



## VANDERBILT INSTITUTE OF NANOSCALE SCIENCE AND ENGINEERING SPRING 2022 NEWSLETTER



### A Note from the Director

On behalf of the entire VINSE team, I wish you a Happy New Year! VINSE is offering a full suite of activities in 2022 while abiding by all university guidelines for health and safety. Highlights include a student-led workshop where you can learn how to add publication-quality false color to electron microscopy images, the first annual Nano Family Day where you and your family can enjoy fun nano-themed activities, and hands-on workshops in electron microscopy and microfluidics led by VINSE staff. I am very proud of how our VINSE community has responded to the challenges faced over the past two years during the pandemic. The VINSE team looks forward to supporting your impactful research discoveries in the year ahead!

Sharon Weiss  
Director, VINSE

### Spring Events

- 1/26 - Colloquium, Dr. Krishen Appavoo, University of Alabama, Birmingham
- 2/16 - GIMP Workshop
- 3/02 - Director's Coffee Hour
- 3/23 - Colloquium, Dr. Michael McAlpine, University of Minnesota
- 4/06 - Colloquium, Dr. Jon-Paul Maria, Pennsylvania State University
- 4/13 - Student Selected Seminar, Dr. Mark L. Brongersma, Stanford University
- 4/16 - Nano Family Day
- 6/06-6/07 - Electron Microscopy Workshop
- 6/16-6/17 - Microfluidics Device Fabrication Short Course

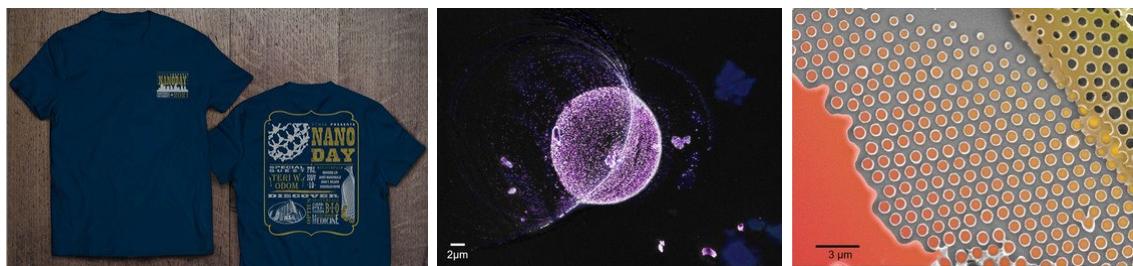
[Event Details](#)



## NanoDay! Recap

More than 170 faculty, postdocs, staff, and students attended the 21st annual Nanoscience & Nanotechnology Forum on November 19th. NanoDay! is our biggest event each year to celebrate research at the nanoscale. It is a big day for small science. Highlights from the 2021 event include:

- Chuchuan Hong received the first annual [Best Graduate Student Publication Award](#) for his paper "*Stand-off trapping and manipulation of sub 10-nm objects and biomolecules using opto-thermo-electrohydrodynamic tweezers*" published in *Nature Nanotechnology*.
- Isom Kelly was awarded the inaugural [Best Collaborative Publication Award](#). Isom's paper "*Tuning endosomolytic polymer composition in porous silicon composite nanoparticles for the delivery of anti-miRNA peptide nucleic acids*" was published in *ACS Applied Materials and Interfaces*.
- 51 posters were presented in this year's [NanoDay! poster competition](#). Congratulations to Garcia Carson (1st place); Maria Lopez Cavestany, Janna Eaves-Rathert (2nd place), Carli DeJulius, Evan Glass, Guanyu Lu, (3rd place) Nathan Spear (fan favorite) and Kieran Nehil-Puleo (IMS rotation).
- The 2021 image competition winners (below) were Elena Kovalik and Andy Du.
- Inspired by Nashville Hatch Print, Chris Sharp designed the winning [NanoDay! t-shirt](#).





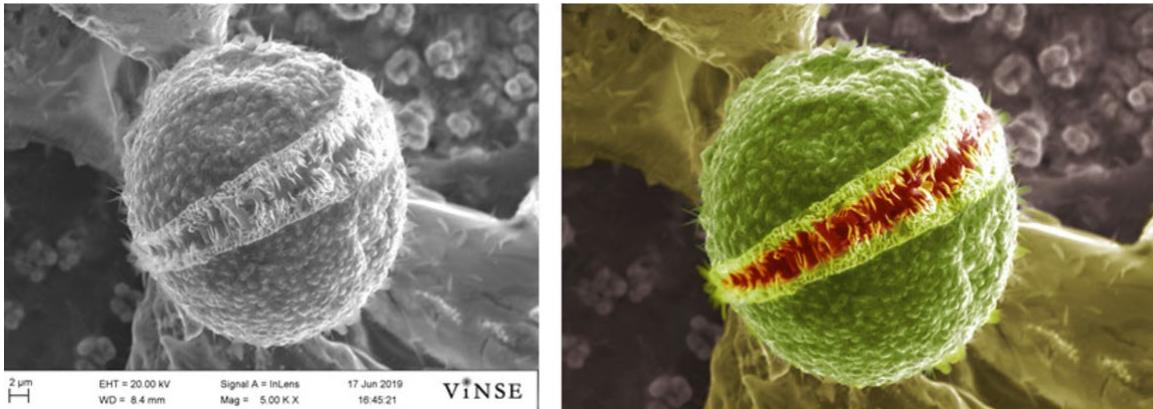
## Researcher Highlights

[Jeremy Espano](#) - 3rd year Ph.D. student Interdisciplinary Materials Science  
*Working on bottom-up phase control of metal chalcogenide nanoparticles*

[Ella Hoogenboezem](#) - 5th year Ph.D. student Biomedical Engineering  
*Using albumin to deliver gene silencing therapeutics*

[Dr. Kalman Varga](#) - Physics  
*Leveraging undergraduate researchers to study interactions of electromagnetic fields with matter*

[Dr. Cynthia Reinhart-King](#) - Biomedical Engineering  
*Working to identify new chemotherapeutic targets*



## Want to add false color to SEM images?

VINSE is organizing a student-led GIMP workshop. GIMP is an open-source image manipulation software that can be used for editing figures, colorizing electron micrographs, and more! In this workshop, we will learn the basics of the interface, specifically techniques for adding false color to an SEM image. No cost to attend.

[Register Now](#)

# Professional Development

## Electron Microscopy Workshop - June 6 & 7

Electron microscopy is a critical component for the characterization of material and biological specimens at the nanoscale. This two-day short course will blend accessible lectures with hands-on experience operating both the Zeiss Merlin SEM and the Tecnai Osiris advanced analytical TEM/STEM. After completing this course, users will know how best to operate both instruments to get the most information and achieve the best possible images. Specific techniques include secondary electron vs. backscattered electron imaging, bright field/dark field TEM, STEM and analytical SEM and STEM using energy dispersive spectroscopy. VU cost \$75.

[MORE INFORMATION](#) | [REGISTER](#)

## Microfluidic Device Fabrication Workshop - June 16 & 17

Microfluidic devices can enable “labs on chips” that consume less reagents and have faster analysis than similar experiments in a traditional lab environment for applications including sensing, cell biology, and high-throughput assays. This workshop will include an overview of microfabrication and microfluidics, photolithography, soft lithography, polymers, microfluidic device design, and microfluidic device applications. Students will fabricate a PDMS-glass microfluidic device inside the VINSE cleanroom with sessions broken down into SU-8 mold fabrication, PDMS mixing and pouring, and device cutting, bonding and testing. VU cost \$150.

[MORE INFORMATION](#) | [REGISTER](#)

## New Zetasizer

The capabilities of the Analytical laboratory are being upgraded by acquiring a flagman tool from Malvern Panalytical – Zetasizer Advance Series Ultra (Red Label). This new tool is the very best of the Zetasizer series and permits much more accurate and rapid measurement of particle and molecular size, particle charge and particle concentration. This new tool is expected to be fully operational by the middle of 2022.

[Learn more about the new zetasizer](#)



## Spring Outreach

240 students from 12 schools representing 10 middle Tennessee counties will visit Vanderbilt as part of the VINSE high school field trip program this spring. Groups of 20 from each school will visit our facilities, perform an experiment, utilize our electron microscope and learn about nanotechnology and energy during their day visit.

2022 participating schools: Columbia Central High School, Greenbrier High School, Gallatin High School, John Overton High School, Harpeth High School, Station Camp High School, Smith County High School, Stewart County High School, White County High School, Clarkrange High School, and Mt. Juliet High School.

# Remembering Professor Yaqiong Xu

We are deeply saddened by the loss of our VINSE colleague, Professor Yaqiong Xu, to a long-term illness last fall. Yaqiong joined Vanderbilt and the VINSE community in the fall of 2009 after receiving a PhD in Physics with Prof. Bang-Gui Liu from the Chinese Academy of Sciences in Beijing, China, a PhD in Electrical and Computer Engineering with Nobel Laureate Richard Smalley from Rice University, and completing postdoctoral training with Prof. Paul McEuen at Cornell University. At Vanderbilt, Yaqiong had faculty appointments in both EECS and Physics & Astronomy.

Yaqiong's research was in the area of low-dimensional materials and her group had many notable contributions exploiting novel optoelectronic properties of nanomaterials.



One experiment in particular exemplified the “tour de force” nature of Yaqiong’s research: the development of a carbon nanotube force sensor utilizing dual-trap optical tweezers to explore the interactions between a single suspended carbon nanotube and a single DNA base in the near-equilibrium regime with sub-piconewton resolution. This experiment took years of skill and patience to achieve and demonstrated the unique experimental capabilities developed by Yaqiong and her group. Over the past few years, Yaqiong was widely recognized for pioneering graphene-based scanning photocurrent microscopy of central nervous systems with unprecedented spatiotemporal resolution, allowing for detection of the electrical activities from individual spines and synapses.

Beyond her groundbreaking research achievements, Yaqiong helped to transform VINSE’s educational mission by introducing a significant immersive component to the Physics course Experimental Nanoscale Fabrication and Characterization, which enabled over 100 students from nine different majors to learn how to fabricate and characterize graphene transistors in the VINSE core facilities. Yaqiong was also a dedicated mentor who supervised Ph.D. students in both EECS and Physics. Yaqiong’s legacy will live on through the students she mentored and through those of us who had the opportunity to work with her in the VINSE community.

