Center for Nanotechnology Education and Utilization Bulletin – April - May, 2007

The Penn State Center for Nanotechnology Education and Utilization (CNEU) is the home of the Pennsylvania Nanofabrication Manufacturing Technology (NMT) Partnership, and the NSF Advanced Technology Education (ATE) Center for Nanofabrication Manufacturing Education. It is also the Penn State home of the NSF National Nanotechnology Infrastructure Network (NNIN), the national NSF nanotechnology resource for enabling academic and industry R&D.

**The CNEU Mission:**

The CNEU is dedicated to research, development, and education across all aspects of micro- and nanotechnology. The Center resources are focused on addressing the incorporation of nanotechnology into secondary education, into post-secondary education, and into industry applications.

**CNEU – Highlights of Upcoming Activities:**

**Capstone Semester Update:** The spring 2007 capstone semester is now complete. Congratulations to the eighteen students who successfully completed the rigorous semester and are now on to the next step in their educational journey or have graduated their degree programs and are entering the working world to contribute to our economy. The summer 2007 capstone semester began on May 21st. Twenty two students are presently immersed in the eighteen-credit twelve week summer session. Registrations are still being accepted for the fall 2007 capstone which will begin on August 27, 2007. Registration for the spring 2008 and summer 2008 capstone semesters are also being accepted. Please contact Lisa Daub at 814-865-9635 (ldaub@engr.psu.edu) to register, or for further information.

**Hands-On Nanofabrication Workshop for Educators:** Attention educators! Registrations are now being accepted for the November 13-15, 2007, three-day Hands-On Nanofabrication Workshop for Educators. Participants will learn about the growing applications of nanotechnology in many industries including the biotechnology, MEMs, optoelectronics, chemical and electronics industries. The basics of nanofabrication processes and tools will be covered and practiced through a combination of classroom lectures and hands-on processing labs in the class 10 clean rooms of the Penn State Nanofabrication Facility. Please contact Lisa Daub at 814-865-9635 (ldaub@engr.psu.edu) to register, or for further information.

**2007 NNIN REU Program:** During the summer of 2007, the National Nanotechnology Infrastructure Network will again host a Research Experience for Undergraduates Program (NNIN REU) from June 4 through August 12 at the nation wide university NNIN research facilities. The experience will culminate with an NNIN-wide convocation which will be held at the University of California at Santa Barbara (UCSB). A wide-range of engineering and science students with broad interests across disciplines focusing on nanotechnology applied for this program. Congratulations to the five deserving undergraduate students who were selected for the Penn State summer research experience: Andrea Boock (Penn State Altoona), Courtney Bergstein (Carlow College), Ashley Colletti (The Johns Hopkins University), Jonathan Ligda (Shippensburg University), and Ashlee Mangan (Carlow College).

**2007 NNIN Research Experience for Teachers (RET) Program:** During the summer of 2007, the Penn State National Nanotechnology Infrastructure Network site in conjunction with the Penn State Science Education Department is again offering teachers (in-service and pre-service) the opportunity to experience the excitement of nanotechnology research and to share this experience in their classrooms and with their peers. Congratulations to the four Pennsylvania teachers Mary Knight (in-service), Tara Fitzsimmons (in-service), Travis Lee (pre-service), and Bill Swann (pre-service) who were selected this year for the Penn State RET program. They will begin their 2007-08 experience on June 25, 2007. This program is also concurrently offered to teachers (in-service and pre-service) by four other NNIN sites: Georgia Institute of Technology, Harvard University, Howard University, and the University of California Santa Barbara. Some of the objectives of this program are to assist a diverse group of science teachers in understanding and communicating the importance of using inquiry-based methods to solve problems by doing research in nanotechnology and to establish a long-term mentorship support group of teachers who will become advocates for nanotechnology education and careers. More detailed information on this program can be accessed at [http://www.cneu.psu.edu/neNewsEventsRETAnnounce.html](http://www.cneu.psu.edu/neNewsEventsRETAnnounce.html).

**Summer Nanotech Camps:** The CNEU will again be hosting ten three-day Nanotechnology Introduction Camps during the summer of 2007. These Nanotech Introduction Camps, for students in 9th grade and above, are a great opportunity to learn about nanotechnology and nanofabrication. Careers are explored and educational pathways to nanofabrication careers are discussed. The agenda is designed to be interactive and fun, while still maintaining a high level of introductory level knowledge. For further information on Nanotech Camps and to make camp reservations, please contact Ms. Darlene Fink at 814-863-2955 or dfink@engr.psu.edu.

**NMT Partnership Industry Outreach Initiative:** In collaboration with area NMT Partners, a series of Industry Outreach Meetings entitled “Competitive Modern Manufacturing through Nanotechnology” are presently scheduled or are in the planning stages at various locations across the Commonwealth in the upcoming months. The desired outcome for this initiative is to reach as many companies as possible to share: a beginning understanding of nanotechnology, the current and forecasted impact of nanotechnology upon the marketplace, and to make them aware of the nanotechnologist worker pool available to them through the NMT Partnership. Please contact Bob Ehrmann at 814-865-7558 (rehrmann@engr.psu.edu) or Darlene Fink at 814-863-2955 (dfink@engr.psu.edu) for additional information.
NMT Partnership Educational Outreach Initiative:  Again, in collaboration with area NMT Partners, a series of Educational Outreach Meetings are being scheduled at NMT Partner facilities across the commonwealth of Pennsylvania. The objective of this initiative is to introduce the nanotechnology and the nanotechnology education program available through NMT Partnership to as many students as possible at NMT Partner institutions.  Please contact Bob Ehrmann at 814-865-7558 (rehrmann@engr.psu.edu) or Darlene Fink at 814-863-2955 (dfink@engr.psu.edu) for additional information.

CNEU Program Highlights for April - May 2007

May 2007 - Hands-On Nanofabrication Workshop for Educators:  The latest offering of this three-day workshop was held May 15-17, 2007 with twenty two educators in attendance. The participants learned about the growing applications of nanotechnology in many industries including the biotechnology, MEMs, optoelectronics, chemical and electronics industries.  The basics of nanofabrication processes and tools were covered and practiced through a combination of classroom lectures and hands-on processing labs in the class 10 clean rooms of the Penn State Nanofabrication Facility and the CNEU Educational Cleanroom.  Eleven of the workshop participants were non-Pennsylvanians (Arkansas, Michigan, New York, Virginia, West Virginia, and Wisconsin) representing secondary and post-secondary institutions in those states.  The next workshop in this continuing series will be held November 13-15, 2007.

Lock Haven Nanotechnology Students / Faculty Visit Seagate and Plextronics:  Seven undergraduate students and three faculty members from the Nanoscience programs at Lock Haven University participated in industry presentations and tours of Seagate and Plextronics in Pittsburgh on May 16, 2007. These tours were organized at the request of Lock Haven University through the PSU CNEU, through their Industry Advisory board members from Seagate, Dr. Earl Johns and Plextronics, Dr. Shawn Williams. At these company laboratories the students found from first hand experience how these companies use nanotechnology techniques in the development of their products. This tour was particularly significant for them as the students were able to understand and relate some of the concepts that they have worked on in laboratory and classroom settings to work place settings. At Lock Haven University all nanoscience programs require the summer capstone semester experience at PSU CNEU in the second year of their program. The students then continues applying these techniques through advanced laboratory and research experiences within their fields when they complete the last two years of their BS degrees at Lock Haven University in their respective science major.

NMT Industry Advisory Board Regional Meetings:  The PA NMT Advisory Board’s most recent meetings took place as a series of regional meetings during May 2007. These meetings were held in strategic locations across Pennsylvania to best facilitate the participation of key industry and NMT partner representatives.  Three partner institutions hosted these regional advisory board meetings (Community College of Allegheny County May 8, 2007; Montgomery County Community College, May 9, 2007; and Northampton Community College, May 10, 2007).  Industry representation came from a variety of large, mid-size, and small “start-up” nanotechnology companies, as follows: May 8th – Bayer Material Science, Kurt J. Lesker Company, Plextronics, PPG, RJ Lee Group, Solid State Measurements, and Seagate;  May 9th – Boy Machines, Data Friendly, Edlon, Fairchild Semiconductor, Rohm and Haas, Tyco Electronics, and Ultrafine Technologies (Delaware company); May 10th – Airgas, Air Products and Chemicals, LSI Corporation, Merck, and Saladax Biomedical.  In addition to industry representation at these meetings, other attendees included representatives from The Minerals Metals and Materials Society, The Pittsburgh Technology Council, Catalyst Connection, partner community college and baccalaureate educational institutions, and Center for Nanotechnology Education and Utilization personnel from Penn State.  The cumulative attendance for these three meetings was forty one.  The goal of these meetings was the same as it has been since the beginnings of the NMT partnership: to solicit industry input regarding the NMT Partnership courses, programs, and plans for the future.

Materials Day 2007:  CNEU staff members participated in the April 10-11, 2007 Materials Day sponsored by the Penn State Materials Research Institute (MRI).  CNEU staff presented a pre-conference workshop entitled “Competitive Modern Manufacturing through Nanotechnology” for eighteen five representatives of industry, government, and the university community.  The programs and initiatives of the PA NMT partnerships were available through a tabletop display at the conference.  Tours of the MRI building facilities including the NNIN Nanofabrication facility, the CNEU Educational Cleanroom, and the MCL laboratories were also given to interested industry and government representatives.


Teaching Clean Room Webcast:  A webcast entitled "Design and Implementation of an Educational Laboratory for Nanofabrication Manufacturing Technology" was held on Friday November 10, 2006 to introduce the new educational cleanroom at the Penn State Center for Nanotechnology Education and Utilization to a national audience.  The webcast included a video tour of CNEU's new Educational Laboratory, a presentation discussing facets of the design process (including laboratory layout, equipment purchase criteria, safety, support and maintenance) and concluded with a live question and answer session.  The webcast was recorded and is available for viewing at http://www.cneu.psu.edu/labwebcast.htm .

CNEU Website:  The CNEU website (www.cneu.psu.edu) continues to be available as an aide to prospective students, parents, educators, counselors, and industry personnel.  Highlighted website features include Nanotechnology Education Modules, Student and Industry
Video testimonials, NMT Associate to Baccalaureate Pathways, and information, overviews of the NMT Partnership Capstone Semester as well as other CNEU programs and offerings. An animation entitled “Amazing Creatures with Nanoscale Features” has been added to the educational tools - activities area of the website. This animation is an introduction to microscopy, scale, and applications of nanoscale properties. It introduces some of the tools that are used by scientists to visualize samples that are smaller than what we can see with our eyes.

CNEU Outreach: During the April and May period, the Center received 205 visitors representing 16 organizations. Offsite and remote access presentations impacted an additional 68 individuals at 6 sites.

For Further Information on these Highlights or on the NMT Partnership in general, please contact:

- Bob Ehrmann  (814) 865-7558  rke2@psu.edu
- Lisa Daub  (814) 865-9635  ldaub@engr.psu.edu