

# National Nanotechnology Infrastructure Network Vol.3 # 1



## A Periodic Newsletter of NNIN News and Announcements

Feb. 2007

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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 [nmin.org](http://nmin.org)

### New Equipment and Processes

#### **Stanford installs AMAT Centura epitaxial reactor**

SNF has completed installation and released to SNF's labmembers a Centura epitaxial reactor donated by Applied Materials. This system will enhance the capability of the lab for processing of silicon, silicon/germanium and germanium epitaxial films for electronic and micromechanical devices. It will complement SNF's existing high rate ASM epsilon II epitaxial reactor.

#### **Stanford acquires J.A. Woollam 2000 ellipsometer**

SNF has acquired a J.A. Woollam M2000 spectral ellipsometer with WVASE 32 analysis software. This system uses multiple wavelengths and multiple angles to analyze multilayer film thicknesses and optical constants.

#### **Cornell Installs Dimatix printer**

The Cornell Nanoscale Science and Technology Facility has installed a Dimatix materials ink jet printer. This device allows printing with various materials inks, allowing direct patterned deposition of semiconductors, metals, and insulators on both hard and flexible materials with feature sizes down to 20 um and drop sizes as small as 1 pl. The tool also has interesting biotechnology applications as well as applications to sensors and flexible electronics. CNF staff will be working closely with the Dimatix applications lab to assure that CNF has access to the most advanced processes. CNF encourages users to join it in developing new materials processes or to employ this tool for new applications.

#### **NCSU Evaluates BioForce Enabler**

BioForce Nanosciences has loaned the NCSU NNIN site a Nano eNabler for six months

to evaluate and develop processes. The Nano eNabler operates somewhat like an atomic force microscope with a fountain pen like tip such that it can deposit sub-micron to micron scale droplets and patterns of liquid substances. The liquids can be of widely varying viscosity, and everything from polymers to quantum dots, DNA and proteins, can be deposited. It is particularly useful for bio-electronic applications. For more information and access information, please go to <http://www.tnlc.ncsu.edu/>

### **Imprint Master Fabrication at U. Texas Austin**

The University of Texas at Austin announces it that now offers full processing of Imprint Masters for imprint lithography, compatible with the Molecular Imprints tool. At least two masters per month are being fabricated. A Users Group is being established to share expertise and experience on template fabrication as well as on imprinting between IMPRIO users.

## **Facilities**

### **UCSB Occupies New Facility**

UCSB is excited to announce the completion of our move to the new nanofabrication facility. The facility contains 12000 SF of class 1000 or better floor space to house research tools for advanced nanofabrication techniques. The move to the new facility has doubled UCSB's wet process capabilities and photo-lithography offerings, including the addition of a second GCA i-line wafer stepper and Karl-Suss MA/BA-6 aligner. Additional new capabilities include:

- a VEECO Nexus ion-beam-deposition system for high-quality optical coatings
- a custom-made wafer fusion furnace and Karl-Suss SB6 substrate bonder
- a new VEECO Dektak VI profilometer
- a Nanonex NX2000 Nanoimprinting system

## **Workshops and Conferences**

### **Nanotechnology Occupational Health Symposium**

In October 2005, the University of Minnesota hosted the 2nd International Symposium on Nanotechnology Occupational Health on the Minneapolis campus. Springer is now publishing a book this month (February 2006) on Nanoparticles and Occupational Health (Andrew Maynard and David Y. H. Pui, Editors). See: <http://www.springer.com/978-1-4020-5858-5>. The on-line version of the book, a Special Issue of the Journal of Nanoparticle Research, is currently available free of charge.

### **Cryo and 3D Electron Microscopy Workshop**

Friday, March 23, 2007

The Pennsylvania State University

The Penn Stater Conference Center and Hotel

Co-sponsored by Materials Research Institute  
and The Huck Institutes

<http://www.mri.psu.edu/conferences/cryoTEM/index.asp>

## Template Fabrication Workshop

The Microelectronics Research Center (MRC) at UT-Austin will tentatively hold its 3rd workshop with lectures on the morning and hands-on session on the afternoon on Tuesday March 20th. We will focus on quartz template fabrication for our imprinting lithography system (IMPRIO100). Check the event MRC/NNIN web site (<http://www.mrc.utexas.edu/nnin-events.html>) for a detailed schedule and registration form.

## Research Results

### Optical Breakthrough Makes Lab-on-a-Chip Possible - Compact device can pack big sensing power on a chip

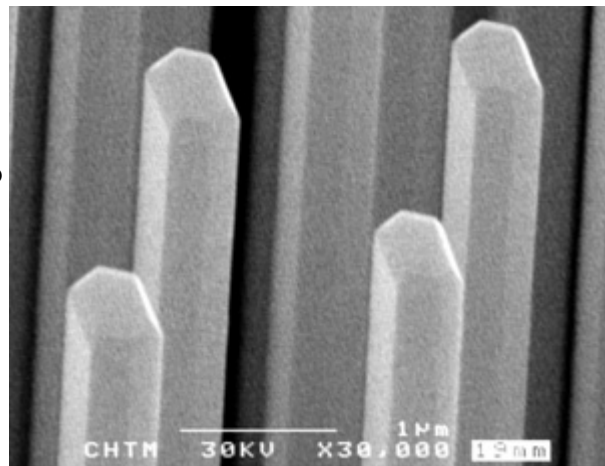
Georgia Tech researchers have found a way to shrink all the sensing power of sophisticated biosensors such as sensors that can detect trace amounts of a chemical in a water supply or a substance in your blood onto a single microchip. The full article is found at <http://grover.mirc.gatech.edu/news.php?id=57>

### Taking Nanolithography Beyond Semiconductors

A new process for chemical patterning combining molecular self-assembly with traditional lithography to create multifunctional surfaces in precise patterns at the molecular level has been developed at the Penn State facility. The process allows scientists to create surfaces with varied chemical functionalities and promises to extend lithography to applications beyond traditional semiconductors. The new technique, which could have a number of practical chemical and biochemical applications, was described in the 22 December 2006 issue of the journal *Advanced Materials* by a team led by Paul S. Weiss, Distinguished Professor of Chemistry and Physics at Penn State, and Mark Horn, Associate Professor of Engineering Science and Mechanics at Penn State. See more information: <http://www.science.psu.edu/alert/Weiss12-2006.htm>

### GaN Nanowire Devices

Professor Stephen D. Hersee of the Electrical & Computer Engineering Department at UNM is receiving international attention for his research into devices based on the semiconductor GaN in the form of nanowires. At the heart of this work is a unique process invented by Prof. Hersee and two of his students, Xinyu Sun and Xin (Allen) Wang, for fabricating uniform arrays of GaN nanowires. In these state-of-the-art arrays, the position, orientation, diameter and length of each nanowire is precisely controlled. This scaleable GaN nanowire process promises not only to develop revolutionary new photonic and electronic devices but also



to move GaN nanowires from their current status as a laboratory curiosity into production. This work was highlighted in Nature Nanotechnology in August, 2006. Working closely with Sandia National Labs and other collaborators, and with funding from DARPA, ARO and Sandia National Labs, the work is now pushing towards active devices. The team has recently demonstrated diode electrical behavior and optically pumped lasing, both in single nanowires. There is international interest in licensing the intellectual property associated with this nanowire process, and Prof. Hersee is working closely with the STC.UNM to develop this IP. A New Mexico start-up company was recently launched and will develop products based on this GaN nanowire technology. Figure shows electron microscope images of precision GaN nanowire arrays. Steve Hersee, [shersee@chtm.unm.edu](mailto:shersee@chtm.unm.edu)

## Outreach

### Howard University Announces the Nanoexpress

The NanoExpress is a self contained mobile nanotechnology laboratory for outreach purposes. The Nanoexpress will be formally dedicated on Feb. 15th in an event at Howard University. It contains a photolithography facility, a combination SEM/TEM, an AFM, and other nanotechnology demonstration instruments. The Nanoexpress, staffed by Howard University staff and students, visits schools and various community events, providing an introduction to nanotechnology. Already over 4000 students have experienced Nanoexpress.



## Other News

### Open positions at Harvard Node

The Center for Nanoscale Systems (CNS) at Harvard University is currently hiring for two nanofabrication positions. CNS is looking for a Nanofabrication Engineer and a Principal Nanofabrication Engineer. Both positions require the ability to operate, maintain, and repair Chemical Vapor Deposition (CVD) and Physical Vapor Deposition (PVD) systems within a research cleanroom environment. Additional duties for each position available online at CNS website: [www.cns.fas.harvard.edu](http://www.cns.fas.harvard.edu). For the Principal Nanofabrication Engineer position, applicants should have a B.S. degree and seven years of relevant experience or advanced degree. For the Nanofabrication Engineer position, applicants should have a B.S. degree and three to five years relevant experience.

**1st prize winner in Raith Micrograph Award 2006!**

Congratulations to Swapnajit Chakravarty, a student working with prof Bhattacharya at the University of Michigan Solid State Electronics Laboratory and a user of the Michigan Nanofabrication Facility, who won the 1st prize at the Raith Micrograph Award 2006 competition. [Click here for more details](#)

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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>