

NanoDay@Penn

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NANO / BIO INTERFACE CENTER

October 22, 2014



PROGRAM

NanoDay@Penn

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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, a research poster session, videos on nanoscale science, and a science fair featuring high school research projects. The day culminates with an NBIC awards program featuring a prominent keynote speaker.

OVERVIEW: Schedule of Events for **Wednesday, October 22, 2014**

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.

9:00 – 9:45 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: Explore exhibits and demonstrations highlighting nanoscale science and engineering presented by NBIC research groups. **Towne Building, 1st Floor**

Multimedia Presentation: Learn about exciting new discoveries from nanoscale researchers in physics, chemistry, physiology and engineering from this ongoing, big screen show. **Towne Building, 1st Floor and Levine Hall, Lobby**

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 – 2 PM. **Levine Hall, Lobby**

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

3:00 – 3:45 PM

High School Science Research Awards Ceremony

Levine Hall, Wu & Chen Auditorium

Winners from the High School Science Fair Research Projects will be recognized (judging runs from 12:30 PM – 2 PM in Levine Lobby).

4:00 – 5:30 PM

Keynote Address and Graduate Student Awards

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

Control Without Measurement: The Profound Challenge of Quantum Information

Charles Marcus, PhD, Keynote Speaker & 9th Annual NBIC Research Excellence Award

Using Light to Detect and Manipulate Biological Processes at the Nanometer Scale

Beatrice Markiewicz, NBIC Graduate Student Research Award

Graduate Student and Post-doctoral Image Awards

Scientific: **Zhengqing John Qi**, Physics, *TEM on Deformed Carbon Nanotube*

Artistic: **Iris Liu**, Chemical and Biomolecular Engineering, *Liquid Crystal*

Animation: **Martha Grady**, PhD, Materials Science and Engineering, *Cell Injection*

(<https://www.youtube.com/watch?v=bG2l2M2eUrY>)

5:30 – 7 PM

Research Poster Session and Reception

Krishna P. Singh Center for Nanotechnology, Lobby

NBIC research groups present some of their newest work.

10 AM – 2 PM Nanoscience Exhibits and Demos

Explore exhibits and demonstrations highlighting nanoscale science and engineering presented by NBIC research groups. **Towne Building, 1st Floor**

Quantum engineering with light

Bassett Group

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

Polymer/Cell Viscoelastic Properties

Composto Group

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

Protein Design for Solar Energy

Discher/Dutton Lab

<http://www.med.upenn.edu/duttonlab/people.html>

Color Change on the Nanoscale: Gold Nanoparticle Synthesis

Dmochowski Group

<http://www.sas.upenn.edu/~ivandmo/>

DNA Sequencing with Nanopores

Drndic Group

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

Unique Properties at the Nanometer Scale

Fakhraai and Park Groups

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

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

Nano-bio Sensors and Electronic Noses

Johnson Group

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

Nanomaterial Response to Stimuli

Murray Group

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

LCDs, Gummy Capsules, Nano Color and Invisibility

Nano/Bio Interface Center

<http://www.nanotech.upenn.edu/>

Computer simulations of protein nano-machines that control cell growth

Radhakrishnan Group

<https://fling.seas.upenn.edu/~biophys/dynamic/wordpress/>**More holes than cheese: high surface area materials and gas adsorption**

Santiago Group

<http://www.seas.upenn.edu/~santiago/index.html>**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 – 2 PM** in [Levine Hall, Lobby](#).

Awards will be given at **3 PM**. [Levine Hall, Wu & Chen Auditorium](#)

Grade 10**Cohen Davis**

Sussex Academy

A Windy ride: The Feasability of Engineering a Wind Turbine on a Vehicle

Alexander deJong

Woodstown High School

Determining Which Sports Drink Has the Highest Concentration of Electrolytes

Khushbu Patel

Middle Township High School

Measuring Surface Tension

Gavin Rees

Germantown Academy

Modifying the One-time Pad Cryptosystem for Practical Use

Alexis Morgan Schneider

Upper Dublin High School

Relationships Between Headgear Effect and Amount of Impact

Sean Sia

Marine Academy of Technology and Environmental Science

What Type of Algae Species Grows Best in a Concentrated Carbon Dioxide Environment?

Nathaniel Watkins

Central Bucks High School West

Hydrogen Detection via the Optical Properties of Gold and Palladium Nanoparticles

Grade 11

Caroline Booraem

Academy of Notre Dame

On the Rebound: The Effect of Goalie Pad Construction on Collision Elasticity

Swetha Chengalvala

Methacton High School

Eat Right and Live Longer

Kerri Diamond

Souderton Area High School

The Hive Simulator: What a computer simulation can teach us about bee deaths

David Grabovsky

Lower Moreland High School

Harnessing Solar Thermal Energy: A More Efficient Solar Technology

Matthew Horger

Bishop Shanahan High School

Creating A Video Game for The Blind Year 2: Testing the Idea

Catherine Huang

Julia R. Masterman Laboratory and Demonstration School

The Wonderful Prescription for the Brain: Chocolate

Milind Jagota

Liberty High School

Finding the Minimal Length for a Conductive, Random Network of Wires

Lois Kim

Parkland High School

Study on water uptake of Superabsorbent Polymers

Zachary Potter

Penn Ridge High School

The Effects of Various Electrolytes on a Hydrogen Fuel Cell

Tien-Sheng Jonathan Wang

High Technology High School

Comparison of Placement of Rim Sensors

Ian Wietecha-Reiman

Cheltenham High School

Exploring Night Lamp Capabilities Using Phosphorescence

Grade 12**Matthew Bahner**

Central Bucks High School West

Robo Cube (Self Solving Rubik's Cube)

Kevin Biju

Methacton High School

The Hype in Hypoxia: Effect of Hypoxia on Tumor Progression via p-EGFRvIII

Megan Gaffney

Haddonfield Memorial High School

VOCS and Carbonblack in Dry Erase Markers

Shane Hensel

Central Bucks High School West

Identifying the Magnetic Properties of Iron at the Nanoscale

Ben Hylak

Salesianum High School

Assisted Living Artificially Intelligent Robot (ALAIR)

Sam Miller

Unionville High School

The Effects of Running Biomechanics and Footwear on Shock Transmission in Experienced Distant Runners

Malika Shukurova

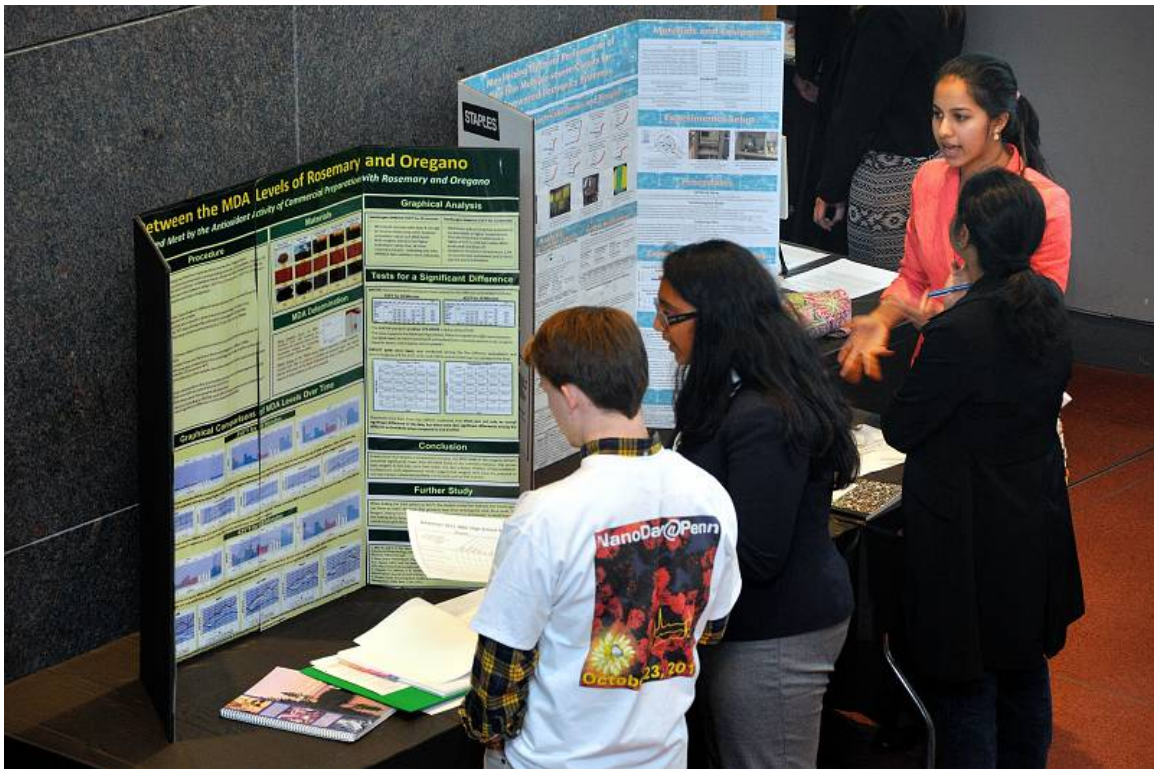
George Washington High School

Analysis of RHA recruitment to a CMV – promoter - regulated transcription site

Justin Wong

Germantown Academy

Coordinate Descent in 2 Dimensions for Protein Loop Closure



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

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

Presentation by the Keynote Speaker & 9th Annual NBIC Research Excellence Award

Control Without Measurement: The Profound Challenge of Quantum Information

Charles Marcus, PhD

Niels Bohr Institute, University of Copenhagen



Possessing astounding capability to make nearly whatever we wish from materials of our choice from the atomic scale upward, we (humans, that is) are poised to take on an engineering challenge of an entirely different level of complexity: to build machines that live in the quantum mechanical realm, where states of the machine do not exist prior to measurement and measurement at one point can project outcomes of measurements at other points. Can we make such a machine, what is it good for, what does it teach us about how our universe works? This talk will describe fledgling experimental approaches to building quantum coherent electrical circuits, the elementary building blocks of a future quantum processor. Approaches will be compared, and future challenges identified.

NBIC Graduate Student Research Award



Using Light to Detect and Manipulate Biological Processes at the Nanometer Scale

Beatrice Markiewicz, 4th year Graduate Student, Dept. of Chemistry at University of Pennsylvania's School of Arts and Sciences

Light-matter interactions can be used to probe and manipulate the structure and dynamics of various biological systems at the nanometer scale. I will briefly discuss how photocages can be used to site-specifically control the structural integrity of peptide hydrogels with light. Also, I will highlight how two-dimensional infrared spectroscopy can be used to interrogate the mechanism of action of pH-gated biological nanopores, using the M2 proton channel of influenza A as an example.

Graduate Student and Post-doctoral Image Awards

Scientific: Zhengqing John Qi, Physics, *TEM on Deformed Carbon Nanotube*

Artistic: Iris Liu, Chemical & Biomolecular Engineering, *Liquid Crystal*

Animation: Martha Grady, PhD, Materials Science and Engineering, *Cell Injection*

5:30- 7 PM Research Poster Session

Krishna P. Singh Center for Technology, Lobby

A program with abstracts will be available at the poster session.

Enhanced Backward Stepping of Myosin V on NP Immobilized F-Actin

Matthew A Caporizzo, Russell J Composto, Yale E Goldman

Sustainable Hydrogen Production by Photoreforming of Alcohols Onto Size- and Shape-Engineered Brookite Rods

Matteo Cargnello, Thomas R. Gordon, Sergey Smolin, Tiziano Montini, Jason Baxter, Angelika Brückner, Paolo Fornasiero, Christopher B. Murray

Fabrication of Graphene-Engineered Protein FET Devices using Mechanical and Photolithography Methods

Madeline Díaz-Serrano, Chris Bialas, Bohdana M. Discher, A.T. Charlie Johnson

Protein Functionalization of Graphene Sensors for Cancer Biomarker Detection

Pedro Ducos, Madeline Diaz, Rodrigo Rodriguez, A.T.Charlie Johnson

Design and Characterization of a Single Chain Amphiphilic Maquette for Membrane Insertion and Electron Transfer

Bryan A. Fry, Geetha N. Goparaju, P. Leslie Dutton and Bohdana M. Discher

Viscoelastic properties of living cells

Martha E. Grady, Emmabeth Parrish, Matthew A. Caporizzo, Judith Kandel, Prathima Nalam, Robert W. Carpick, David M. Eckmann, Russell J. Composto

Quantum Engineering at Penn

David Hopper, Richard Grote, Lee Bassett

Nanoscale wear of patterned PMMA structures characterized via atomic force microscopy

Yijie Jiang, Zachary B. Milne, Robert W. Carpick and Kevin T. Turner

Examining interactions between cell mechanics and mitochondrial health

Judith Kandel, Philip Chou, Martha E. Grady, Matthew A. Caporizzo, Prathima Nalam, Russell J. Composto, David M. Eckmann

DNA-Carbon Nanotube Vapor Sensors for Complex Biochemical Samples

Nicholas J. Kybert, Katharine A. Prokop-Prigge, George Preti, A. T. Charlie Johnson

Fundamental Investigation of Spray Layer-by-Layer Assembly

WeiYang Lim, Abhishek Ravva, Daeyeon Lee

Cytoplasmic Dynein Ring Tilting, Identified Using Combined Single Particle Tracking and PolTIRF, Correlates with Stepping

Lisa G. Lippert, Tali Dadosh, Benjamin T. Diroll, Jeffrey Hallock, Christopher B. Murray, Samara L. Reck-Peterson, Yale E. Goldman

Measuring Viscoelasticity of Hydrogels using Magnetically-Actuated Scanning Probe Microscopy

Prathima C. Nalam, Matthew Caporizzo, Nitya N. Gosvami, Russell J. Composto, Robert W. Carpick

Growth of molybdenum disulphide by built-in source platform
Carl Naylor, Ganghee Han, Nicholas Kybert, A. T. Charlie Johnson

Dynamics of Sub-Micron Bubbles Growing in a Wedge in the Low Capillary Number Regime
Michael M. Norton, Frances M. Ross, Haim H. Bau

Multi-port Microfluidic Probe to Generate Hydrodynamically Confined Microflows
Choongbae Park, Kevin T. Turner

Dynamics of trapped water molecules inside an A β fibril
Ileana M. Pazos, Jianqiang Ma, Feng Gai

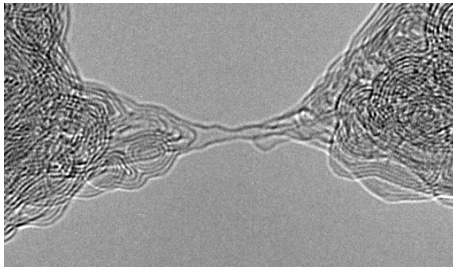
Protein-decorated graphene: the ionic screening effect and detection of enkephalin
Jinglei Ping, Pedro Ducos, Mitchell Lerner, Renyu Liu, and A. T. Charlie Johnson

Graphene Nanoribbon-Nanopore Devices for Biomolecule Detection and DNA Sequencing
Matthew Puster, Julio A. Rodríguez-Manzo, Adrian Balan, Marija Drndić

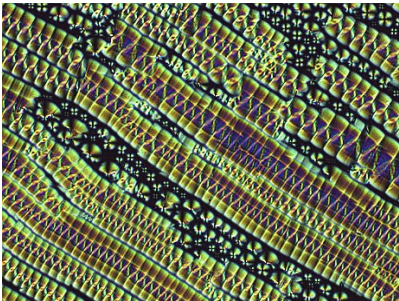
Model for DNA packing using molecular dynamics
Eric Rosenthal, Sara Jabbari-Farouji, Marc Joyeux

Liquid Cell Electron Microscopy with the nanoAquarium
Nicholas M Schneider, Michael M Norton, Jeung Hun Park, Frances M Ross, Haim H Bau

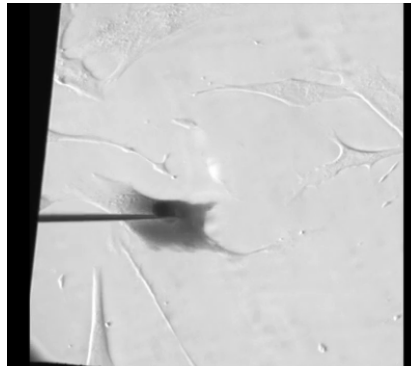
Computational Modeling and Design of Nonbiological Protein Assemblies
Christopher D. Von Bargen, **Matthew J. Eibling**, Christopher M. MacDermaid, Christopher J. Lanci, Michael J. Therien, Jeffery G. Saven



Scientific Image Award Winner:
 Transmission electron microscope
 of a deformed carbon nanotube
 being torn apart under mechanical
 stress. (John Qi)



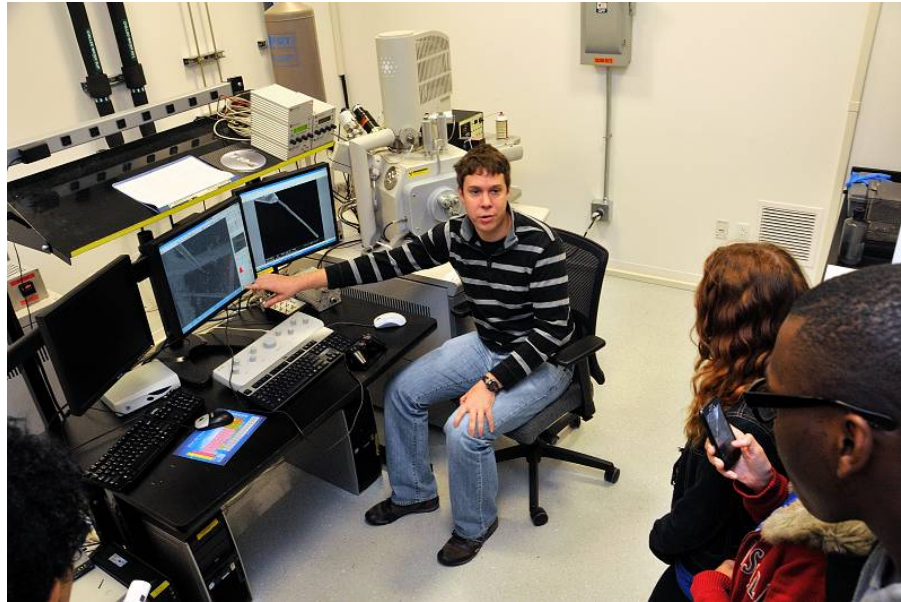
Artistic Image Award Winner:
 Liquid Crystal (Iris Liu)



Animation Award Winner: Cell
 Injection (Martha Grady)

<https://www.youtube.com/watch?v=bG2l2M2eUrY>

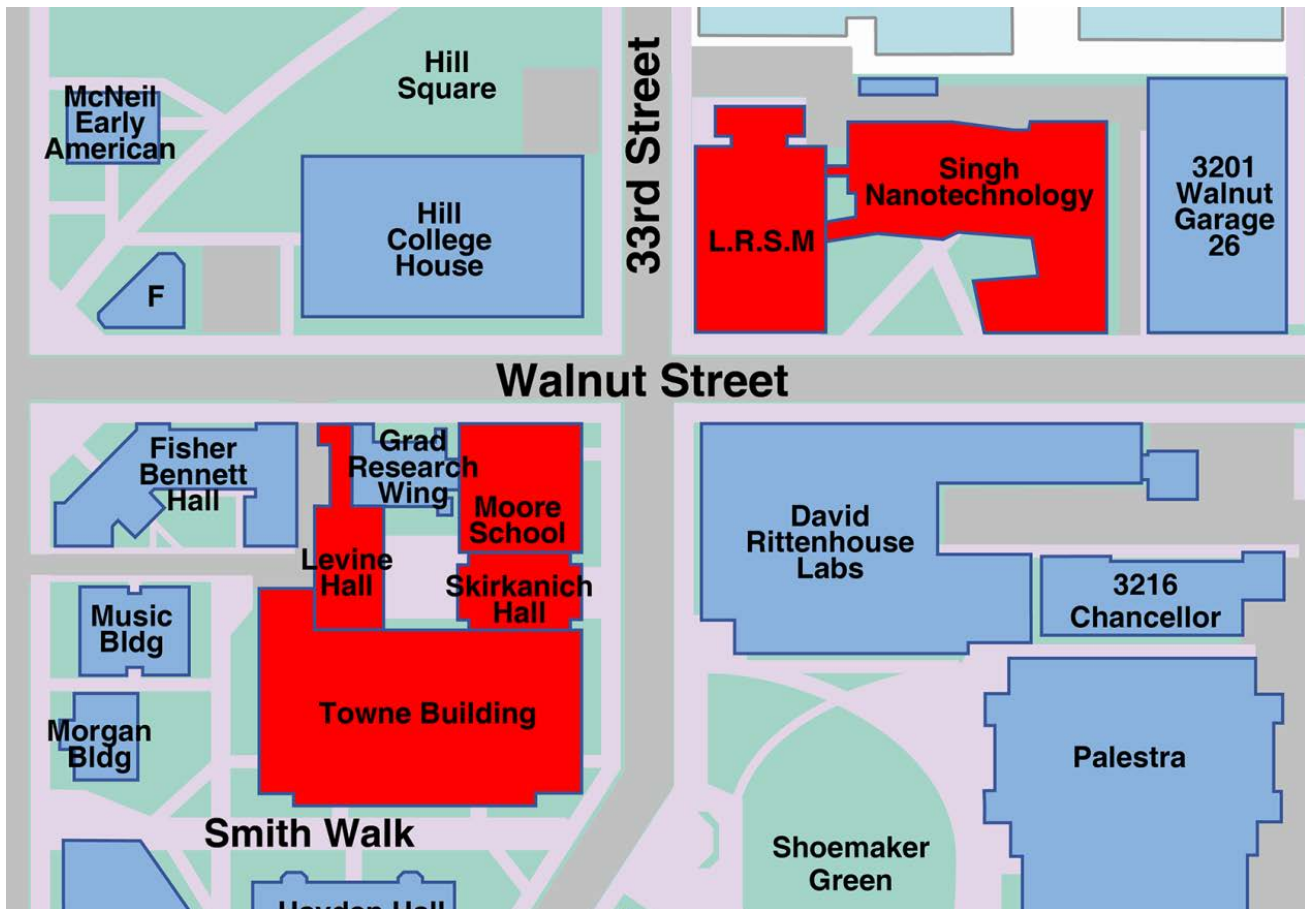
A big thank you to the many volunteers who donated their time and expertise! The 2014 NanoDay@Penn could not happen without them.



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.

Nano/Bio Interface Center at the University of Pennsylvania is a Nanoscale Science and Engineering Center (NSEC) bringing together researchers from the Schools of Engineering and Applied Science; Arts and Sciences; and Medicine. The NBIC exploits Penn's internationally recognized strengths in design of molecular function and quantification of individual molecules. The Center unites investigators from ten departments to provide, not only new directions for the life sciences, but also for engineering in a two-way flow essential to fully realizing the benefits of nano-biotechnology.

NanoDay@Penn is brought to you by

