
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. The CNEU also coordinates the educational outreach activities for the Penn State site 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 nano- 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 summer 2008 capstone semester is now complete. Congratulations to the twenty seven students from all across Pennsylvania 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 fall 2008 capstone semester began on August 25, 2008, and fifteen students are presently immersed in the eighteen-credit fall session. Registrations are still being accepted for the spring 2009 capstone which will begin on January 12, 2009. Registration for the summer 2009, fall 2009, and spring 2010 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 next Hands-on Nanofabrication Workshop for Educators to be held December 2-4, 2008 at the Center for Nanotechnology Education and Utilization (CNEU) at Penn State University. This three-day workshop utilizes the facilities at Penn State to teach nanotechnology at an introductory level and also enables the participant to understand how nanotechnology is and will continue to be integral to STEM curriculum and careers. 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, utilizing the Penn State NNIN Nanofabrication Facility along with the CNEU educational cleanroom. Please contact Lisa Daub at 814-865-9635 (ldaub@engr.psu.edu) for further information. Please register online at http://www.cneu.psu.edu/newsevents_Dec08EdWorkshop.html.

NMT Partnership Career Day: The Pennsylvania NMT Partnership will again be holding a Career Day on November 10, 2008 at University Park. This event which will be held at the Penn Stater Conference Center in University Park, PA will bring together Pennsylvania employers, students enrolled in the capstone seminar, and alumni of the NMT capstone seminar. This NMT Career Day is a great way for students to update their skills, refresh knowledge, reconnect with former classmates, and network with Pennsylvania nanotechnology companies. For further information please contact Pham Oanh Pham at 814-865-9662 (ppham@engr.psu.edu). More information and an event registration form can be accessed from the CNEU home page at www.cneu.psu.edu.

NMT Partnership Industry Outreach Initiative: In collaboration with area NMT Partners, a series of Industry Outreach Workshops entitled “Competing in the 21st Century: The Nanotechnology Edge” 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 what nanotechnology is and the immense opportunities that nanotechnology offers, 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. For information on our upcoming schedule for these events, please see www.cneu.psu.edu. Please contact Bob Ehrmann at 814-865-7558 (rehrmann@engr.psu.edu) or Darlene Fink at 814-863-2955 (dfink@engr.psu.edu) for any additional information.

NMT Partnership Educational Outreach Initiative: The fall 2008 recruitment season is underway. Jamie Houseknecht is presently in the process of scheduling a series of Educational Outreach events at NMT Partner facilities across the commonwealth of Pennsylvania. These outreach opportunities will continue during the spring 2008. The objective of this initiative is to introduce nanotechnology and the nanotechnology education program available through PA NMT Partnership to as many students, administrators, and faculty as possible at NMT Partner institutions. This program along with the always welcome visits and tours to University Park are great opportunities to spread the word about the incredible academic opportunity available to Pennsylvania students. Please contact Jamie Houseknecht at 814-865-5285 (jhu147@psu.edu) or Darlene Fink at 814-863-2955 (dfink@engr.psu.edu) for additional information. To schedule a facility tour on line please see http://www.cneu.psu.edu/edOutreachSecEdTour.html.

Website Upgrade: The CNEU website is presently undergoing redesign. The new and improved student-centric website is scheduled to launch this fall semester. Watch for it!
**CNEU Program Highlights for July - August 2008**

**National Nanotechnology Infrastructure Network (NNIN) Research Experience for Undergraduates (REU) Program Convocation:** The NNIN REU Convocation was held August 10-14 at the Cornell University. The Convocation was the culminating experience for the 2008 NNIN REU program brought together seventy four select undergraduate students from colleges and universities from across the nation who each performed a ten week summer research experience at one of the thirteen NNIN partner institutions. Penn State University hosted five of these students: Amy Beaston (Tulane University), Dustin Keefer (Beloit College), Sarah Koehler (Cornell University), Jill Lowman (Old Dominion University), and Yaw Owusu-Boamah (Virginia Commonwealth University). Each student worked on a research project for a PSU researcher. The PSU faculty members who directed these summer 2008 projects were Dr. Michael Hickner, Dr. Jun Zhu, Dr. Aman Haque, Dr. Melik Demirel, and Dr. Suzanne Mohney. The invaluable PSU NNIN REU mentors for this summer 2008 were Stephanie Petrina, Ke Zou, Mohan Manoharan, Hui Wang, and Kartik Karpatwari. In addition Courtney Bergstein attended the Convocation and presented on her summer 2008 second year research experience in Japan. Ms. Bergstein was a summer 2007 PSU REU student and a May 2008 graduate from Carlow College, who competed with other 2007 REUs for and earned her spot for this second year international experience. Congratulations to the 2008 REU students, their mentors, the PSU faculty, Ms. Bergstein, and all of the NNIN REU participants on a job well done.

**National Nanotechnology Infrastructure Network (NNIN) / PSU Science Education Research Experience for Teachers (RET):** The CNEU and Penn State Center for Science and the Schools jointly hosted 2 in-service and 2 pre-service secondary teachers from Pennsylvania for a six week research experience from June 23, 2008 through August 1, 2008. 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. This years teachers experienced research first hand, collaborated with PSU research faculty, and helped to develop lesson plans and activities to be utilized back in their home classroom to assist in the teaching of science utilizing nanotechnology. The research objective for this cohort of teachers was to gain hands-on experience in the synthesis of nanowire sensors. The teachers fulfilled this objective by garnering experience is growing silicon nanowires with chemical vapor deposition. They learned about practical applications for this emerging technology. The teachers also successfully developed a lab on a chip platform using microfluidics to perform different tests designed by students in biology and chemistry curricula. Follow-up with these teachers will occur during this school year, where these teachers will continue to collaborate with CNEU and CSATs personnel on nanotechnology in-classroom activity development. Hollidaysburg Area High School will be using this project in a senior research class where students will continue the work of the teachers with the assistance of CNEU staff and the participating RET teacher at that school. This experience will culminate by participation at the National Science Teacher’s Association National Conference in New Orleans in the spring of 2008. Congratulations to the four Pennsylvania teachers Mamadou Kane (in-service), Lynette Luke (in-service), Mark Merritt (pre-service) and Elizabeth Haggerty (pre-service) for their performance this summer during the RET.

**Summer Nanotech Academies:** Eight three-day Nanotechnology Introduction Academies were completed in June and July. The total attendance this year was 133 students and 33 chaperones. These Nanotech Introduction Academies, for students in 9th grade and above, serve as an acknowledged, excellent opportunity to learn about nanotechnology and nanofabrication. Again this year, processing, characterization, and applications of nanotechnology were covered and, careers were explored and educational pathways to nanofabrication careers were discussed. The agenda for this year was again improved to be even more interactive and fun, while still maintaining a high level of introductory level knowledge. Please remember that 1 day nanotechnology experiences are available throughout the year. Please contact Ms. Darlene Fink at dfink@engr.psu.edu for further information on available nanotechnology experiences.

**CNEU Outreach:** During the months of July and August 2008 Center received 239 visitors representing 10 organizations. Offsite and remote access presentations impacted an additional 79 individuals at 4 sites.
**Center Assets Reminders:**

**Student Recruitment Brochure and Recruitment Video are Available:** The Center published a new recruitment brochure and produced a new 9 minute recruitment video to attract students into nanotechnology degree programs at Pennsylvania Partner schools in the summer of 2008. The new tag line developed during this process is “Take Matter Into Your Own Hands: The Capstone Semester: Your Pathways to a Career in Nanotechnology”. The video can be viewed on the Center website at http://www.cneu.psu.edu/nePublications.html#capstoneVideo. The brochures and DVD copies of the video can be attained by contacting Darlene Fink at 814-863-2955 dfink@engr.psu.edu.

**Penn College Nanotechnology Video Available on CNEU Website:** In mid November 2007, the Pennsylvania College of Technology and WVIA public television released a broadcast production entitled “Degrees that Work - Nanotechnology”. The video introduces 21st century career and education opportunities to viewers. This 30-minute presentation explores nanotechnology and the related career opportunities with experts in the field. The production follows a former Penn College student, Mark A. Atwater, as he completes the capstone semester at The Pennsylvania State University’s Center for Nanotechnology Education and Utilization. The video can be accessed at http://www.cneu.psu.edu/edCapstoneVideo.html.

**Testimony to U.S. House of Representatives Committee on Science and Technology:** On June 19, 2007 Professor Stephen Fonash gave invited testimony on Nanotechnology Technician Education before the House Subcommittee on Research and Science Education. This testimony was part the subcommittee’s examination of role that community colleges play in recruiting and training skilled technicians and industry workers in the advanced manufacturing industry. Complete transcripts and videos of this event are available at http://www.cneu.psu.edu/newsevents_061907subCommitteeTestimony.html.

**Teaching Cleanroom Webcast:** We continue to have requests from associates across the nation to access the teaching cleanroom webcast entitled "Design and Implementation of an Educational Laboratory for Nanofabrication Manufacturing Technology". The webcast 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, overviews of the NMT Partnership Capstone Semester as well as other CNEU programs and offerings. Recent additions to the website include the 30 minute video entitled “Degrees that Work – Nanotechnology” which was produced by the Penn College of Technology, and the new 9 minute student recruitment video.

**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