

## National Nanotechnology Infrastructure Network Vol.4 # 2

### A Periodic Newsletter of NNIN News and Announcements

July, 2008

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## NNIN

The National Nanotechnology Infrastructure Network consists of 13 nanotechnology user facilities at 13 major academic institutions. Funded by the National Science Foundation, our facilities are available to the national user community on an open basis. We provide accessible resources across the entire breadth of nanotechnology. To this end, each site has specialized areas of expertise within the network, ranging from biology and chemistry to materials characterization and traditional microfabrication. Complete information on NNIN sites, resources and access is available via the web site at [nnin.org](http://nnin.org)

## Program Highlights

### NNIN International Winter School for Graduate Students

NNIN announces and solicits applications for its first [International Winter School for Graduate Students](http://www.nnin.org/nnin_iwsg.html). This two week program in India offers an intense graduate level course in Organic Optoelectronics and Electronics, coupled with a rural technology implementation experience. The course will take place at IIT Kanpur, Dec. 8-19, 2008. The program is open to graduate students (U.S.Citizens or Permanent Residents) of the highest quality from across the United States with an application deadline of Sept. 10, 2008. Participants need not be NNIN Users. All living and transportation expenses will be covered. For further information, visit [http://www.nnin.org/nnin\\_iwsg.html](http://www.nnin.org/nnin_iwsg.html).

### REU

Each summer NNIN conducts a large **Research Experience for Undergraduates** program with over 70 students participating at the 12 sites. The 2008 participants have recently started their program and will be continuing until Aug. 10. They will all gather at Cornell University for an end of program Convocation Aug 11-13 where they will present their results to their peers. This REU program, now in its 12th year, is supported by the NSF REU program, by the NSF NNIN award, and by Intel Corporation. Applications for the 2009 program will open in November.

### iREU

NNIN realizes that the development of globally aware researchers is critical to research in the 21st century. As a follow on to its highly successful REU program, NNIN has begun a second year program in conjunction with the **National Institute of Materials Science** in Japan and the **Forshungzentrum Julich** in Germany. Some of the best students from last year's REU program were selected for a second summer of intense research in an international environment; five at NIMS in Japan and three at the Forshungzentrum in Julich. These students are in place and are having a wonderful and unique research experience. This program not only provides an advanced research experience for these select participants but demonstrates to them the global nature of

scientific research and that, even early in their careers, they can be effective researchers in an international environment. This program is supported by the IRES and IREE programs within NSF.

## New Equipment Highlights

### **Penn State Equipment Additions: RIE for complex Oxides and XPS upgrade**

The [Penn State facility](#) has installed a Tegal 6540, a high-density plasma etch tool specifically for etching of complex oxide materials. This tool features the unique HRe- reactor, and Tegal's patented dual-frequency RF power technology and magnetic plasma confinement. This system is a critical enabler for etching noble metal electrode and capacitor materials, including PZT, as well as other ferroelectric, magnetic, high-K dielectric, compound semiconductor, and interconnect materials. According to Professor Theresa Mayer, Associate Director, Materials Research Institute, and Professor of Electrical Engineering, Penn State University has extensive experience in the deposition, etching, characterization, and integration of complex oxide thin films for piezoelectric, pyroelectric, tunable dielectric, and electro-optic device applications. The Nanofabrication Laboratory at Penn State offers our academic and industrial users unique access to these advanced processing capabilities. The Tegal 6540 plasma etching system will add significant new strengths, for example the etching of thick PZT, to our growing suite of complex oxide device fabrication systems. Penn State University has also upgraded their Kratos X-Ray Photoelectron Spectrometer to include a Delay-Line Detector (DLD) for rapid spectral acquisition and quantitative chemical state imaging, and a hot/cold stage for sample temperature control from +600C to -100C.

### **New Equipment at UT-Austin**

The [MRC UT-Austin](#) is doing installation of new equipments in the cleanroom:

- Field Emission Scanning Electron Microscope: Zeiss Neon 40 with EBL capabilities from Raith.
- CHA Industries Ion Assisted E-beam evaporator. The system has 4 crucibles of 25cc, a cryogenic pump and state-of-the-art controller for thin film growth.
- Stylus profilometer Veeco Dektak 150 for 2D-characterization of surfaces with a large scan length, 3D surface analyses and stress measurement.
- Veeco Dimension Nanoman VS Atomic Force Microscope System with Scanning Capacitance Microscopy (SCM) and Tunneling/Conductive module.

### **New DRIE Tool and Contact Aligner at Michigan**

To improve redundancy and satisfy high demand from the user community, the [Lurie Nanofabrication Facility at Michigan](#) has purchased a second STS DRIE and a second Suss MicroTech MA-6 contact aligner. The existing STS DRIE and Suss MA-6 are two of the busiest tools in the LNF toolset and the additional equipment will help the LNF provide better service to its user community. [www.mnf.umich.edu/MNF](http://www.mnf.umich.edu/MNF)

### **New Equipment at Harvard Center for Nanoscale Systems**

The [Center for Nanoscale Systems at Harvard University](#) has purchased multiple new instruments as the Center has transitioned into a bigger footprint in the recently constructed

Laboratory for Integrated Science and Engineering (LISE) building. Below is just a partial list of the exciting new line-up of tools already here or coming in the next couple of months:

Tools already commissioned or to be online soon include:

- STS ICP RIE (commissioned)
- STS PECVD (commissioned)
- Cambridge Nanotech Savannah-200 ALD (commissioned)
- Orion Helium Ion Microscope (commissioned)
- 1040 NanoMill (commissioned)
- Versalaser Cutting/Engraving System (commissioned)
- Toho FLX-2320 Stress Measurement System (commissioned)
- Witec NSOM (commissioned)
- Denton E-beam Evaporator (commissioning underway)
- Lakeshore 1.5K Probe Station (commissioning underway)
- Finetech Flip Chip Bonder (ordered, arriving soon)

Please contact the Center for Nanoscale Systems at [info@cns.fas.harvard.edu](mailto:info@cns.fas.harvard.edu) to inquire about these and other new, improved, or expanded capabilities.

## Facility Highlights

### Dedication of the University of Michigan's New Cleanroom

The expanded [Lurie Nanofabrication Facility](#) at the University of Michigan was officially dedicated on April 11th, 2008. The University of Michigan is currently investing more than \$65M to renovate and expand the existing cleanroom from 6,500 to over 12,500 square feet of state-of-the-art class 10/100/1000 and 10,000 cleanroom facilities. The expanded facility will serve a wide variety of research and instructional needs including microelectronics, high-speed nanoelectronics, optoelectronics, polymer-based organic electronics, nanomaterials, MEMS, BioMEMS, as well as a vast array of nanotechnology-based research programs and start-up businesses. In addition to state-of-the-art facilities, the expanded laboratory will boast the latest in safety features assuring safe 24/7 operation. More information is available at [www.mnf.umich.edu/MNF](http://www.mnf.umich.edu/MNF)

## Technical Courses and Training Events

### Aerosol & Particle Measurement: August 18-20, 2008

### Air & Gas Filtration: August 21-22, 2008

The University of Minnesota's Particle Technology Laboratory presents two aerosol short courses this summer. Aerosol & Particle Measurement (August 18-20) includes material on air pollution, industrial hygiene, and nanoparticle technology as well as aerosol sampling and measurement for bioaerosol, cleanroom and contamination control. The course covers both fundamentals and applications to meet the growing demand of professionals for training in the aerosol field. Air & Gas Filtration (August 21-22) provides training for industrial and university personnel interested in the fundamentals of air and gas filtration and their applications to air and gas cleaning for nuclear, microelectronics, automotive/gas turbine, respiratory protection, building ventilation, indoor air quality, hospital air purification, and other applications. For

complete information and registration, visit: <http://www.cce.umn.edu/conferences/aerosol/>

### **BioMEMS & Microfluidics for the Life Sciences: August 28-29, 2008**

The [University of Minnesota's Nanofabrication Center](#) will present **BioMEMS and Microfluidics for the Life Sciences: A Hands-On Two-Day Introduction to the Field**. This short course is designed to provide an understandable overview of microfluidics for biomedical applications. It is intended for those who might be interested in becoming involved in the microfluidics field, but need a basic outline of what is possible and how the devices are designed and built. For complete details, visit: <http://www.nano.umn.edu/biomems08/>

### **SAME-TEC Conference 2008, Metrology Workshop at MRC UT-Austin, July 28-31, 2008**

During the [SAME-TEC](#) pre-conference day, UT experts will demonstrate the use of Atomic Force Microscopy (AFM), Profilometer, Scanning Electron Microscopy (SEM), Optical Microscope, Transmission Electron Microscopy (TEM), and Ellipsometer, to explore the micro to nanoscale material properties. Participants will compare analysis performed on AFM vs. Profilometer and SEM vs. Optical Microscope on patterned wafers. Participants will have the opportunity to see deeper (down to atomic level) with the MRC's TECNAI TEM. Ellipsometry will reveal the optical property of film as thin as a few nanometers. The participants, under the supervision of a UT expert, will operate the characterization tools and make their own SEM images of carbon nanotubes.

For more information: <http://www.matec.org/convention/index.htm>

Contact Angela Obolsky at [angela.obolsky@domail.maricopa.edu](mailto:angela.obolsky@domail.maricopa.edu)

### **Workshop on Surface Modification by Ion Beams at the University of Michigan**

The Michigan Ion Beam Laboratory at the University of Michigan is organizing a workshop on Surface Modification by Ion Beams on September 18th, 2008. This workshop will be beneficial to all those who wish to learn about surface modifications by ion beams and to conduct experiments utilizing these techniques.

The workshop objectives are: presentation of the basics of ion implantation, ion beam assisted deposition and accelerator based surface modification and analysis, discussion of current and potential applications, and hands-on laboratory applications of these techniques. For more information, go to <http://www-ners.engin.umich.edu/research/Mibl/index.html>

### **Materials Characterization Short Courses at Penn State**

Penn State University's Materials Research Institute will be conducting a Materials Characterization Short Course Series: SURFACE CHARACTERIZATION and VIBRATIONAL SPECTROSCOPY, Monday-Friday, August 18-22, 2008, Room 206 Penn State Conference Center Hotel, State College, PA. For more information or to register, visit the website at <http://www.mri.psu.edu/facilities/MCL/events/shortcourses.asp>

## **Education and Outreach News and Events**

### **Nanooze**

Nanooze is the NNIN's science news magazine/web site for children. It presents nanotechnology and related science concepts in a light, colorful format, primarily for middle school students. Previously available only on the web ([www.nanooze.org](http://www.nanooze.org)), Nanooze is now also available in

print. Due to mailing expense, individual copies are not distributed; Classroom packs are distributed to teachers at major conferences and NNIN events, or by mail by direct request. Teachers can request packages (multiples of 30) for current or future issues directly from NNIN ([rathbun@cnf.cornell.edu](mailto:rathbun@cnf.cornell.edu)).

Nanooze is a project of NNIN, the [Cornell Nanoscale Facility](#), and Prof. Carl Batt of Cornell.

### **NNIN Education Presentations**

The NNIN education program is nationally recognized for its broad contributions to nanoscale education. The contributions of the NNIN education program are highlighted in the following national and international presentations.

- Annual meeting of the American Society for Engineering Education - Research Experience for Undergraduates in Nanotechnology: Analysis of Participants 1997-2007 Nancy Healy and Lynn Rathbun, June 22-25, 2008, Pittsburg, PA.
- Invited talk at the International Conference on Electronic Materials (IUMRS-ICEM 2008) Promoting a K-Gray STEM involvement through nanotechnology education and outreach programs Nancy Healy, Lynn Rathbun, and Sandip Tiwari, July 28 August 1, 2008, Sydney, Australia.

### **AFM to Support Education Programs**

The [NNIN site at Georgia Tech](#) has recently acquired a NanoScience EasyScan AFM for use as an education and outreach tool. Two high school teachers participating in the NNIN Research Experience for Teachers Program are working this summer with this instrument to help design classroom activities suitable for physics classrooms. The UCSB site has also obtained a similar EasyScan AFM for educational activities.

### **NanoCamps for Middle and High School Students at Michigan**

NanoCamps have been organized at the [Lurie Nanofabrication Facility at the University of Michigan](#) for groups of Middle/High school students. The April edition of the NanoCamp was synchronized with the NiseNet NanoDays and was a large success, with about 50 students coming and learning about micro- and nanotechnology. The next NanoCamp is scheduled for July 15th, see <http://www.mnf.umich.edu/Events.aspx?id=96>

## **Job Openings**

### **Technical Staff at Harvard**

Center for Nanoscale Systems at Harvard University is seeking talented, enthusiastic individuals to fill two open technical staff positions within the Center.

- Requisition 33909 Biological/Advance Imaging Scientist
- Requisition 34264 Principal FIB Engineer

To learn more about these positions or to apply, please go to the CNS web site, <http://www.cns.fas.harvard.edu>. Harvard University is an Affirmative Action/Equal Opportunity

Employer. Harvard requires pre-employment reference and background screening for these positions. Candidates must be authorized to work in the United States.

**Director of Operations - Penn State Nanofabrication Laboratory**

Penn State s Nanofabrication Laboratory is seeking a highly-qualified [Operations Director](#) to provide onsite management and to interface with external and internal users of the laboratory....

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NNIN is a network of open user facilities. All resources at member facilities are available equally to users from Academia, industry, and government. Contact information and facility details are available via the NNIN web site at <http://www.nnin.org>.