

# NanoDay@Penn

[www.nanotech.upenn.edu](http://www.nanotech.upenn.edu)

**NANO / BIO INTERFACE CENTER**

October 26, 2016



# PROGRAM

## NanoDay@Penn

October 26, 2016

The Singh Center for Nanotechnology and the Nano/Bio Interface Center of the University of Pennsylvania sponsors a day of education and outreach programs for the Penn community as well as for regional high schools and neighbors. Activities include exhibits and demonstrations, laboratory tours, videos on nanoscale science, and a science fair featuring high school research projects. The day culminates with an awards program featuring a prominent keynote speaker.

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## OVERVIEW: Schedule of Events for **Wednesday, October 26, 2016**

All events are open to the public except for the High School group NanoTours. Additional details for the program are presented after the Schedule Overview. A map is on the final page of the program.

### **9:30 – 9:50 AM**

#### **NanoDay Opening – Introduction to some exciting topics in nanotechnology**

Skirkanich Hall, Berger Auditorium and Towne Hall Room 225, Raisler Lounge

What's so big & hot about nano? Graduate students introduce some key concepts and cool applications of nano-scale science.

### **10:00 AM – 2:00 PM**

#### **NanoDay Activities – Learn more about the Nano Sciences**

Exhibits and Demos (ends at 1:30): Explore exhibits and demonstrations highlighting nanoscale science and engineering presented by Penn research groups. *Tip: These demos will be very busy until 12:50. 12:50-1:30 pm will offer the best time to visit if you are not part of a school group.*

Singh Center, Rooms 105-106

Multimedia Presentation: Learn about exciting new discoveries from nanoscale researchers in physics, chemistry, physiology and engineering from this ongoing, big screen show. Levine Hall, Lobby and Singh Center, 1<sup>st</sup> Floor

High School Science Fair Research Projects: See posters and displays of research conducted by regional high school students. Displays will be available for viewing from 10 AM – 2 PM. To interact with the high school students about their work, visit the Science Fair during the judging, which will run from 12:30 PM – 1:50 PM. Levine Hall, Lobby

NanoTours and special college admission programs for visiting high school groups (pre-arranged; not open to the public)

**2:45 – 3:30 PM**

### **High School Science Research Awards Ceremony**

**Singh Center, Glandt Forum**

Winners from the High School Science Fair Research Projects will be recognized (judging runs from 12:30 PM – 1:50 PM in Levine Lobby).

**4:00 – 5:30 PM**

### **Keynote Address and Graduate Student Awards**

**Krishna P. Singh Center for Nanotechnology, Glandt Forum (3rd Floor)**

*Gold Nanocrystals: Physics, Chemistry, Biology, and Ecology*

**Catherine J. Murphy**, PhD, Keynote Speaker & 11<sup>th</sup> NBIC Research Excellence Awardee

*Beyond Graphene*

**Carl H. Naylor**, NBIC Graduate Student Research Award

*Graduate Student and Postdoctoral Image Awards will be announced.*

**5:30 – 6:30 PM**

### **Reception**

**Krishna P. Singh Center for Nanotechnology, Lobby**



## 10 AM – 1:30 PM Nanoscience Exhibits and Demos (12 tables)

Explore exhibits and demonstrations highlighting nanoscale science and engineering presented by Penn undergraduate and graduate students and postdocs. *Singh Center, Rooms 105, 106*

### Atoms, Light, and Colors

Bassett Group

<http://nanoquant.seas.upenn.edu/>

*The relationship between light and atoms is crucial to our understanding of the world and many technological devices. Our demonstrations start with how particular substances can change the color of light and end with how computer and phone screens are able to produce such clear and vibrant images.*

### Nanotribology: Friction at the Nanoscale

Carpick Group

<http://carpick.seas.upenn.edu/>

*We demonstrate the mechanisms of friction using a series of example surfaces and an incline plane. A model atomic force microscope provides an example of how research is carried out at the nanoscale.*

### Polymers are Different

Composto Group

<http://www.seas.upenn.edu/~polymer/>

*Experiments will be conducted showing the exciting properties of polymers.*

### Nanoparticle and Protein Design for Light Energy Conversion

Discher/Vinogradov Labs <http://www.med.upenn.edu/biocbiop/faculty/discher/> and

<http://www.med.upenn.edu/apps/faculty/index.php/g20/p11726>

*Nanoparticles and proteins can be designed in order to better harvest solar energy. Here, we will show how we can change the color of nanoparticles and proteins using oxidants, reductants, or light. Students will have a hands-on opportunity to mix reagents and proteins and use light to observe changes in color by eye and by a spectrophotometer.*

### Gold Nanoparticle Synthesis

Dmochowski Group

<http://dmochowskigroup.chem.upenn.edu/>

*Gold nanoparticles are tiny particles made up of gold atoms that can be highly useful in detecting and treating disease. Because of their small size, the way they interact with light changes dramatically, compared to the gold in jewelry or Olympic medals. Come make your own gold nanoparticles and explore how we can manipulate their color by changing their size!*

### Nanopore Explorin'

Drndic Group

<http://www.physics.upenn.edu/drndicgroup/>

*We will go through the process of sequencing DNA with nanopores.*

### Size of a Nano

Fakhraai Group

<http://fakhraigroup.chem.upenn.edu/index.html>

*Using a hand-held microscope, we'll show objects such as hair, crystal and pixel. A set of gold nano particles of different sizes will also be presented.*

**Nano-noses**

Johnson Group

<http://www.lrsm.upenn.edu/~nanophys/>

*We develop highly accurate sensors by using nanotechnology. By using single atom thick materials we create "NanoNoses" that could sniff out diseases at an early stage.*

**Nanoscale Phenomena**

Murray Group

<https://sites.sas.upenn.edu/cbmurray/>

*We'll explore memory metals and thin films.*

**High specific surface area carbon nanomaterials**

Santiago Group

<http://www.seas.upenn.edu/~santiago/>

*Highly porous carbon can exhibit up to 2000 m<sup>2</sup> / g. This enormous specific surface area enables advances in energy storage, water & air purification, gas separation, fuel cell catalysis, and other areas. We'll illustrate how these materials have such big surface areas and give a simple demonstration of gas adsorption.*

**LCDs, Invisibility, Gummy Capsules, Heat Transfer [2 tables]**

Singh Center and the Nano/Bio Interface Center

<http://www.nanotech.upenn.edu/>**10 AM – 2 PM High School Science Fair Research Projects**

See posters and displays of research conducted by regional high school students. Displays will be **available for viewing from 10 AM – 2 PM**. **Levine Hall, Lobby**

To interact with the high school students about their work, visit the Science Fair during the **judging**, which will run from **12:30 PM – 1:50 PM** in **Levine Hall, Lobby**. Awards will be given at **2:45 PM**. **Singh Center, Glandt Forum**

**Grade 10****Elizabeth Berzin**

Lower Moreland High School

*Numerical Aperture of Optical Fibers***Anjali Chakradhar**

High Technology High School

*Design and Evaluation of Betulin-Based Anti-Cancer Compounds***Jonathan Cheng**

Methacton High School

*Chirality of Sugar Solutions***Sathya Edamadaka**

High Technology High School

*Using Invisible Light to Create a More Efficient Solar Panel*

**Ethan Moyer**

Souderton Area High School

*The Dawn of Genetic Storage: Proof of Concept***Aditi Pallod**

Parkland High School

*Novel Method to Creating a Polypeptide Plasmid Structure for Drug Delivery***Harsha Santhanam**

Methacton High School

*Morphing Wings: The Shape of Things to Come***Sriyaa Suresh**

Parkland High School

*Model the In Vivo Diffusion of Calcium Ions to Maintain Bone Structure***Adam Zhang**

Methacton High School

*The Effect of Protease Activity on the Formation of Gelatin*

## Grade 11

**Jonathan Ardit**

Owen J Roberts High School

*Isolation and Quantification of Nucleic Acids in Common Fruits and Vegetables***Ananth Dandibhotla**

Methacton High School

*Med Helper: A Smart Tool to Research and Track Medications***Victoria Hoffner**

Upper Dublin High School

*Comparing the Efficiency of Biofuels to Standard Fuels***Hyunji Kim**

Germantown Friends School

*Operator-Independent Tumor Volume Measurement on MRI Images***Sahas Kurumety**

Methacton High School

*Effectiveness of Environmentally Friendly Insulators***Jackie Lanzalotto**

Academy of Notre Dame de Namur

*Regulation of CRABP2 as a Biomarker for Ovarian Cancer***Achyut Reddy**

Methacton High School

*Determining Cardiac Volumes and EF From MRI Scans using Machine Learning***Matthew Siracusa**

Devon Preparatory School

*Real-Time Asbestos Detection in Air*

**Seungkwon Son**

Parkland High School

*Efficient Method of Producing Large Quantities of Graphene Through Shear Exfoliation***Grade 12****Alan Balu**

Charter School of Wilmington

*Immunohistochemical and Stereological Analysis of Optogenetically Modified Neurons in the Nigrostriatal pathway***Zachary DeStefano**

Malvern Preparatory School

*Mining Public Twitter Data to Derive Correlations Between Connotation and Geographical Demographics***Jennifer He**

Holmdel High School

*Determination of the Optimal Speed of a Novel Oleophilic Oil Skimmer***Tyler Hook**

Germantown Academy Upper School

*Electromagnetic Accelerator***Roy Kim**

Biotechnology High School

*Analyzing the Distortion of Bone-Conduction Frequencies***Kayla Mitchell**

Marine Academy of Tech/Environmental Science

*Determining the Effects of Soil pH on Calcium Carbonate Concentration in M. terrapin Eggs***Janice Noh**

Cherry Hill High School East

*Bud - Turning Over a New Leaf for Occupational Therapy Patients***Swathi Pavuluri**

High Technology High School

*A Novel Device for Eliminating Airborne Pathogens***Gavin Rees**

Germantown Academy Upper School

*Simulating Brain Development for Neural Network Compression***Alexis Schneider**

Upper Dublin High School

*Combating Post-TBI Depression***Sneha Sharma**

Holmdel High School

*Biofuels from Coffee Grounds and Christmas Trees*



## 4:00-5:30 PM Keynote Address and Graduate Student Awards

Krishna P. Singh Center for Nanotechnology, Glandt Forum (3rd Floor)

Presentation by the Keynote Speaker & 11<sup>th</sup> Annual NBIC Research Excellence Award

***Gold Nanocrystals: Physics, Chemistry, Biology, and Ecology***

***Catherine J. Murphy, PhD***, University of Illinois at Urbana-Champaign

Gold nanocrystals of controlled size and shape have tunable optical properties that enable new science. Upon illumination with resonant light, these gold nanocrystals generate plasmons (coherent oscillations of conduction band electrons). These plasmons, in turn, can produce local electric fields and heat. In this talk I will discuss four short stories about gold nanocrystals and their plasmons. In “Physics” we will discuss how molecules experience the local electric field provided by illuminated plasmonic nanorods. In “Chemistry” we will discuss how the surface chemistry of the nanocrystals can be tuned with both hard and soft shells, and how the particular chemistry at the surface dictates molecular function. In “Biology” I will discuss how these nanocrystals interact with biological fluids and living cells; and in “Ecology” I will discuss how these nanoparticles are distributed in an estuarine ecosystem as a function of surface chemistry.



## NBIC Graduate Student Research Award



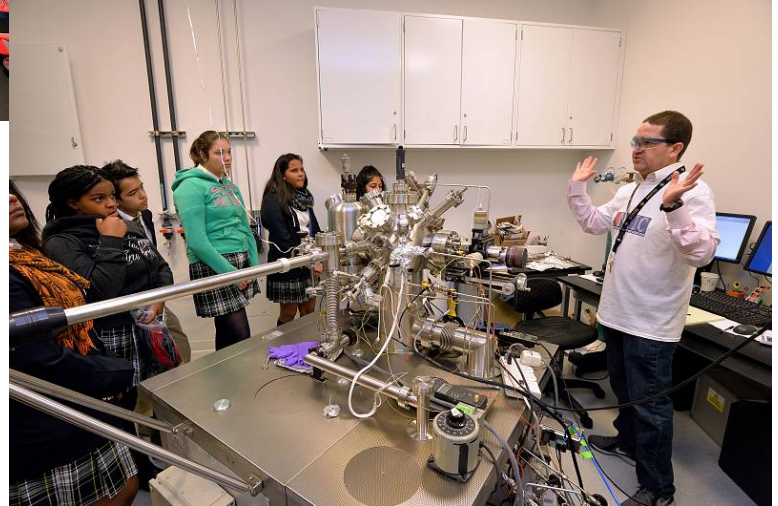
### ***Beyond Graphene***

**Carl H. Naylor**, PhD Candidate, Dept. of Physics and Astronomy, University of Pennsylvania

“Beyond Graphene” is a field of study that has attracted a tremendous amount of attention in the past several years. The focus of my research is to grow and study novel 2D materials that are potential candidates to be the next Graphene and incorporate them into novel electronic systems.



*A big thank you to the many volunteers who donated their time and expertise! The 2016 NanoDay@Penn could not happen without them.*



#### Public Notice

By entering, and by your presence here, at any NanoDay@Penn activities (October 26, 2016), you consent to be photographed, filmed and/or otherwise recorded. Your entry constitutes your consent to such photography, filming and/or recording and to any use, in any and all media throughout the universe in perpetuity, of your appearance, voice and name for any purpose whatsoever in connection with the production presently entitled: NanoDay@Penn at the University of Pennsylvania, Philadelphia, PA, 19104.

**You understand that all photography, filming and/or recording will be done in reliance on this consent given by you by entering this area.**

*If you do not agree to the foregoing, please do not enter this area.*

#### NanoDay@Penn Sponsors



National Science Foundation  
WHERE DISCOVERIES BEGIN



Buildings with NanoDay@Penn activities are marked in Red. Specific locations are detailed within the program.

*The Singh Center* is centered around four major research facilities, all featuring state-of-the-art equipment for nanoscale characterization, measurement, and fabrication: the Quattrone Nanofabrication Facility, the Nanoscale Characterization Facility, the Scanning and Local Probe Facility, and the Material Property Measurement Facility.

The multi-user facilities are vital to the research and educational programs at Penn and are leveraged by partner institutions and local industry within the Mid-Atlantic region. Unifying these central resources fosters the exchange of scientific ideas and the development of nanoscale science and technology, brings together crosscutting capabilities and the staffing to support these tools, and provides the modern infrastructure necessary to establish a regional center for nanotechnology.

NanoDay@Penn is brought to you by

