

The Minnesota Nano Center is Moving

The new Physics and Nanotechnology Building (PNB) is nearing completion. Handover of the building from the contractor to the University is scheduled for early November. Furniture will then be moved into the building. MNC offices will shift to the new building around the first of the year. We expect to begin using the facilities there for training in January. We will start moving equipment from the current lab to the new building in early December. The tentative outline is shown below. **Users should plan their work accordingly.** While we will make every effort to minimize down time, the unforeseen is always possible.

Vistec EBL	December	AJA 2 Sputterer	January
Cleanroom SEM	December	MA-6 Aligner	January
Heidelberg	December	Ion Mill	February
CHA Evaporator	December	Oxford Etcher	February
AV Etcher	December	Nano Imprint	March

We will continue to operate the clean room in Keller Hall as part of MNC. Users will be able to use either or both facilities. The Keller Hall facility will be equipped primarily for micro scale research including MEMS, microfluidics, materials, and large devices. The PNB facility will be more targeted to nano scale research work. Staff will be housed in PNB, but will have desk space in the current maintenance staff area in Keller. Professor Jianping Wang's C-SPIN Center will be moving into the current MNC administrative offices, while the current process staff area will be repurposed for visiting users.

I think that you will be extremely impressed with the new clean room in the new PNB. I certainly am. The lab is spacious, brings new functionality, and is an extremely prominent location. New capabilities include a plasma ALD system, the new bionano wet lab, and the new nanomaterials wet lab all of which we are currently projecting to become available by April. Look for more information on these new labs in the January newsletter.

The Physics and Nanotechnology Building, as of September 2013.



Reminder: If your work uses the Minnesota Nano Center (formerly NFC) please add the following in the acknowledgements section of any publication: "Parts of this work were carried out in the Minnesota Nano Center which receives partial support from NSF through the NNIN program."

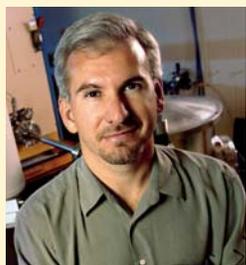
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CHARACTERIZATION FACILITY NEWS

CHARFAC DIRECTOR'S MESSAGE



*CharFac Director,
Greg Haugstad*

Many issues of this newsletter have highlighted CharFac equipment acquisitions. These items have been of strong interest to both our internal user base (eight colleges within the University of Minnesota) and external academics and industrial companies. The human part of CharFac, however, has received less attention, particularly in terms of partnering with external users. The roles of the CharFac staff are multifarious. Externals can purchase CharFac analytical services, as done with commercial service providers, or may seek training by the staff for hands-on usage of CharFac instrumentation (and thus pay only rental time beyond training). Thirdly, there may be prospects for **research collaboration**, wherein staff members develop/improve analytical capabilities but with a focus on materials and issues of interest to our industrial partners. In this issue we further describe and highlight such interactions.

Since the inception of the Characterization Facility 25 years ago, many companies have accessed CharFac's suite of instrumentation for hands-on usage and/or analytical work performed by the CharFac's technical staff. (The latter is charged at prices consistent with and determined by the

commercial analytical services market, as required by federal statutes.) Usually this work targets proprietary issues, protected by the University's contractual documents. In addition there has been some research collaboration with the CharFac staff, most commonly IPRIME member companies who are active in the Nanostructural Materials and Processes research program. (IPRIME: Industrial Partnership for Research in Interfacial and Materials Engineering, www.iprime.umn.edu). Other research interactions with the CharFac staff have been funded by (i) corporate grants via the University's Sponsored Projects Administration (SPA) office, or (ii) SBIR grants (Small Business Innovation Research) from federal grant agencies (e.g., NSF, NIH) to companies who in turn subcontract the CharFac. The CharFac intends to more aggressively pursue all of these possibilities in the future.

Within just the past couple of years, however, the CharFac has become much more involved in research collaborations with IPRIME members via the **industrial fellows** program. These are interactions that explore publishable topics and are thus classified as academic in nature (i.e., charged at internal academic charge rates as defrayed by membership dollars). CharFac staff members seek to improve their understandings of analytical methods as applied to complex materials important to industry. In some cases new analytical methodologies are developed (e.g., atomic force microscopy for nano-tribological characterization under variable humidity). In others, the complementarity of techniques is explored to a greater extent than is typically employed in service work. In the past two years, some interactions have targeted (1) biomedical technologies such as lubricious catheter coatings or drug-eluting polymeric materials that serve as coatings on angioplasty balloons or as insulating collars of electrical device leads; and (2) rubbery multiphase materials for mechanical applications, such as nanocomposites containing inorganic nanoparticles dispersed in polymeric matrices. In all cases general scientific issues are being explored, though in the context of real industrial problems. Results are presented at the annual IPRIME meeting and usually written up for publication in journals, conference proceedings and/or book chapters.

Please feel free to email haugs001@umn.edu with questions about research collaboration or to simply discuss your technical problem, whether it is amenable to open research or proprietary in nature.

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Greg Haugstad, Director

MINNESOTA NANO CENTER NEWS

MNC DIRECTOR'S MESSAGE



*NFC Director,
Steve Campbell*

By the time the next newsletter reaches you, we will be in the new Physics and Nanotechnology Building. The lab was originally housed in the fifth floor of the old EE building. The south wing of that building was demolished after Keller Hall was built to permit expansion of the ME building. We opened up the Keller Hall lab in 1990. At the time, we had about 30 users, mostly from four or five EE faculty groups. Our lab was led by the Lab Director, Mr. Wally Lindeman, who came to us from Control Data. The building project was driven by Dean Enfante.

The facility has served us well under many names (Micro Lab, MLRE, NFC, and now MNC) but our user base of 330 has outgrown it. Our internal users come from 14 departments and bring in about 10 million dollars in research contracts per year. Almost 100 users are from outside the University. External users include nearly two dozen educational institutions. MNC has also become an incubator where companies can try out new ideas, build prototypes, and interact with faculty and students. The new building would not have happened without the leadership of Dean Crouch. It will ensure that Minnesota remains very big in things that are very small, for decades to come.

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CHEAPER PHOTOMASKS

Do you want to make chrome-on-glass photomasks for under \$100? If you're an academic member of MNC you can do so by making it yourself. Learn to operate the DWL200 laserwriter system from Heidelberg Instruments to expose photomasks rather than have MNC staff make your mask. Starting late September we will be offering training classes on how to use the DWL200 to expose photomask plates with your mask designs. We still are offering a full mask service with pricing for academic masks at \$206 for features down to 1.5 microns, and \$363 down to 1.0 microns. Industrial pricing is \$465 for features down to 1.5 microns. The design rules and mask submission form can be found on the lower left side of the MNC home page: www.mnc.umn.edu. Questions can be emailed to nfcmasks@umn.edu.



Heidelberg DWL200 Laserwriter

NEW USER ORIENTATION

MNC is offering New User Orientation for new users twice each month. On the first Thursday of every month, the session begins at 1pm, and on the third Thursday of the month the session begins at 10am. A MNC staff member provides a tour showing some of the safety related equipment and the gowning process used for the MNC cleanroom. There is also training on using Badger, the lab software. The safety training takes about one hour to complete, and must be done before users will be granted access to MNC facilities. See the 'For New Users' section of our website for complete information: <http://www.mnc.umn.edu/secondary.php?nav=newusers>

NANOTECHNOLOGY NEWS

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Minnesota Nano Center: www.mnc.umn.edu

The MNC is a state-of-the-art facility for interdisciplinary research in nanoscience and applied nanotechnology. The Center offers a comprehensive set of tools to help researchers develop new micro- and nanoscale devices, such as integrated circuits, advanced sensors, microelectromechanical systems (MEMS), and microfluidic systems. The MNC is also equipped to support nanotechnology research that spans many science and engineering fields, allowing advances in areas as diverse as cell biology, high performance materials, and biomedical device engineering.

The MNC is composed of two main facilities. Our current clean room and associated labs, formerly known as the Nanofabrication Center, are housed in Keller Hall. The Keller Lab has a 3000 square foot Class 100 clean room, and an additional 4000 square feet of labs and support areas.

In late 2013, the MNC will open a new research facility in the Physics and Nanotechnology (PN) building. The new PN Lab facility will offer a larger and more advanced clean room, with state-of-the-art tools for fabricating structures under 10 nanometers in size. The MNC will also offer two new specialized labs to support interdisciplinary research in bio-nanotechnology and nano-and micrometer-scale materials.



The National Nanotechnology Infrastructure Network: www.nnin.org

The National Nanotechnology Infrastructure Network (NNIN) is an integrated networked partnership of user facilities, supported by the National Science Foundation, serving the needs of nanoscale science, engineering and technology. The mission of the NNIN is to enable rapid advancements at the nano-scale by efficient access to nanotechnology infrastructure. The NNIN supports the Minnesota Nano Center at the University of Minnesota. As a node in NSF's National Nanotechnology Infrastructure Network (NNIN), the NFC provides access to advanced multi-user facilities to both industry and academic researchers, the latter at a subsidized rate.