



Winter 2019

## Save the Dates for this Summer's Workshops!

### Second Annual Nanomedicine Short Course June 6-7, 2019

Like last year, this year's short course will feature presentations on research at the intersection of nanotechnology and the life sciences. Speakers will offer attendees an introduction to the world of nanomedicine, covering topics including nanoparticle drug delivery, nanoscale biosensors, and advanced biomedical devices. The first day of the short course will feature presenters from a variety of institutions and academic backgrounds, describing their work in applying nanoscience to the life sciences. During the second day, registered attendees will take part in a hands-on laboratory session to learn more about some of the lab techniques used in the field. Due to limited lab space, the hands-on lab session is limited to 20 attendees, so preregistration will be required. Admission to the short course is free and open to everyone with an interest in the subject.

More information and registration forms will be on our web site ([mnc.umn.edu](http://mnc.umn.edu)) by early May. For more information contact Dr. Jim Marti, at [jmarti@umn.edu](mailto:jmarti@umn.edu) or 612-626-0732. We hope to see you at the Nanomedicine Short Course!

### Fourth Annual 2D Materials Summer School June 13-14, 2019

The summer school provides a unique opportunity for graduate students to learn about the emerging field of 2D materials. The summer school consists of a two day program. On the first day, students hear lectures from world-leading experts in 2D materials, while on the second day, they gain hands on experience with modeling tools and laboratory techniques. In previous programs, leading researchers from prominent institutions such as Harvard, Stanford and Columbia have provided outstanding talks on a wide range of topics including 2D material growth, electronic and photonic devices, spintronics, and biosensors, both from a theoretical and experimental point of view. Links to previous programs can be found on the Midwest Nano Infrastructure Corridor (MINIC) website: <http://minic.umn.edu/2d-materials/summer-program-2018>. For the first time this year, the program will include speakers from international institutions. Complete workshop and registration details will be on our web site ([mnc.umn.edu](http://mnc.umn.edu)) by the end of February. We hope you can join us for this year's event!

#### ACKNOWLEDGEMENT REMINDER

If your work uses the Minnesota Nano Center, please add the following in the acknowledgements section of any publications: "Portions of this work were conducted in the Minnesota Nano Center, which is supported by the National Science Foundation through the National Nano Coordinated Infrastructure Network, Award Number NNCI -1542202."

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# characterization FACILITY news



*CharFac Director,  
Greg Haugstad*

CharFac's recently installed low-temperature scanning tunneling microscopy system in Shepherd Labs (see photo) is now open for training and analytical work. The Omicron LT-STM is an ultrahigh vacuum local probe technique which allows characterization of topography and electronic structure at controllable temperatures between 5 K and 500 K. The instrument has a capability of ~5 pm topographic resolution, single point surface spectroscopy, and mapping spectroscopic information to topographic features on an atomic scale. The system is equipped with an *in situ* sample heater, Ar ion sputter gun, and tip annealing stage.



## CharFac at the University of Minnesota

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Greg Haugstad, Director

Thus far the STM/STS has been used for the analysis of the surface electronics of simple metals and complex semiconductors. Please contact staff scientist Dr. Geoff Rojas ([garojas@umn.edu](mailto:garojas@umn.edu)) for more information, including complementarity with ultraviolet photoelectron spectroscopy methods on our Phi Versaprobe.

In January CharFac participated in the Midyear Workshops of IPRIME, our industrial consortium, by holding a 2-day workshop/demo event highlighting methods for surface and thin film analysis. Based in part on this experience as well as our most recent facility-wide workshop/demo events (Aug. 2016, 2017), we are considering narrower foci for some future events. One challenge in broad events is that some content may not be pertinent to certain technologies (and thus attendees); for example methods that provide information on electrical conductivity in vacuum (which is not so pertinent to the lubricity of intrabody device coatings for example), or on hydrated soft matter (which is not so pertinent to microelectronics development). A more targeted event might indeed have a *technology focus*; not as narrow as the preceding examples but perhaps on inorganic thin films (whether for electronic applications or others), or thick-to-bulk polymeric materials (whether for biomedicine or otherwise). A second idea is to hold an event that considers specific *industrial problems*, combining "challenge statement" talks from industry with pertinent analytical technique talks. A third kind of event, perhaps more advanced and internally facing, might emphasize *atypical methodologies* used with otherwise well-known instruments (e.g., aqueous-immersion AFM, cryo electron microscopy, cross-sectional microanalysis) as well as *less commonly used instruments* (e.g., for Rutherford backscattering, microtensimetry, electron energy loss spectroscopy). We are very interested to hear from both current and prospective users/clients! Please communicate interests to [cfac-dir@umn.edu](mailto:cfac-dir@umn.edu).

Behind the scenes, CharFac is in the process of creating a new web site that adopts the look and feel of the Drupal development environment (for consistency across the University). The new environment will make it much easier for us to update web pages for new instrumentation, events, initiatives and more. In the process we are adding new types of content to better serve both our user base and general visitors to the site. Drupal will also provide more contemporary widgets and be more easily viewed on mobile devices. We anticipate launching the new site this spring.





*MNC Director,  
Stephen Campbell*

As a node of the NSF National Nano Coordinated Infrastructure (NNCI) Network, MNC gets annual feedback on how our users view the lab. Our figures for 2018 were quite positive. 99% rated MNC as Very Good or Excellent (our average score was 4.8 on a scale of 1.0 to 5.0). 100% said that they would recommend the Lab to a friend. Individual staff members also received quite a bit of positive feedback. We thank you for this. We also received suggestions for improvements. Greg and I are currently looking through these suggestions to see how we can make your experience in MNC better. You can expect this opportunity to comment annually, but if you have suggestions on how the Lab could make your work better, don't hesitate to let us know. If you would like to see the survey results in more detail, go to the MNC web page and click on the For Current Users link under the For Lab Users pull-down menu.

Finally I want to remind you about acknowledging NNCI support on our publications. Please help us retain NNCI support by using the following verbiage in all of your publications that use the lab in any way: "Portions of this work were conducted in the Minnesota Nano Center, which is supported by the National Science Foundation through the National Nano Coordinated Infrastructure Network, Award Number NNCI1542202."

## Minnesota Nano Center at the University of Minnesota

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Steve Campbell, Director  
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## New Tools at the Nano Center

Several new tools have been added to the Nano Center's cleanrooms and labs, including a high speed benchtop centrifuge, a new reactive ion etcher, and a sensitive UV-Vis spectrophotometer.

The new reactive ion etcher (RIE), an Advanced Vacuum Vision 320 mK II RIE tool, is being installed in bay 3 of the Keller cleanroom. The etcher is plumbed with the same gases as our existing STS etcher (fluorine based chemistry), and will be used as a general etching tool for a variety of thin film materials, including dielectrics and semi-conductors.

Two new tools have been installed in the Bio-Nano Lab. A Beckman Allegra X-30 benchtop centrifuge has been added to the lab, allowing users to rapidly concentrate particle dispersions and perform separations of cell cultures. The X-30 is equipped with both fixed-angle and swinging bucket rotors. The latter rotor can accommodate up to 1.6 L of material, while the fixed angle rotor is capable of very high spin speeds and forces (18,000 rpm/29,000g).



A NanoDrop UV-Vis spectrophotometer by Thermo Scientific is the latest addition to the Bio-Nano Lab. The NanoDrop One C is easy to use and can quantify DNA, RNA, and protein samples in seconds with only 1-2  $\mu$ L of sample (a 5 mL cuvette is available for larger samples). Absorbance spectra can also be obtained from liquids, solutions, and suspensions.

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## Minnesota Nano Center and the National Nanotechnology Coordinated Infrastructure

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.

In September 2015, the National Science Foundation funded the National Nanotechnology Coordinated Infrastructure (NNCI). MNC is part of this initiative, along with our partner facility at North Dakota State University. The NNCI aims to advance research in nanoscale science, engineering and technology by enabling NNCI sites to provide researchers from academia, small and large companies, and government with access to university user facilities with leading-edge fabrication and characterization tools, instrumentation, and expertise within all disciplines of nanoscale science, engineering and technology. The NNCI framework builds on the National Nanotechnology Infrastructure Network (NNIN), which enabled major discoveries, innovations, and contributions to education and commerce for more than 10 years.

### *Nanotechnology News from the University of Minnesota*

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Comments and suggestions are welcome! Would you like to be added to or removed from our distribution?

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This publication is available in alternative formats upon request.

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