



Nanoscale Science and Engineering Forum Newsletter

<https://engineering.purdue.edu/ChE/Nano/NanoChmE>

May 4, 2004

Gil Lee
2003-2004 NSEF Chair
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As this is the first newsletter of the Nanoscale Science and Engineering Forum (NSEF), I thought it might be helpful to give members a synopsis of activities that have taken place over the last two years, the organizational structure of the Forum, and some of the activities that will take place in the coming year. Future newsletters will include minutes of the executive council and general meetings.

The NSEF was formed through the approval of the Chemical Engineering Technology Operating Council on July 5, 2002, after a successful topical conference in Reno and sustained activity throughout the Institute. The Forum's objectives were to: 1) provide a forum for communication and networking among those interested in nanotechnology; 2) coordinate, sponsor, co-sponsor, and advertise relevant programming, including crosscutting and special initiative technical sessions and conferences; 3) promote interchange of ideas, concepts, know-how, and experience in nanotechnology; 4) encourage educators at all levels, particularly in chemical engineering, to integrate concepts of nanoscale science and engineering; 5) advocate curricula that prepare students for career use of nanotechnology; 6) promote lifetime learning through workshops and short courses; and 7) provide centralized links to technical publications and databases related to nanotechnology as it related to chemical engineering science.

The by-laws for the Forum were modeled after those of the Computational Molecular Science and Engineering Forum, which had recently been successfully organized. We owe Tim Anderson and Phil Westmoreland much thanks for providing us with invaluable advice throughout our organization process. The by-

laws of the NSEF can be found at the Forum website which is currently located at engineering.purdue.edu/ChE/Nano/NanoChmE.

A committee was formed in the spring of 2003 that prepared a list of nominees for the executive committee positions and considered several modifications to the Forum's by-laws. This committee was chaired and co-chaired by Phil Westmoreland and Alan Weimer. In the fall of 2003 a slate of executive officers was identified and electronic balloting was handled by Matt Tirrell, who chaired the Forum in 2002-2003. The slate, which is summarized below, was unanimously approved by the membership.

Chair: Gil Lee
1st Vice Chair: Sharon Glotzer
2nd Vice Chair: Daniel Coy
Secretary Treasurer: Nick Abbott
Vice Chair for Membership: Brett Cruden
Vice Chair for Communication: Bob Hoch
Liaison Directors:
Michael Hu
Mihail Roco
Al Weimer
Phil Westmoreland

The first general meeting of the NSEF was held at the Annual Meeting of the AIChE in San Francisco. The agenda of this well attended meeting was to recognize Matt Tirrell's service as 2002-2003 chair of the NSEF, introduce the executive committee members, and ask the attendees for guidance on programming for the coming year. In addition, members expressed interest in developing programming for the spring 2004 meeting, which appears to have been a success due to the efforts of Bob Hoch and Bert Diemer.

The primary focus of the NSEF executive committee this year has continued to be to facilitate programming at the annual meeting, although programming is now spreading to the

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spring meeting and we are co-sponsoring the Society for Biological Engineering workshop on Bionanotechnology in September. We continue to promote communication on nanotechnology within the AIChE and with other professional societies. Within the AIChE, we have liaisons directors with the particle technology forum, computational molecular science and engineering forum, and materials engineering and science division. We believe that our liaison activities need to be expanded in the coming year. External conferences and workshops we have cosponsored include:

National Nanotechnology Initiative, April 2-4, 2003, Washington, DC.

NanoBusiness Alliance's NanoBusiness2003, May 11-13, 2003,

ASME's 2nd Annual Nano Engineering & Investing Trends Conference, Friday, June 20, 2003, at the NYU Stern School of Business, NY, NY.

World Nano-Economic Congress - North America, "Where Nanotechnology and Business Meet," September 8-10, 2003, Washington

ASME's Integrated Nanosystems 2003: Design, Synthesis and Applications - September 17-19, 2003, Palo Alto, CA.

NanoCommerce 2003 - December 8-11, 2003, Hyatt Regency McCormick Place & Conference Center, Chicago, IL.

Probably the most exciting thing that has happened to the Forum over the last year has been the growth of the membership. Growth of the membership takes place through self registration during the annual AIChE membership renewal. In the fall of 2002 our membership was approximately 60, by March of 2003 it had grown to 400, and we now have over 1000 members. A quick review of the membership suggests that we are split evenly between academia and industry and that approximately 5% of our members are located outside the United States.

NSEF Programming at the 2004 Annual Meeting in Austin

Sharon Glotzer
Chair of the NSEF 2004 Topical
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The NSEF will again sponsor a topical conference at the 2004 Annual Meeting in Austin on November 7-12, 2004. The NSEF -- now known as Group 22 -- has seen a significant

growth in its programming and will be sponsoring 46 sessions in Austin.

The topical conference will again highlight national and international trends in nanotechnology through two plenary sessions that are tentatively scheduled to take place on Monday. Plenary speakers include Professor James Baker, Director of the Center for Biologic Nanotechnology at the University of Michigan, Professor Angela Belcher of MIT, and Professor James Tour of Rice University. Several others speakers have been invited but have not been confirmed at this time.

In addition to the plenary session, NSEF continues to program in the area of nanotubes, nanoparticles, nanobiology, theory, education, transport, membranes, self assembly, and polymers as they apply to nanotechnology. We are also introducing new sessions on nanotechnology and nanobiotechnology for sensors, nanomaterials and nanodevices for energy applications, nanoelectronics and molecular electronics, nanofabrication, nanowires and nanotubes, nanotribology and nanometrology. Following last year's tradition, NSEF will host a reception and business meeting during the week. Stay tuned.

NSEF collaboration with other divisions and topical conferences within the Institute continues to be a high priority. This year we are co-sponsoring 18 additional sessions on nanotechnology-related topics with groups 1A, 1C, 1D, 3, 8D, 9, 10C, 20 and 21. *Abstracts are due May 10.*

Planning for the NSEF Program at the 2005 Annual Meeting in Cincinnati

Dan Coy
Chair of the NSEF 2005 Topical
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NSEF program planning is well underway for the 2005 AIChE Fall National Meeting in Cincinnati. NSEF programming Chair for the meeting is Dr. Daniel Coy of Nanophase Technologies Corporation, a leading nanomaterial supplier. Meeting Program Chair is Professor D.B. Bhattacharyya of the University of Kentucky.

The meeting will retain many of the most popular sessions from the past, as well as introduce a few new sessions and combine some existing sessions with similar sessions from other programming areas. And, of course,

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invited lecturers will cover topics of wide interest in the developing world of Nanotechnology. For those who are interested, a snapshot of the meeting plan can be viewed at <http://trickle.ecn.purdue.edu:8080/annual05/grouppsummary.jsp?gid=22>.

While planning is well underway, there is still time to make adjustments to accommodate the needs of NSEF members and the AIChE community. If you are interested in chairing a session that is not currently listed on the web site, please contact the 2005 NSEF Programming Chair, Dan Coy, at dcoy@wideopenwest.com with the name and description of the proposed session. Industrial participants are particularly encouraged to apply. Also, if you are aware of a speaker whom you feel is particularly well-suited to address the interests of AIChE members through an invited talk, please pass that information along to Dan Coy as well.

NSEF Programming at the 2004 Spring Meeting in New Orleans

Bob Hoch
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For the first time, the NSEF has sponsored a topical conference at the AIChE Spring meeting. Two plenary sessions, a session on nanoporous and nanostructured materials, and modeling and synthesis methods in nanotechnology were organized by Bert Diemer and myself.

Plenary speakers included Minoo Dastoor from NASA, David Brown from VTT Processes, Bill Faulkner from Cima Nanotechnology Inc, Sam Brauer from BCC Communications, Vicki Colvin from Rice University, and Richard Laine from the University of Michigan. Speakers came from as far away as Finland and Korea! Both the Plenary and submitted talks were excellent and well received by the audience. It was particularly gratifying to see excellent research from Professor Lu's group at Tulane University presented at the Spring meeting.

The attendance was solid and most importantly stayed constant through the whole duration of the four sessions. An unscientific sampling of the attendees indicated that they were pleased. Based on this, we anticipate again organizing a Topical Conference at the 2005 Spring Meeting in Atlanta.

AIChE and Nanotechnology

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As the AIChE nears its centennial, its members will celebrate a discipline and profession which formed the unit operations and the transport phenomena paradigms. It seems fitting that as we near this milestone, we now embrace what some believe will be the third paradigm, engineering at the molecular level. The NSEF has been the first and most effective visible proponent of nanotechnology in AIChE. On the larger scale, the National Nanotechnology Initiative (NNI) drives the advancement of nanotech.

National Nanotechnology Initiative

The NNI, guided by the National Science and Technology Council's Subcommittee on Nanoscale Science, Engineering and Technology (NSET), is an interagency effort that maximizes the R&D investments through coordination of funding, research, and other activities. This initiative was methodically developed through a federal interagency working group formed in 1996. They organized symposia and workshops on how to advance nanoscale science and technology, as well as how to address potential ethical, legal and social impacts. Since its inception in 2001, the NNI has helped encourage federal funding, inspired foreign governments to develop their own programs, fostered cross-disciplinary networks and partnerships, and resulted in the unprecedented collaboration of 16 government agencies.

Funding

NNI realized that in order to realize the full potential of nanotech, government funding for early stage research and development was required. Their efforts helped drive the increase of federal R&D investment from \$116 million in FY1997 to \$849 million in FY2004. NNI investment is five-fold: 1) fundamental research, 2) centers of excellence conducting research within host institutions, 3) infrastructure development including instrumentation, standards, cyber infrastructure, and other research tools, 4) research on societal impacts including educational needs and workforce preparations, and 5) nine grand challenges focused on specific R&D areas directly related to nanotechnology applications potentially resulting in a return on investment.

Chemical Industry Role

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In 2002, NSET invited the Vision2020 group to develop a roadmap based on the first NNI grand challenge, Nanostructured Materials by Design. The Chemical Industry Vision 2020 Technology Partnership is made up of diverse chemical industry representatives. They had previously developed technology roadmaps on other key topics of interest to the US chemical industry. Their key recommendation was a fundamental change in the R&D approach. They urged US stakeholders to invest in solutions-based approaches where material requirements for specific applications drove the design process. This contrasted with the current methodologies where discoveries are made first, and their applications determined second.

In the short-term, the *Nanomaterials by Design Roadmap* called for the development of physical and cyber infrastructure, interdependent and multidisciplinary research, and industry commitment and involvement. In the long-term, a complete understanding of nanoscale physics and chemistry embodied by a library of nanomaterials and synthesis techniques is desired.

Current State of NNI and Vision 2020

Approximately two thirds of NNI funding is awarded by participating agencies to support academic research. A significant percentage of funding also supports partnerships between researchers and private enterprise. It is estimated that private industry is investing just as aggressively. To date, over 100 nanoscience and technology centers of excellence for individuals and institutions are planned or are operational. The NIH will kick off the Nanomedicine Roadmap project on May 4 as they focus on how new technologies can improve human health. The business community has also taken notice, with numerous nanotech venture capital opportunities and the creation of a nanotechnology index on the American Stock Exchange.

AIChE has seen nanotech interests grow within the chemical engineering community with technical programming at national meetings increasing by 500% since 2000. Shortly, AIChE will take a broader, strategic look at its own nanotechnology initiatives to determine what actions should be taken in education, industry involvement, and membership in order to advance the chemical engineering role in nanotechnology. It seems to be an obvious fit, especially since nanotechnology is, as a NIST

fact sheet describes it, simply the breaking and making of chemical bonds - something chemical engineers have been refining for nearly a century.

Upcoming Meetings

The First International SBE Conference on Bioengineering and Nanotechnology, 26 to 29 September 2004, Biopolis, Singapore

Online registration and abstract submission for ICBN 2004 have now been activated. Visit www.icbn2004.com for more details and conference updates. Confirmed invited speakers: Nicholas Abbott, Kristi Anseth, David Edwards, James Heath, Adam Heller, Alan Hoffmann, Gil Lee, Kam Leong, Daniel Morse, Buddy Ratner, Ryong Ryoo, Kenneth Smith, Myron Spector, Gregory Stephanopoulos, Galen Stucky, Samuel Stupp, James Swartz, Matthew Tirrell, Feng-Shou Xiao, Shuguang Zhang, and Dongyuan Zhao.

Topical Conference on Nanoscale Science and Engineering, Annual Meeting of the AIChE, Austin, Texas, Nov.7-12, Austin Convention Center, Austin, TX

<http://www.aiche.org/conferences/annual/index.htm> **Topical Conference on Nanoscale Science and Engineering**, 2005 Spring National Meeting of the AIChE, April 10-14, Hyatt Regency, Atlanta, GA

NSEF Officers

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