

## Announcements

- VINSE pilot funding
- Acknowledgement text for publications that include work in VINSE facilities
- Facility tour policy
- VINSE conference room available for booking
- New and updated capabilities in core facilities
- Personnel and committee updates
- Coming soon: workshops and VINSE billing and reservations transitioning from CORES to iLab

More details found on pages 2-4 and on [vu.edu/vinse](http://vu.edu/vinse)

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## Save the Dates

**October 14th**  
Fall Faculty Celebration

**November 22nd**  
20th Annual NanoDay!

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## Director's Note:

As the new Director of VINSE, I am excited to have the opportunity to lead our institute with the goals of continuing to provide:

- Outstanding service and capabilities in our shared user facilities
- An environment that is conducive to collaborative research in nano- and micro-scale science and engineering
- Immersive educational experiences in our core facilities
- Exciting and impactful STEM outreach experiences for K-12 students in Middle Tennessee and the surrounding counties

Over the course of this first year of my directorship, I am launching new programs aimed at increasing the Vanderbilt community's awareness of VINSE resources, increasing synergies between researchers with a materials focus and researchers with a biology/medicine focus across all Colleges and Schools in Vanderbilt and VUMC, and offering student immersion opportunities consistent with Immersion Vanderbilt graduation requirements. Please stay tuned for notices of upcoming **workshops** that highlight the capabilities of our tools and **meetups** where we will bring together groups of researchers to discuss potential areas of collaboration that build on existing research strengths in VINSE (Nano + X). We are also undertaking a review of our current tool capabilities and future user needs to put together a five-year plan for acquiring upgraded and new instrumentation. Your input is encouraged and welcomed – please talk with members of the VINSE User Committee (listed on p. 4) or email [vinse@vanderbilt.edu](mailto:vinse@vanderbilt.edu).

A new **pilot funding** program commenced earlier this semester with four new projects already approved. I encourage you to utilize this new VINSE resource to explore how VINSE facilities and technical staff can help advance your research initiatives. Our technical staff are available to consult with you and work with you to demonstrate the feasibility of your new projects.

An important part of my role as VINSE Director is being responsive to the needs of the VINSE community. Accordingly, if you have a suggestion for ways to make VINSE more impactful for you, please feel free to reach out to me or send an email to [vinse@vanderbilt.edu](mailto:vinse@vanderbilt.edu). To make myself more accessible to the VINSE community, I will be holding **Coffee Breaks with the Director** every Friday from 10am-noon in the VINSE conference room (ESB 226) – no appointment needed, just stop by to chat and have a cup of coffee or tea.

I look forward to working together with all of you to make VINSE an even more valuable resource for Vanderbilt.

Sharon Weiss  
Director, VINSE

## VINSE Pilot/Feasibility Studies – Funding Available

Funding is available from VINSE on a competitive basis to provide Vanderbilt investigators the opportunity to utilize VINSE tools to obtain preliminary results for new research initiatives prior to submitting grant applications. Applications from users interested in demonstrating the feasibility of a new process or measurement are encouraged, and all necessary staff support will be provided. Typical awards range from a total of \$500 to \$2000 for up to 6 months on a fiscal year basis with all funds dedicated to VINSE user fees. Proposals will be judged based on scientific merit, likelihood for success, and the potential impact VINSE will have on the project. The number of awarded projects is subject to the availability of funds. Proposals are accepted throughout the year and are reviewed at the end of each month. Please visit the [VINSE website](https://www.vanderbilt.edu/vinse/) for more details and to apply for this funding (<https://www.vanderbilt.edu/vinse/pilot-funds.php>). VINSE pilot/feasibility study funding is made possible by support from Vanderbilt's Trans-Institutional Programs (TIPs).

## VINSE Acknowledgement

VINSE users should add the following acknowledgement to all publications that include work done in VINSE facilities:

*[A portion of]\* this research was conducted at the Vanderbilt Institute of Nanoscale Science and Engineering.*

\*Please replace [A portion of] with a description of what fabrication, characterization, or measurements were carried out in VINSE. For example, "Scanning electron microscopy imaging was conducted at...."

## VINSE Facility Tours

Requests for VINSE facility tours should now be made via the VINSE website and should be submitted at least two weeks prior to the event (<https://www.vanderbilt.edu/vinse/tours.php>).

VINSE offers both guided and self-guided tours of our facilities.

Guided Tours - Our guide will show you around the outside of the labs where you can look into the various areas and see the equipment and researchers at work. This tour takes approximately 30 minutes.

Guided Tour Add-on - Want to dress up like a nanoscientist? We can add-on a gowning activity where one or two members of the tour group gown up in cleanroom bunny suits in the lobby before the window tour. This typically adds 30 minutes to the tour.

Window Tour of VINSE Cleanroom (Self-Guided) - Take a window tour using our self-guiding posters positioned in the appropriate locations in each of the bays of the cleanroom. Read about different research techniques and then look in through the windows to see where that activity is actually done. Start the tour at the corner of the cleanroom inside the Engineering and Science Building across from the Wond'ry.

Advanced Imaging Visualization Center (Self-Guided) - Learn about VINSE imaging capabilities at the visualization center in the basement of the Engineering and Science Building. Watch live video feeds from all four VINSE imaging tools in real time.

## VINSE Conference Room Available for Booking

Members of the VINSE community can now book our conference room, located in 226 of the Engineering and Science Building, by emailing a request to [vinse@vanderbilt.edu](mailto:vinse@vanderbilt.edu). Video conferencing is available for use with programs such as Skype and WebEx. Laptops and tablets can be connected via air media or using the HDMI cable provided in the room.

**ATOMIC LAYER DEPOSITION (ALD)** Installation of the new Picosun R200 Advanced ALD tool is complete and processes are now being run to deposit conformal films with atomic level precision. The ALD tool is capable of both thermal and plasma based deposition processes, and is equipped with a diffusion enhancer for high-aspect ratio structures, an ultrasonic system for nanoparticle depositions, an in-situ spectroscopic ellipsometer for film growth studies and precise deposition control, and an ozone generator. Recipes for  $\text{Al}_2\text{O}_3$ ,  $\text{AlN}$ ,  $\text{TiN}$  and  $\text{VO}_2$  films are currently available for researchers to use and recipes for  $\text{TiO}_2$ ,  $\text{ZnO}$  and  $\text{AZO}$  films are expected to be available by the end of 2019.

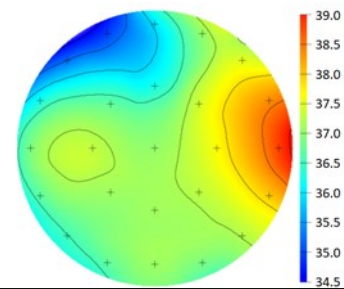
**SOFT LITHOGRAPHY** VINSE has developed a range of processes to support users in soft lithography activities for applications spanning microfluidics, cell biology, lab-on-a-chip, and flexible electronics/photronics. Services available include device design, SU-8 and silicon mold fabrication, plasma bonding, PDMS surface functionalization, preparation and etching of polymers, electrode integration, wax printing, 3D printing, and flow testing. Paper-based fluidics applications are also supported. Devices fabricated at VINSE include patterned surfaces and stamps, microfluidic networks, microfluidic cell habitats, fluidic valves, cell traps, and flexible electronics. In Spring 2020, VINSE will offer MSE 3890/6392 – Fabrication of Microfluidic Systems, a class that teaches fundamental knowledge and incorporates hands-on laboratories in which the students will fabricate microfluidic devices inside the VINSE cleanroom.

**PHOTOMASK DESIGN & FABRICATION** VINSE now provides a full suite of photomask design and fabrication services. Glass and transparency masks are made to order with resolution down to  $1\ \mu\text{m}$  (glass) and  $10\ \mu\text{m}$  (transparency). VINSE accepts designs in .dxf or .gds file format or can create designs from back of the envelope sketches. VINSE staff work with users to ensure masks fit their process requirements. Pricing is dependent on the mask write time; however, rates are guaranteed to be below those of commercial photomask services.

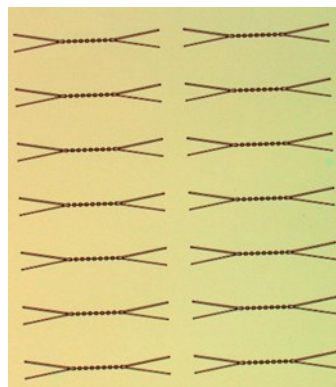
**New Capabilities on HELIOS DUAL BEAM FIB/SEM** In collaboration with the School of Medicine Basic Sciences and Center for Structural Biology, VINSE is expanding the capabilities of the Helios by adding a Quorum cryo-stage and a retractable directional back-scatter (DBS) detector. The new cryo-stage will enable the study of bacteria and whole cells, which are too thick for conventional electron microscopy, by thinning the cells to about 200 nm. The samples can then be imaged on the new Titan Krios tool highlighted below to investigate the structure and function of a complex within its native environment of the cell. The new DBS detector will enable improved material and topographical contrast. These new capabilities are expected to be available in early Spring 2020.

### Partner User Facility – Vanderbilt Cryo-Electron Microscopy Facility TITAN KRIOS TRANSMISSION

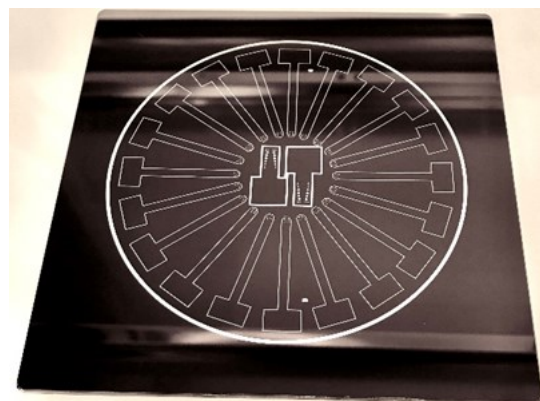
**ELECTRON MICROSCOPE (Cryo-EM)** The School of Medicine Basic Sciences and the Center for Structural Biology have acquired a new Thermo Fisher Titan Krios transmission electron microscope, which is located in ESB 003 adjacent to the VINSE Advanced Imaging facility. The Titan Krios is the state-of-the-art microscope for life science applications that allows for faster, simpler, and more efficient collection of high-resolution structural information of protein complexes, viruses and whole cells. Applications of the Titan Krios include investigation of single molecule interactions, the effects of small peptides bound to receptors, antibody recognition sites, and how single amino acid mutations can affect protein structure and function. For more information on the Titan Krios, please contact the Vanderbilt Cryo-Electron Microscopy Facility co-directors, Melissa Chambers <melissa.g.chambers@vanderbilt.edu> and Scott Collier <scott.e.collier@vanderbilt.edu>.



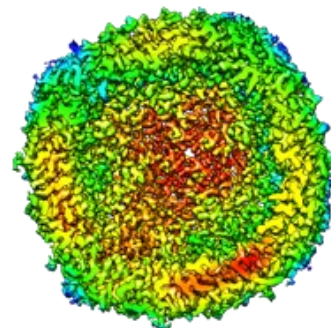
Thickness map demonstrating good uniformity of 37nm  $\text{Al}_2\text{O}_3$  ALD film across 6 inch wafer.



Silicon wafer mold for cellular microchannels fabricated in Oxford DRIE



Chrome – glass dark field mask used to fabricate graphene biosensors that probe electrical activity in the brain



Electron density map of the protein complex, apoferritin, from data collected on the new Titan Krios.

# VINSE Personnel & Committee

## VINSE Faculty Leadership

Sharon Weiss (Director) & Jason Valentine (Deputy Director)

## VINSE User Committee

Jason Valentine (Chair), Josh Caldwell, Janet Macdonald & John Wilson

## Administrative Staff: Updated Roles

Sarah Ross, Program Manager

Financial Unit Manager, Graduate Education, iLab/CORES, External Partnerships, Community Outreach, Reporting Statistics, Admissions & Website

Alisha McCord, Program Assistant

Special Event Management, REU Coordinator, Colloquium, Guest Travel, Publicity and Recruiting Materials, Social Media, Nanoseminar, Purchasing & Accounts Payable

## VINSE Technical Staff

Kurt Heinrich, Anthony Hmelo, Dmitry Koktysh, Alice Leach, William Martinez & James McBride

## VINSE Undergraduate Tech Crew

Megan Dernberger, Savannah Dubose, Dayana Espinoza, Patia Fann, Davis Fehrman, Hannah Hickman, Jamie Huang, Brandon Jacome-Mendez, Katie Johnson, Zakiya Mensah, Justin Mollison, Kristofer Ortman, Danielle Richardson, Sevrina Tekle, Steven Udotong & Lily Wald

## Quick Facts:

- 326 current trained facility users:
  - VU School of Engineering
  - VU College of Arts and Science
  - VU School of Medicine
  - VU Medical Center
- Industry Users:
  - Aegis Technologies
  - Nanosys, Inc.
  - Summit Information Solutions
  - Surnetics
  - Ultra Small Fibers, LLC
- External University Users:
  - Bilkent University
  - Emory University
  - Fisk University
  - Florida State University
  - Middle Tennessee State University
  - North Carolina University, Chapel Hill
  - Tennessee State University
  - Tennessee Technological University
  - University of Alabama, Huntsville
  - University of Memphis
  - University of Tennessee, Knoxville
  - University of Tennessee Space Institute
- VINSE faculty cumulatively publish 300 papers a year, with 25% of those being collaborative among VINSE faculty.
- Degrees awarded (*includes trained users of facilities for research or coursework*):
  - 393 Ph.D.
  - 2 M.D.
  - 87 Masters
  - 279 Undergraduate
- Number of students participating in immersion coursework
  - 47 graduate students
  - 115 undergraduate students

## Coming Soon

### Technical Workshops & Short Courses

Over the next year, VINSE will be organizing workshops to highlight the capabilities of VINSE instruments, with an emphasis on new applications at the intersection between nanomaterials and biology. VINSE will also offer short courses on topics such as Soft Lithography for Microfluidics and Cell Biology that combine hands-on laboratory sessions and supporting classroom lectures.

### iLab Implementation

This fall VINSE will transition from CORES billing/reservation system to iLab. VINSE facility users will be required to have an iLab account. Stay tuned for instructions on how to set-up your account. VINSE staff will be available to answer any questions you may have.