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American Institute of Chemical Engineers
Knoxville-Oak Ridge Section

For additional information see our Web site at: http://www.ornl.gov/sci/aiche/
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February 2015 Meeting – Joint with ANS

Date: Thursday, February 19, 2014
Cost: $20
Location: Rothchild Catering and Conference Center, 8807 Kingston Pike, Knoxville TN

5:30 pm Executive Committee Meeting (All members welcome)
6:00 pm Dinner
7:00 pm Program – Robert (Bob) M. Wham, Oak Ridge National Laboratory, *Pu-238 Supply Project*

Abstract – The National Aeronautics and Space Administration (NASA) relies on radioisotope power supplies (RPSs) to provide heat and electricity for deep space missions, such as the Viking spacecraft as well as the Mars Rover. The current supply of ^{238}Pu is nearly exhausted. Developing a new supply chain is underway using existing reactors at Oak Ridge National Laboratory (ORNL) and Idaho National Laboratory (INL) and using existing chemical recovery facilities at ORNL. Validation and testing activities are taking place to provide data for scale-up to production. Target design qualification, target fabrication and irradiation of prototypical targets have been accomplished. Chemical processing development tasks have begun on selected separations.

Bio – Robert Wham is a PhD Chemical Engineer whose research focus is radioisotope production and radiochemical separations including recycle of used nuclear fuel. He currently serves as Technology Integration Manager for the Pu-238 Supply Project.

Previously, he served as Technology Integration manager for the Nuclear Science and Technology Division (NSTD) and was responsible for six groups within NSTD. The groups covered diverse areas such as radiochemical processing, robotics, stable isotope production, radioisotope production, and design of remotely operated equipment.

Prior to that, he managed several radiochemical processing programs at the Radiochemical Engineering Development Center (REDC). His experience in hot cells and radioisotope production comes from working on the production of heavy elements in the Transuranium Element Program, as well as the recovery of plutonium, americium and curium from targets irradiated at the Savannah River Site. Both of these took place at REDC. He was Facility and Program Manager for REDC from 1991 to 1997.

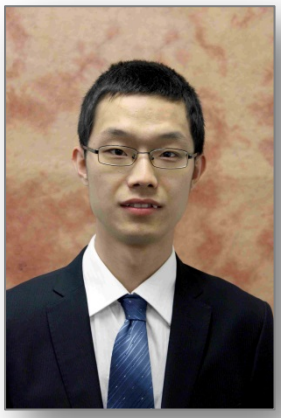
Please make your reservations no later than noon on February 17, by contacting

Be sure to RSVP even if you accepted the Outlook notice for this meeting

Paula George, georgepm@ornl.gov, (865)576-0603 or
Rita Gray, rgray22@utk.edu, (865)974-5356

Students are encouraged to attend and will be subsidized

UT Student Poster Presentation at February Meeting



University of Tennessee Chemical and Biomolecular Engineering PhD candidate, Bo Zhang, will present a poster on his research, titled: *A study of diblock copolymer/charged particle nanoporous membranes: morphology, design, and transport property modeling,* at the February meeting of the Knoxville-Oak Ridge Section of AIChE. You are invited to either come at 5:30 p.m. or stay after the regular meeting to talk with Bo about his work.

Abstract - Nanoporous materials offer new opportunities for technological development in a wide range of applications, including oil processing, separation and concentration of amino acids, waste water treatment, and many others. These materials were studied theoretically at two different length scales in our research: the macroscopic level (>100 nm) and microscopic level (< 10 nm).

In the first part, we used self-consistent field theory along with density functional theory (SCFT/DFT) to examine the energy and morphologies of diblock copolymer systems with either a neutral or charged tethered nanoparticle, which was attached either between the two blocks or at the end of one of the blocks. In particular, we examined the conditions under which periodic, hexagonal arrays of cylinders could be generated wherein the tethered particles would primarily be located within the interface between the two block domains of the copolymer system. Different particle sizes and particle-block interactions were tested in order to understand the particle effect on the phase diagrams, especially the critical points, stable morphologies, and system energies.

The transport properties of charged particles (especially the conductivity) through a nanoporous membrane were also investigated following the SCFT/DFT simulation study, using continuum percolation theory, which was inspired by Archie's law. Theoretical predictions of this model were compared against experimental data of conductivity for four different membranes: DuPont's Nafion 117 (*EW* = 1100), Membrane C (*EW* = 900) of Chlorine Engineers Corp., Japan, Dow's XUS 13204.10 (*EW* = 800), and 3M membrane developed by 3M Corp. (*EW* = 1000) for different water contents and temperatures. The theoretical predictions of the model matched the experimental data with reasonable quantitative accuracy in most cases.

Bio - Bo Zhang is currently a Ph.D. candidate in the Department of Chemical and Biomolecular Engineering at the University of Tennessee, Knoxville. He received his B.S from Beijing Institute of Technology, China in 2010 and the Master of Science degree from the University of Tennessee, Knoxville in 2013. Bo joined Dr. Edwards' research group in Spring 2012. His research focuses on the modified diblock copolymer morphology simulation and modeling the transfer properties through polymer membranes. The primary goal of his research is to elucidate under which conditions a copolymer system could form appropriate morphologies that could be used in nanofiltration or other membrane technologies. Bo is currently working on the development of a new method to model the conductivity of the polymer membrane.

You can reach him at: bzhang13@vols.utk.edu, Tel: 702-628-6431

An Evening with Tennessee's new Commissioner of Education

Dr. Candice McQueen, the new Tennessee Commissioner of Education, will discuss her vision for the future of education in our state. The event will be at 7pm, Thursday, March 26 at the Downtown Marriott. Free parking for the event will be available at the hotel. The event is being organized by the Knox County Education Association, the Great Schools Partnership, and the Education Committee of the League of Women Voters. AIChE members with an interest in education are encouraged to attend.

(Article courtesy of Paul Taylor, using Information from Joe Carson)

Recap of Dr. Sorenson's Presentation at the January Meeting

Dr. Soren Sorenson, Professor in the Department of Physics and Astronomy at the University of Tennessee, gave a very interesting talk on ***"What is everything made of? The quest for the ultimate building blocks of the physical universe,"*** at the January meeting of the Knoxville Oak Ridge Section of AIChE. The meeting was held at the Sunsphere and was a joint meeting with the local section of ASM International, who organized the meeting. There were about 100 people in attendance; including, 39 from AIChE members, spouses, and students.

Dr. Sorenson discussed the quest to identify the fundamental building blocks that make up all of the visible matter in the universe. The first recorded attempt to identify the fundamental building blocks of all of the materials on earth was by the ancient Greeks, in the 5th century BCE. Democritus and Leucippus proposed that matter was composed of indivisible particles called *atomos*, meaning indivisible, from which the modern word "atom" is derived. Empedokles proposed that four different elements, namely water, air, fire and earth could be combined in different ways to produce the various forms of matter.

Although some of the elements (atoms) were know in ancient times, most were identified in the 18th and 19th centuries. In 1869 Dmitri Mendeleev arranged the 63 elements known at that time into the first modern periodic table, and correctly predicted several unknown elements, based on empty blocks in his table. Although the elements were the building blocks of all of the materials on earth, there were so many of them that they were not very satisfactory as fundamental building blocks.

In the 20th century, atoms were found to be composed of even smaller entities: electrons, neutrons, and protons. This was a remarkably simple system. By taking different combinations of just three subatomic particles, all of the elements seen in nature can be accounted for. It also explained the physics underlying the structure of the periodic table. For a while, it seemed that the fundamental building blocks of the universe had been found. However, starting in the 1930s, when physicists started to study cosmic rays, a veritable zoo of new subatomic particles, including antimatter particles, began to emerge. The large number of subatomic particles called into question whether they were the fundamental building blocks of matter.

In 1964, theorists Murray Gell-Mann and George Zweig independently suggested that all of the observed mesons and baryons (heavy particles) could be constructed from just three fundamental building blocks. They regarded these "quarks" as mathematical constructs that were useful for explaining the observed data, but not necessarily as fundamental particles corresponding to physical reality. By the early 1970s, detailed analyses of the distribution of the scattered electrons from the Stanford Linear Accelerator revealed three scattering centers within protons and neutrons, the first experimental evidence that quarks were in fact real. Physicists Jerome Friedman, Henry Kendall, and Richard Taylor received the Nobel Prize for this discovery in 1990. As new types of quarks and antiquarks and also leptons (electrons, positrons, etc.,) were discovered, the large number again called into question whether they were truly the fundamental building blocks. Dr. Sorenson mentioned String Theory, which is one attempt to explain the variety of quarks and leptons that have been found, but no experimental evidence exists to support any of the proposed building blocks of quarks and leptons.

(Article courtesy of Paul Taylor)

2015 Southern Appalachian Science and Engineering Fair

The 2015 Southern Appalachian Science and Engineering Fair (SASEF) will be held March 30 – April 2 at Thompson Boling Arena. Paul Taylor and Mark Swientoniewski have signed up to serve as judges for the AIChE special awards. If you would like to help with judging for the special awards or for the general awards, please use the following link to register: http://sasef.com/. Select "Judges" and then "Register Online", or contact Tim Prater at prather@tennessee.edu.

(Article courtesy of Paul Taylor)

Comparison of the Knoxville – Oak Ridge Section with National AIChE Averages

National AIChE conducted a survey of the Local Sections in 2014. The purpose was to help determine, and support, the health and stability of the Local Sections. The response was good, with 71% of the Local Sections submitting responses. The results for our Local Section and national averages are shown below.

"National feels that the Local Sections are instrumental for the success of AIChE as an organization because of their potential to exhibit the numerous benefits that come with being part of the Institute in a more frequent and personal way. Furthermore, the members of these sections can serve as a talent pool for crafting a new generation of leaders for our Institute."

"Because AIChE is positioning itself as a data-driven organization, its initiatives must be supported accordingly. With this in mind, a systematic and sustainable measurement of the health of the sections can help in identifying areas for supporting the Local Section executive boards in addition to measuring performance of initiatives and programs."

"Primarily, the health of LS depends on its ability to:

1. Remain organized at the board level.
2. Remain relevant to its members.
3. Remain financially stable.
4. Recruit new members.
5. Maintain healthy member involvement."

Question	Knoxville-Oak Ridge	National Average
Did the section hold officer elections in accordance with the LS's by-laws?	Yes	67% yes
Did your section file a local section annual report within the last two years?	Yes	90% yes
Does your section fill a treasurer's report according to the specific section requirements?	Yes	90% yes
Does the section operate and maintain an up-to-date webpage?	Yes	57% yes
Did the section publish a newsletter (physical or digital) periodically in the last year?	Yes	42% yes
Does the section actively maintain a social media presence for communications, advertising, event info etc.?	No	40% yes
Did the section attend the Local Section Leadership Workshop meeting within the last two years?	No	33% yes
Did the section conduct any activity with student chapters in its area within the last year?	Yes	68% yes
Does the section have a Young Professionals group?	No	25% yes
How many TOTAL members does the section currently have?	119	45% < 50
What is the LS's Net Worth per member?	$42	$174

Comparison of the Knoxville – Oak Ridge Section with National AIChE Averages (continued)

The Knoxville – Oak Ridge Section generally compares well with the national averages. We have a larger than average membership and an active leadership structure. Two areas where we could potentially do more are in maintaining a social media presence and in having a young professionals group within the Section. Addressing these areas will require having a volunteer, hopefully a young engineer, to work on them. If you are interested, please contact one of the Board members.

The net worth (bank account balance) of the Section divided by the number of members is below average, but we purposely do not maintain a large balance. Most of the funding for the Local Section comes from local dues that are collected by National. Most of our costs are for student related activities, including paying for student meals to encourage attendance at our meetings, student awards, and supporting local science fairs and competitions.

(Article courtesy of Paul Taylor, using information from *2014 LOCAL SECTION ANNUAL REPORT*,
Authors: Rishon Benjamin[1], Daniel Sujo[1], Brian Daly[2], Anthony Fregosi[3], Monica Stowe[4]
(1) Delaware Valley Section, (2) Local Sections Committee, (3) Career & Education Operating Council, (4) AIChE Staff, January 2015.)

Activities Calendar

Date	Time	Topic	Speaker	Location
Feb 19	6:00 PM	Pu-238 Supply Project – Joint with ANS	Bob Wham, ORNL	Rothchild's, Knoxville TN
Mar 12	6:00 PM	Proton Therapy	Niek Schreuder	Rothchild's, Knoxville TN
Apr 16	6:00 PM	3D Modeling and Engineering	Jack Kissell, ModernTech	ModernTech, 1626 Downtown West, Knoxville
Apr 2		UT Department of Chemical & Biomolecular Engineering Awards Dinner		Calhoun's on the River
May 14	6:00 PM	TBD	TBD	McClung Museum

Sponsoring Opportunities

We continue to accept advertising in the newsletter in order to provide funds to support student participation in the meetings.

Rates per newsletter are:

$80 full-page advertisement

$45 half-page advertisement

$25 quarter-page advertisement

The section will also continue to accept individual or corporate sponsors to provide student meals at section meetings. The sponsor will be recognized at the meeting and in the Newsletter.

The cost to sponsor one meeting is **$200**. It's a great way to encourage students to attend the local meetings and become future members in the Institute!

(Fermi National Accelerator Laboratory Superconducting RF Cavity - Source: DOE Digital photo archive at: http://www.flickr.com/photos/departmentofenergy)

"Success is the sum of small efforts repeated day in and day out."

Robert Collier
American author
1885-1950

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http://www.ornl.gov/sci/aiche/

Editor: B. Lewis

About Our Organization – Careers

Whether you're a student looking for an internship, a young professional looking for your first job or a seasoned engineer looking to breathe new life into your career, AIChE offers a variety of options to help guide you.

Learn about institute networking opportunities, attend a career fair, get profession advice, or simply check out the AIChE job board, CareerEngineer.

- Find a Job
  Search through the AIChE CareerEngineer job board's online jobs to find your new career path.

- 2013 Salary Survey
  Every other year in June, *CEP* Magazine publishes the AIChE Salary Survey, which provides information on the salaries of chemical engineers related to multiple factors and demographics.

  In turn, AIChE's blog ChEnected publishes a related series on benefits and salaries. The series consists of three posts, two of which are available now, with one to be added soon.

- Post your resume
  Access the newest and freshest jobs available to professionals seeking employment.

  Post your resume online today! Whether you're actively or passively seeking work, your online resume is your ticket to great job offers!

- Create a job alert
  Create Job Alerts and never let a matching job opportunity pass you by! New jobs that match your search criteria will be emailed directly to you.

- Post a job
  Reach the most qualified candidates by posting your job opening on our online Career Center.

  AIChE is a premier technical and professional society and global leader of the chemical engineering profession for over 100 years. We strive to make members aware of employment opportunities while connecting hiring employers with the most qualified candidates.

(Article from AIChE website at: http://www.aiche.org/resources/careers)

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