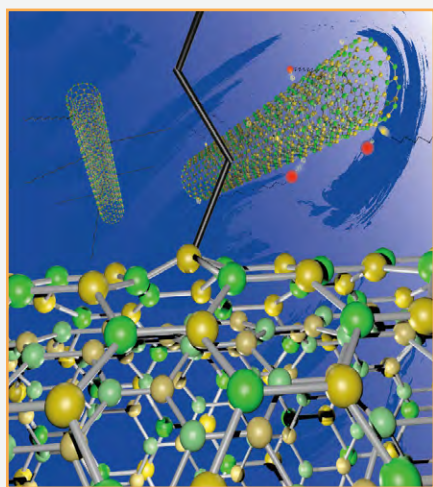


New routes to Nitrogen-Containing Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) are interesting candidates for organic electronics due to their unique and tunable electronic properties. Controlled insertions of heteroatoms allow for fine tuning of PAH electronic properties, but reliable and general methods for these sorts of additions are relatively underdeveloped. Researchers in Professor Don Tilley's group at the University of California Berkeley discovered a new method for synthesizing nitrogen-containing PAHs in a generalizable fashion, opening up a library of analogous compounds and allowing for the exploration of structure-property relationships.

Their two-step method starts with the cyclization of oligo(dinitrile) precursors with $\text{Cp}_2\text{Ti}(\text{Me}_3\text{SiC}=\text{CSiMe}_3)_2$ to form a PAH appended with di(aza)titanacyclopentadiene functionality. Now set up for a transfer reaction, diazol, pyrazine, or o-quinone units can be installed

onto the PAH framework. Tilley's group demonstrated rational control over the absorption properties of different nitrogen substituted PAH frameworks and are looking to extend this chemistry to new systems. This work was funded in part by CHE-1708210 and was recently published in the *Journal of the American Chemical Society* (DOI: 10.1021/jacs.7b13823).



Processing inert Boron nitride nanotubes

Boron nitride nanotubes (BN NTs) are nanomaterials with an impressive set of properties: they are stronger and lighter than steel, conduct heat like copper, are electrically insulating and resist thermal decomposition at temperatures higher than 700°C . Unfortunately, what makes BN NTs an attractive material, inertness, also makes them difficult to process. Looking to disperse individual BN NTs into solution for easy processing and deposition, Professor Angel Marti's team at Rice University discovered a route to chemically modify their stubbornly inert surface.

Adapting the Billups-Birch reaction, often used for functionalizing carbon nanotubes, the BN NTs are submersed in liquid ammonia with metal lithium. This readies sites on the surface of the BN NT so that as they are exposed to 1-bromododecane, dodecyl chains graft onto the surface. With the alkyl chains attached to their surface, BN NTs are dispersible in various organic solvents, potentially making them amenable to

manufacturing processes. Because BN NTs are resistant to oxidation, removing the alkyl chains is as simple as heating BN NTs to temperatures over 500°C . This work is supported in part by CHE-1610175 and was recently published in *ACS Applied Nano Materials* (DOI: 10.1021/acsanm.8b00633)

NEW 2019 CHE CAREER AWARDEES

Congratulations to the NSF/Chemistry 2019 CAREER Awardees!

The faculty Early Career Development (CAREER) Program is a Foundation-wide activity that offers the NSF's most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations. Such activities should build a firm foundation for a lifetime of leadership in integrating education and research.

We hereby recognize the NSF/CHE CAREER Awardees, Class of 2019!



ROBBYN ANAND
Iowa State University

Award Number:
1849109

Title:
CAREER: Advancing Ion Concentration Polarization to Enrich New Classes of Analytes from Complex Media and to Interface with Analysis: Breaking the Glass Ceiling on Enrichment



PAULO ARAUJO
University of Alabama, Tuscaloosa

Award Number:
1848418

Title:
CAREER: Exploration and Controllability of Excitonic Behaviors in Conjugated Polymer Single Isolated Chains and Chain Aggregates



JOANNA ATKIN
University of North Carolina, Chapel Hill

Award Number:
1848278

Title:
CAREER: Modulation Nanospectroscopy for Characterization of Local Electronic Properties



ALEXANDER AYZNER
University of California, Santa Cruz

Award Number:
1848069

Title:
CAREER: Soft Light-Harvesting Systems Based on inter-Conjugated Polyelectrolyte Complexes



CARLOS BAIZ
University of Texas Austin

Award Number:
1847199

Title:
CAREER: Ultrafast Hydrogen-bond Dynamics in Crowded, Heterogeneous Environments



TIMOTHY BERKELBACH
University of Chicago

Award Number:
1848369

Title:
CAREER: Spectroscopy of Metals from Ab Initio Quantum Chemistry



NOAH BURNS
Stanford University

Award Number:
1846512

Title:
CAREER: Chemical Synthesis and Biophysical Study of Noncanonical Membrane Lipids



MATTHEW CAIN
University of Hawaii

Award Number:
1847711

Title:
CAREER: Roadmaps for Developing Hypervalent Phosphorus-Based Main Group Catalysts and Bridging Gaps in STEM Education in Hawaii



YANA CEN
Albany College of Pharmacy

Award Number:
1846785

Title:
CAREER: Allosteric Activation of SIRT6 by DNA



WEI-CHEN CHANG
North Carolina State University

Award Number:
1845913

Title:
CAREER: Investigating Non-heme Iron Enzyme Catalyzed Csp2-Csp3 and Nitrile Formation Mechanisms in Etoposide and Other Natural Product Biosynthetic Pathways



TIMOTHY COOK
The State University of New York at Buffalo

Award Number:
1847950

Title:
CAREER: Small Molecule Activations Enabled by Coordination-Driven Self-Assembly



ANTHONY COZZOLINO
Texas Tech University

Award Number:
1847878

Title:
CAREER: Pnictogen Bonding in Solution: Developing Tools for the Self-assembly of Inverted Bilayer Membranes, Heteromolecular Dyads and Supramolecular Catalysts



KATERI DUBAY
University of Virginia

Award Number:
1848009

Title:
CAREER: Using Numerical Simulation to Investigate the Influence of Collective Behaviors on the Sequences of Step-grown Copolymers



CHRISTOPHER FENNELL
Oklahoma State University

Award Number:
1847583

Title:
CAREER: Modeling Matter and Improving Aqueous Transfer Processes with Molecular Distributions



DAN FU
University of Washington

Award Number:
1846503

Title:
CAREER: Imaging Vesicular Neurotransmitter Dynamics with High-sensitivity Stimulated Raman Scattering Microscopy



ALEXANDER GRENNING
University of Florida

Award Number:
1844443

Title:
CAREER: Developing a Modular Synthesis of 6-7-5 Terpenoid Natural Products and Analogs



MICHAEL HILINSKI
University of Virginia

Award Number:
1845219

Title:
CAREER: New Methods for the Synthesis of Nitrogen-Containing Heterocycles



AMY HIXON
University of Notre Dame

Award Number:
1847939

Title:
CAREER: Molecular-Scale Behavior of Actinide Elements at the Mineral-Water Interface



CHRISTOPHER HOBBS
Sam Houston State University

Award Number:
1847914

Title:
CAREER: Developing New Polymer Supported Catalysts Using ROMP, ADMET, and ATRP with High School, Undergraduate, and Graduate Students



HRANT HRATCHIAN
University of California, Merced

Award Number:
1848580

Title:
CAREER: Development of Efficient Spin Projection Models for Applications to Transition Metal Catalysis



PENGFEE HUO
University of Rochester

Award Number:
1845747

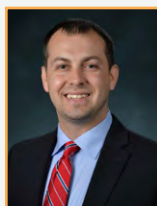
Title:
CAREER: Quantum Dynamics of Photochemical Reactions in Solar Energy Conversions



TODD HYSTER
Princeton University

Award Number:
1846861

Title:
CAREER: Biocatalytic Synthesis of Enantioenriched Nitrogen Containing Heterocycles



JONAH JURSS
University of Mississippi

Award Number:
1848478

Title:
CAREER: Precise Structural Control in Transformative Catalysts for Efficient Multielectron Carbon Dioxide Reduction



JULIA KALOW
Northwestern University

Award Number:
1847948

Title:
CAREER: Photocontrolled Dynamic Covalent Crosslinkers for Light-Responsive Polymer Networks



ANGELA KOEHLER
Massachusetts Institute of Technology

Award Number:
1845464

Title:
CAREER: Reprogramming Transcriptional Regulation by Chemical Stabilization of Repressive Homodimers



REVATI KUMAR
Louisiana State University & Agricultural and Mechanical College

Award Number:
1845795

Title:
CAREER: Exploring Chemistry at Graphene Oxide Liquid Interfaces



DAVID LACY
The State University of New York at Buffalo

Award Number:
1847933

Title:
CAREER: Synthesis and Characterization of Manganese Complexes Toward Earth-abundant Green Catalysts



FRANK LEIBFARTH
University of North Carolina, Chapel Hill

Award Number:
1847362

Title:
CAREER: A New Class of Polar Thermoplastics: Mechanistic Investigations into the Synthesis of Isotactic Poly(vinyl ethers)



TIANBIAO LIU
Utah State University

Award Number:
1847674

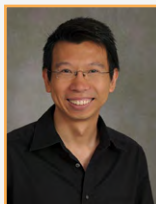
Title:
CAREER: Designer Redox Active Molecules for Sustainable Electrochemical Energy Storage



MICHAEL MARTY
University of Arizona

Award Number:
1845230

Title:
CAREER: Enabling Nanodisc Native Mass Spectrometry to Study Membrane Active Compounds

**SHARON NEUFELDT***Montana State University***Award Number:**
1848090**Title:**
CAREER: Combined Experimental and Computational Approach to Controlling Site Selectivity in Cross Coupling**ERIC NEUSCAMMAN***University of California, Berkeley***Award Number:**
1848012**Title:**
CAREER: Extending Ground State Quantum Chemistry to Excited States**MING-YU NGAJ***The State University of New York at Stony Brook***Award Number:**
1848463**Title:**
CAREER: Chiral Catalysts for Enantioselective Photoredox-Catalyzed C-C Bond-Forming Reactions**CHRISTINE PHILLIPS-PIRO***Franklin & Marshall College***Award Number:**
1847937**Title:**
CAREER: Probing Structure and Expanding Function with Genetically Encoded Non-Canonical Amino Acids**JULIE PIGZA***University of Southern Mississippi***Award Number:**
1848257**Title:**
CAREER: Bridging Synthesis and Computational Chemistry to Parameterize Noncovalent Interactions in Asymmetric Catalysis**DAVID POWERS***Texas A&M University, Main Campus***Award Number:**
1848135**Title:**
CAREER: Aerobic Hypervalent Iodine Chemistry as a Platform for Oxidase Catalysis**SERGEY PRONIN***University of California, Irvine***Award Number:**
1848076**Title:**
CAREER: Development of Catalytic Enantioselective Hydrofunctionalizations of Alkenes**RYAN RAFFERTY***Kansas State University***Award Number:**
1848186**Title:**
CAREER: Penetrating Barriers – A New Paradigm for Enhancing Molecular Transport into Complex Biological Membranes



JESSICA ROUGE
University of Connecticut

Award Number:
1847869

Title:
CAREER: Multi-stimuli Responsive DNA-Nanoshells - Compartmentalizing Molecules at the Nanoscale for Enhanced Reaction Selectivity and Sensitivity



CODY SCHLENKER
University of Washington

Award Number:
1846480

Title:
CAREER: Time-resolved Multi-pulse Spectroscopy of Solvated Aza-aromatics



NATHAN SCHLEY
Vanderbilt University

Award Number:
1847813

Title:
CAREER: Iridium Catalysts for the Activation and Functionalization of Ethereal Substrates



SEVERIN SCHNEEBELI
University of Vermont & State Agricultural College

Award Number:
1848444

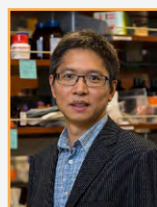
Title:
CAREER: Ribosome-inspired Synthesis of Precision Polymers



MOHAMMAD SEYEDSAYAMDOST
Princeton University

Award Number:
1847932

Title:
CAREER: New Metalloenzyme-Catalyzed Transformations in Natural Product Biosynthesis



JIA SHENG
The State University of New York at Albany

Award Number:
1845486

Title:
CAREER: Chemical Biology Approaches to Study 5-Methylcytidine Derivatives in RNA and Develop CRISPR-Tet2-Based Epitranscriptomic Tool for Gene Regulation



AARON SMITH
University of Maryland, Baltimore County

Award Number:
1844624

Title:
CAREER: Structure, Mechanism, and Selectivity of Microbial Ferrous Iron Transport



ALEXANDER SPOKOYNY
University of California, Los Angeles

Award Number:
1846849

Title:
CAREER: Pt(II) PHOLED Materials Featuring Multidentate Carborane-Based Ligands



SABINE CHANTAL STIEBER

*California Poly Pomona
Foundation, Inc.*

Award Number:
1847926

Title:
CAREER: Quantifying NO
Activation and Coordination
Modes through Synthesis,
Spectroscopy and Computations



GRACE STOKES

Santa Clara University

Award Number:
1848583

Title:
CAREER: Quantifying How Peptoids
Interact with Lipid Membranes



THOMAS TEETS

University of Houston

Award Number:
1846831

Title:
CAREER: Synthetic Strategies
to Optimize Luminescence
and Photoredox Properties of
Organometallic Complexes



LAURENE TETARD

University of Central Florida

Award Number:
1847830

Title:
CAREER: Instrument
Development of Plasmonic-Assisted
Nanomechanical Detection for
Polarized Spectroscopy and Imaging



STEVEN TOWNSEND

Vanderbilt University

Award Number:
1847804

Title:
CAREER: Bioorganic Investigation
of Human Milk Oligosaccharide
Modulation of Group B Streptococcus



BRETT VANVELLER

Iowa State University

Award Number:
1848261

Title:
CAREER: Investigation of
Environmentally-Sensitive
Photoreactions

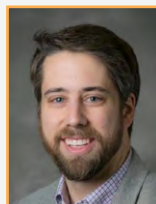


MATTHIAS WAEGELE

Boston College

Award Number:
1847841

Title:
CAREER: Elucidating How the Liquid
Side of the Electrochemical Interface
Controls Catalytic Selectivity during
Carbon Dioxide Reduction



KEVIN WELSHER

Duke University

Award Number:
1847899

Title:
CAREER: Target-locked Single
Molecule Spectroscopy and
Super-resolution Microscopy



XIAOJI XU
Lehigh University

Award Number:
1847765

Title:
CAREER: Development of
Super-Resolution Scanning Probe
Stimulated Raman Microscopy with
sub 10 nm Spatial Resolution



LIMEI ZHANG
University of Nebraska, Lincoln

Award Number:
1846908

Title:
CAREER: Structural and Mechanistic
Studies on an Iron-Sulfur Cluster-
Based Nitric Oxide Sensor



MINGJIANG ZHONG
Yale University

Award Number:
1845184

Title:
CAREER: Synthesis of
Hierarchically Structured
Polymeric Materials Enabled
by Polymerization-Induced
Branching

| Division of Chemistry | | | |
|--|--|--------------|-------------------|
| Name | Title | Telephone | Email |
| Dr. Carol Bessel | Acting Division Director | 703-292-4906 | cbessel@nsf.gov |
| Dr. Lin He | Acting Deputy Division Director | 703-292-4956 | lhe@nsf.gov |
| Mrs. Gloria Yancey | Program Support Manager | 703-292-4718 | gyancey@nsf.gov |
| Ms. Debbie Jones | Operations Specialist | 703-292-7852 | djones@nsf.gov |
| Ms. C. Michelle Jenkins | Program Analyst | 703-292-7874 | cjenkins@nsf.gov |
| Dr. Melissa Olson | Presidential Management Fellow | 703-292-7448 | molson@nsf.gov |
| Program Specialists Team | | | |
| Mrs. Marsha Hawkins | CMI, MRI | 703-292-4877 | mhawkins@nsf.gov |
| Ms. Renee Ivey | CAT, CLP | 703-292-4928 | sivey@nsf.gov |
| Mr. Darren Kimble | CSDM-A & B, ECS, REU | 703-292-7159 | dkimble@nsf.gov |
| Ms. Kimberly Noble | CTMC, MSN | 703-292-2969 | knoble@nsf.gov |
| Ms. Marla Stewart | CCI, SYN | 703-292-8735 | mastewart@nsf.gov |
| Technical Staff | | | |
| Dr. Catalina Achim | CLP | 703-292-2048 | cachim@nsf.gov |
| Dr. Michelle Bushey | CCI, REU, Special Projects | 703-292-4938 | mbushey@nsf.gov |
| Dr. Jin Cha | SYN, CAT | 703-292-2461 | jcha@nsf.gov |
| Dr. Kelsey Cook | CMI | 703-292-7490 | kcook@nsf.gov |
| Dr. Katharine Covert | CCI | 703-292-4950 | kcovert@nsf.gov |
| Dr. Walter Ermler | CTMC, REU | 703-292-2919 | waermler@nsf.gov |
| Dr. Colby Foss | CSDM-A, CCI | 703-292-5327 | cfoss@nsf.gov |
| Dr. John Gilje | SYN | 703-292-8840 | jwgilje@nsf.gov |
| Dr. Evelyn Goldfield | CTMC | 703-292-2173 | egoldfie@nsf.gov |
| Dr. P. Shing Ho | CLP | 703-292-7054 | puiho@nsf.gov |
| Dr. George Janini | MSN | 703-292-4971 | gjanini@nsf.gov |
| Dr. Bruce Johnson | CTMC, REU | 703-292-8840 | brjohnso@nsf.gov |
| Dr. Richard Johnson | CSDM-B | 603-862-2302 | ricjohns@nsf.gov |
| Dr. Bob Kuczkowski | MRI | 703-292-8840 | rkuczkow@nsf.gov |
| Dr. Tingyu Li | CSDM-B | 703-292-4949 | tli@nsf.gov |
| Dr. Robin McCarley | CLP, CMI | 703-292-7514 | rmccarle@nsf.gov |
| Dr. Kenneth Moloy | CAT | 703-292-8441 | kmoloy@nsf.gov |
| Dr. Carlos Murillo | MRI | 703-292-4970 | cmurillo@nsf.gov |
| Dr. John Papanikolas | CSDM-A, MSN | 703-292-8809 | jpapanik@nsf.gov |
| Dr. Tomislav Pintauer | MSN | 703-292-2394 | tompinta@nsf.gov |
| Dr. Thomas Rauchfuss | CAT, SYN | 703-292-8653 | trauchfu@nsf.gov |
| Dr. Tong Ren | CSDM-B | 703-292-8840 | tren@nsf.gov |
| Dr. Tarek Sammakia | SYN, CAT | 703-292-7486 | tsammaki@nsf.gov |
| Dr. Anne-Marie Schmoltnner | ECS, CSDM-A | 703-292-4716 | aschmolt@nsf.gov |
| Dr. Suk-Wah Tam-Chang | MSN | 703-292-8684 | stamchan@nsf.gov |
| Chemistry Program Abbreviations | | | |
| Chemical Catalysis (CAT) | Environmental Chemical Sciences (ECS) | | |
| Centers for Chemical Innovation (CCI) | Major Research Instrumentation (MRI) | | |
| Chemistry of Life Processes (CLP) | Macromolecular, Supramolecular & Nanochemistry (MSN) | | |
| Chemical Measurement & Imaging (CMI) | Research Experiences for Undergraduates (REU) | | |
| Chemical Structure, Dynamics & Mechanisms (CSDM A & B) | Chemical Synthesis (SYN) | | |
| Chemical Theory, Models & Computational Methods (CTMC) | | | |

The mission of the Division of Chemistry is to promote the health of academic chemistry and to enable basic research and education in the chemical sciences. The Division supports research in all traditional areas of chemistry and in multidisciplinary fields that draw upon the chemical sciences. The Division also supports projects that help build infrastructure, workforce, and partnerships that advance the chemical sciences.



National Science Foundation
WHERE DISCOVERIES BEGIN

DIVISION OF CHEMISTRY

National Science Foundation
2415 Eisenhower Ave, Alexandria, VA 22314

For inquiries, comments or questions, please contact:
Marsha Hawkins | Program Specialist, NSF/Chemistry
Phone: 703-292-4877 | Email: mhawkins@nsf.gov