Welcome to the First Edition of the Chemical Sciences Roundtable (CSR) Newsletter. The Chemical Sciences Roundtable is a Forum of the National Academies. Our vision is to be recognized as the premier resource to inform on developing issues in chemistry and chemical engineering, and this newsletter is our relaunch to introduce ourselves to you. This newsletter will keep you updated on current activities of the CSR, to engage you in these activities, and to seek your input on future directions. It will be published quarterly and will be available on the CSR website (http://nas-sites.org/csr/). It will also be disseminated electronically to all interested parties.

The Chemical Sciences Roundtable was established by the Board on Chemical Sciences and Technology (BCST). BCST is one of the eleven Boards of the Division of Earth and Life Sciences, one of the program units of the National Academies. CSR differs from the BCST in that workshop topics are chosen by CSR members, with input from the chemistry and chemical engineering communities, and workshop topics need not be commissioned by funding agencies. As a result, CSR membership also includes representation from federal funding agencies in addition to industry, academia, and national laboratories. CSR’s current membership is given at http://nas-sites.org/csr/members/

One key function of the Chemical Sciences Roundtable is to organize workshops and symposia, and to publish the resulting reports, on topics important to the continuing health and advancement of chemical science and technology. The next activity for CSR in this regard is a series of four seminars on the Chemistry of Microbiomes. More information about these upcoming seminars and how to register for them is given in this newsletter. We encourage your attendance and participation in our workshops! You may also be interested to learn about other recent CSR workshops on a wide range of technical educational, outreach, and workforce development topics. Summary reports for these workshops can be downloaded free of charge from the CSR website.

We are looking to enhance our connection with the chemistry and chemical engineering communities. Hence, we very much welcome your input on future workshop themes. Please send in your suggestions of cutting-edge themes via e-mail to CSR@nas.edu, or feel free to reach out to one of the CSR members directly.

Please let us know any other suggestions you may have to help CSR achieve its vision.

Thank you and best regards,

CSR Co-Chairs
William Carroll (wcarroll@indiana.edu) and Jennifer Sinclair Curtis (jscurtis@ucdavis.edu)
On February 17-18, 2016, the Chemical Sciences Roundtable (CSR) undertook a serious self-examination in order to sharpen its vision and mission, and develop ways to increase its effectiveness. As background, CSR grew out of a 1994 American Chemical Society (ACS) Colloquium that identified a need for a neutral and credible forum for communication on key issues among government, industry, and university representatives. In that era, standing forums and roundtables were highly unusual. While no longer distinctive in that respect, the CSR remains unique in that it possesses a high degree of freedom and flexibility to identify scientific topics and to develop discussions around those topics.

Typically, the CSR has held short workshops (1-1.5 days long) to help moderate the discussions around specific topics and have published corresponding reports. CSR screens topics via internal discussion and by inviting guests to speak on topics of possible interest at its meetings. Recent workshop areas have included mesoscale chemistry, undergraduate chemistry education, antibiotic discovery and development, and the role of the chemical sciences in finding alternatives to critical resources.

Much of CSR’s self-examination in February consisted of formal strategic planning, facilitated by Carol Duane from ACS. The group discussed vision and mission statements at length, with the resultant vision being “to be recognized as the premier resource to inform on developing issues in chemistry and chemical engineering,” and the mission being “to provide a science-oriented, apolitical forum to enhance understanding of critical issues in chemical sciences and technology affecting the government, industrial, and academic sectors.” The group also identified major stakeholders in CSR. The principle three are those identified in its mission statement—government, industry, and academia—but also includes professional societies and the general public. These and other discussions were summarized in a Strategic Planning Report by the facilitator.

CSR developed 4 goals and began to discuss ways to achieve them:

1. Identify timely, impactful, visionary critical issues.
2. Expand CSR’s reach into the chemical community in 3-5 years.
3. Within 3 years build 3 regular channels of communication with associated metrics for disseminating CSR information.
4. Within 3 years develop and implement mechanisms to effectively promote awareness of the value and capabilities of CSR to the public.

CSR decided to establish internal committees as an effective way to achieve these goals. To achieve Goal #1, CSR has established a Program Committee, and charged it with developing and overseeing workshop construction, and particularly with reaching out to the community for input. To achieve Goal #2, a new Outreach Committee is charged with developing relationships with groups outside of the NAS—especially groups in government, industry, and academia. To achieve Goal #3, a new Communications Committee is charged with branding and marketing, especially developing the website, a logo, a newsletter, and social media outlets.

In addition to establishing 4 major goals for CSR, the roundtable members reevaluated the traditional workshop activity as a means to facilitate discussions on specific topics. To improve and increase impact, the CSR has decided to expand the types of activities they host, in addition to the traditional workshop. This includes seminar series, poster sessions, video recordings, and other formats that are catered to the specific scientific idea and desired outcome. This format will be used for the first time in The Chemistry of Microbiomes: A Four Seminar Series, which will be taking place over the 4-month period spanning September-December 2016.

CSR plans to report on its meetings regularly via this quarterly Newsletter. It also plans to publish about CSR and CSR topics in venues such as journal perspectives and guest editorials in C&EN. It will also be more active in soliciting input from the community (that means you!) on pressing issues in chemistry and chemical engineering. So expect to be hearing and seeing more about CSR!
Redox-flow battery using Alloxazine

Written by Marthe Folvi, Ripon College

Fossil fuels have served as popular energy sources since the commencement of the 18th century industrial revolution. These relatively low-cost energy sources are used in many diverse applications including motor vehicles. Despite their ubiquitous usage, fossil fuels have negative environmental and health consequences. The consumption of fossil fuels causes the release of greenhouse gases and small particulates into the environment. These emissions are believed to contribute to global warming and respiratory disorders in humans, amongst other issues. Recent years have seen a global push towards the use of cleaner or green energy sources.

These sources include solar, hydroelectric, and wind energy. Although clean or green energy sources remove, for the most part, the emissions associated with fossil fuels, they are not without fault. A challenge facing these energy types, especially solar and wind energy, is the storage of energy for later use. Redox flow batteries, rechargeable batteries composed of ongoing redox reactions, are being developed to improve energy capacity.

Researchers at Harvard University led by Michael Aziz, Roy Gordon, and Alán Aspuru-Guzik, have developed flow batteries that use an organic molecule similar to vitamin B2 to store electricity (Nature Energy 2016, DOI: 10.1038/nenergy.2016.102). This research conducted by Ph.D. student Kaixiang Lin and others expands work using quinones as replacements for metal ions in batteries. The concept behind the new type of flow battery is using energy-storing molecules found in plants and animals. The flow batteries designed by Lin and others use alloxazine, a tautomer of vitamin B2’s isoalloxazine backbone. Synthesis of alloxazine is done at room temperature by coupling o-phenylenediamine derivatives and alloxan in a single step. Usage of the resulting alloxazine in an alkaline flow battery results in an open-circuit voltage near 1.2 V, 99.7% current efficiency, and 99.98% capacity retention, at minimum. The research team believes the molecule can be manufactured at low costs on a larger scale.

Microbiomes—the collections of bacteria, viruses and fungi that inhabit essentially every conceivable environment—impact the metabolic diversity of the planet in many ways. They produce a vast array of chemicals that are used to interact and communicate with each other, their living hosts, and their surrounding abiotic environment. These molecules catalyze a broad range of chemical reactions responsible for maintaining ecosystem and human health, but there is still much to learn about the chemical mechanisms through which these interactions work.

To examine what is currently known and opportunities for additional research, a series of four seminars will be hosted in Washington, DC during the months of September-December. The first three seminars will each focus on one of three microbiome systems: earth, marine, and human. Each seminar will feature presentations and discussions on:

• The role of chemistry in microbial communities, including microbe-microbe signaling and host-microbe interactions
• Current challenges and potential future research

Commonalities and differences among the chemistries of these interactions across systems will be highlighted in the final seminar scheduled in December.

The series will be webcast online at www.dels.nas.edu/csr. Please register to be a webcast participant or to attend in person.

Register at: www.dels.nas.edu/csr

The National Academies of Sciences - Engineering - Medicine

CSR@nas.edu

前途の興味

MICROBIOME SEMINAR

TOPICS OF INTEREST

BCST - Fall 2016

Chemical Sciences Roundtable
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Jennifer Sinclair Curtis, University of California, Davis

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Photos in this Issue:
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p. 1: Bill Carroll (left), Jennifer Curtis (right)
p. 2-3: Covers of previous CSR Workshop Summaries from 2008-2016
p. 4: Taken from Nature Energy 2016, DOI: 10.1038/nenergy.2016.102
p. 7: Albert Einstein statue of the National Academy of Sciences Building, Washington, DC
Back Cover: Front of the National Academy of Sciences Building 2101 Constitution Avenue, NW

Please email CSR@nas.edu to subscribe to the CSR newsletter and to receive notifications about CSR’s upcoming workshops and events. You can change your subscription preferences or unsubscribe at any time.