

# BIONANOTECHNOLOGY SUMMER INSTITUTE 2011

University of Illinois at Urbana-Champaign

July 25 - August 5, 2011



Venue: [Micro and Nanotechnology Laboratory \(MNTL\)](#)

University of Illinois at Urbana-Champaign

208 N. Wright Street, Urbana, IL 61801

Phone: 217-333-3097 and 217-244-1353

<http://www.cnst.illinois.edu/bionanoinstitute.html>

The BioNanotechnology Summer Institute 2011 introduces participants to the basics of cancer biology and cell mechanics. Biological and engineering/physical science experimental methods are taught using a hands-on approach in the laboratory.

*Intended audience: senior undergraduates, graduate students, post docs, and faculty members from engineering, physical sciences, and biological sciences who are interested in state-of-the-art interdisciplinary research at the intersection of engineering and biology*

Rev. 8/4/2011 2:37 PM

## Monday, July 25

- 7:00-8:15 AM **Registration and Breakfast:** MNTL Atrium
- 8:30-8:40 AM **Session Chair:** Jimmy Hsia\*, Professor of Mechanical Science and Engineering, and Associate Vice Chancellor for Research  
**Welcome Remarks**  
*Ilesanmi Adesida, Dean, College of Engineering*
- 8:40-9:00 AM **nano@Illinois: Center for Nanoscale Science and Technology (CNST)** Rashid Bashir\*, Director, MNTL and Irfan Ahmad\*, Executive Director, CNST, University of Illinois
- 9:00-9:10 AM **Short Video on Micro and Nanotechnology Laboratory**
- 9:10-9:30 AM **Student Introductions**
- 9:30-10:45 AM **Introduction to Cell Biology**  
*Scott Siechen, Natural Sciences, Parkland College*
- 10:45-11:00 AM **Discussion**
- 11:00-11:15 AM **Coffee Break**
- 11:15 AM-12:15 PM **Perfluorocarbon Nanoparticles for Diagnosis and Therapy**  
*Samuel Wickline\*, School of Medicine, Washington University, Saint Louis*
- 12:15-12:30 PM **Discussion**
- 12:30-1:15 PM **Lunch and Micro and Nanotechnology Laboratory Safety Session**  
*John Hughes, Associate Director Operations, MNTL, University of Illinois*
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail



## Tuesday, July 26

- 7:45-8:15 AM **Breakfast:** MNTL Atrium
- 8:30 AM-9:45 AM **Basics of Mechanobiology**  
*Taher Saif\**, Mechanical Science and Engineering, University of Illinois
- 9:45-10:00 AM **Discussion**
- 10:00-10:15 AM **Coffee Break**
- 10:15-11:15 AM **Magnetic Nanocomposites as Remotely Controlled Materials**  
*J. Zach Hilt\**, Chemical Engineering, University of Kentucky
- 11:15-11:30 AM **Discussion**
- 11:30 AM-12:30 PM **Molecular Basis of Mechanotransduction at Cell-Cell Junctions (mechanisms)**  
*Deborah Leckband\**, Chemical and Biomolecular Engineering, University of Illinois
- 12:30-1:15 PM **Discussion and Lunch**
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail

## Wednesday, July 27

- 7:45-8:15 AM **Breakfast:** MNTL Atrium
- 8:30-9:45 AM **Basics of Cancer Biology**  
*Ann Nardulli\**, Molecular and Integrative Physiology, University of Illinois
- 9:45-10:00 AM **Discussion**
- 10:00-10:30 AM **Coffee Break and Group Photo**
- 10:30-11:20 AM **Toward Sequencing a DNA Molecule using a Nanopore**  
*Aleksei Aksimentiev*, Physics, University of Illinois
- 11:20-11:30 AM **Discussion**
- 11:30 AM-12:20 PM **Dissecting and Controlling the Fate of Human Pluripotent Stem Cells**  
*Fei Wang\**, Cell and Developmental Biology, University of Illinois
- 12:20-12:30 PM **Discussion**
- 12:30-1:15 PM **Lunch**
- 1:15-2:15 PM **Molecular Engineering and FRET for the Visualization of Tunable Molecular Conformations in Live Cells**  
*Yingxiao (Peter) Wang\**, Bioengineering, University of Illinois
- 2:15-2:30 PM **Discussion**
- 2:30-3:30 PM **Bionanophotonics Sensors and Devices**  
*Luke Lee*, Bioengineering, University of California, Berkeley
- 3:30-3:45 PM **Discussion**
- 3:45-4:00 PM **Break**
- 4:00-6:00 PM **Session Chairs:** Irfan Ahmad and Laura Miller, Program Manager, IGERT/M-CNTC  
**Speed Dating: Get to Know Your Class Members Professional Interests**

### Thursday, July 28

- 7:15-7:45 AM **Breakfast:** MNTL Atrium
- 8:00 AM-12:00 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail
- 12:00-1:15 PM **Lunch and Nick Holonyak Documentary**  
<http://engineering.illinois.edu/news/2011/07/01/a-brilliant-idea-nick-holonyak-and-led-premieres-btn-july>
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail
- 6:30-9:00 PM **Special Program: BBQ and Activities at Crystal Lake Park**  
(For logistical details please contact Atif Irfan at [airfan@illinois.edu](mailto:airfan@illinois.edu))

### Friday, July 29

- 7:45-8:15 AM **Breakfast:** MNTL Atrium
- 8:30 AM-12:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail
- 12:30-1:15 PM **Lunch**
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail
- 6:30 PM **Suggested Activity (optional):**  
**Live concert Krannert Event: Matuto - Open Air at the UI Research Park**  
(For logistical details please contact Atif Irfan at [airfan@illinois.edu](mailto:airfan@illinois.edu))  
<http://krannertcenter.com/performance.aspx?id=201155143848710128174106178>

### Saturday, July 30

- 8:30 AM-10:00 PM **Suggested Activity (optional):**  
**Day Trip to Chicago**  
*There may still be seats available on the bus. Please check at the registration desk and for logistical details contact Atif Irfan at [airfan@illinois.edu](mailto:airfan@illinois.edu).*

### Monday, August 1

- 7:15-7:45 AM **Breakfast:** MNTL Atrium
- 8:00-9:00 AM **Nanophotonic Particles for Enhanced Molecular and Cellular Diagnostic Imaging and Therapeutics**  
*Gang Logan Liu, Electrical and Computer Engineering, University of Illinois*
- 9:00-10:00 AM **Coffee Break and Poster Setup**
- 10:00-11:00 AM **BioMEMS and 3D Bio-fabrication**  
*Rashid Bashir\*, Electrical and Computer Engineering, and Bioengineering, University of Illinois*
- 11:00-11:15 AM **Discussion**

- 11:15 AM-12:15 PM **What are Cells Thinking? Answers from Nano, Micro and Macro-scale Tools**  
*Muhammad Zaman, Biomedical Engineering, Boston University*
- 12:15-12:30 PM **Discussion**
- 12:30-1:45 PM **Lunch and Poster Setup**
- 2:00-6:00 PM **Session Chairs:** *Lizanne DeStefano\**, Professor of Education Psychology, and Director, I-STEM; and *Phoebe Lenear*, Educational Programs Manager, EBICS  
**Poster Session and Reception**

## Tuesday, August 2

- 7:45-8:15 AM **Breakfast:** MNTL Atrium
- 8:30 AM-12:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail
- 11:30 AM-1:30 PM **Lunch:** Beckman Café (please consult Lab Schedule Detail for specific time)
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail

## Wednesday, August 3

- 7:45-8:15 AM **Breakfast:** MNTL Atrium
- 8:30 AM-12:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail
- 11:30 AM-1:30 PM **Lunch:** Beckman Café (please consult Lab Schedule Detail for specific time)
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail

## Thursday, August 4

- 7:45-8:15 AM **Breakfast:** MNTL Atrium
- 8:30 AM-12:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail
- 12:30-1:30 PM **Lunch and Speaker**  
**MEMS Technology and Bioinspired Sensors**  
*Chang Liu, Mechanical Engineering, Northwestern University*
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail

**Friday, August 5**

- 7:45-8:15 AM **Breakfast:** MNTL Atrium
- 8:30-9:30 AM **Optical Platforms for Detection of Biomolecular Interactions and Sensing of Individual Bacteria and Viruses**  
*Bennett Goldberg\*, Physics, Boston University*
- 9:30-9:45 AM **Discussion**
- 9:45-10:00 AM **Coffee Break**
- 10:00-11:00 AM **Label-free and Real-time Impedance Spectroscopic Analysis of Cellular Activities of Oral Cancer Cells**  
*Liju Yang\*, Pharmaceutical Sciences, North Carolina Central University*
- 11:00-11:15 AM **Discussion**
- 11:15 AM-12:15 PM **Entrepreneurship in Innovative Fluorescence Instrumentation for Life Sciences, Drug Discovery, Material Sciences and Basic Physical-Chemical Research Applications**  
*Ben Barbieri, Founder and President, ISS, Inc.*
- 12:15-12:30 PM **Discussion**
- 12:30-1:15 PM **Lunch**
- 1:30-3:00 PM **Session Chairs:** Rashid Bashir and Irfan Ahmad  
**Closing Session**
- Post-event Survey
  - Recognitions
  - Certificate Awards and Concluding Remarks
- 3:00-5:00 PM **Laboratory Tours** (optional): *<meet at MNTL Atrium by 3:05 PM>*  
Tour Coordinators: Laura Miller, Program Manager; and Atif Irfan
- Beckman Institute
  - FS Materials Research Laboratory
  - Institute for Genomic Biology (*can be arranged on request*)
  - UI Research Park and Enterprise Works (*can be arranged on request*)
- 5:15 PM **ADJOURN**

\*NSF IGERT and/or NIH/NCI M-CNTC/CCNE collaborator For more information, contact Laura Miller at [arriola@illinois.edu](mailto:arriola@illinois.edu)

## 2011 Summer Institute Organizing Committee

- **Rashid Bashir**, Professor, Electrical and Computer Engineering, Bioengineering, and Director, Micro and Nanotechnology Laboratory (MNTL), Co-Director, CNST, College of Engineering (COE), University of Illinois, **Summer Institute Chair**
- **Irfan Ahmad**, Executive Director, Center for Nanoscale Science and Technology (CNST), and Research Faculty, Agricultural and Biological Engineering, Colleges of Engineering, and of Agricultural, Consumer, and Environmental Sciences (ACES), University of Illinois, **Summer Institute Co-Chair**
- **Laura A. Miller**, Program Manager, CMMB IGERT and M-CNTC, University of Illinois, **Summer Institute Co-Chair**
- **Lizanne DeStefano**, Professor of Education Psychology, and Director, I-STEM, College of Education, University of Illinois
- **Martha Gillette**, Professor, Cell and Developmental Biology, College of Liberal Arts and Sciences, University of Illinois
- **Jimmy Hsia**, Professor, Mechanical Science and Engineering, Associate Vice Chancellor for Research, Center for Emergent Behaviors of Integrated Cellular Systems, and Center for Cellular Mechanics, University of Illinois
- **Atif Irfan**, Administrative Assistant, Center for Nanoscale Science and Technology (CNST), University of Illinois
- **Valerie Leppert**, Associate Professor, School of Engineering, University of California, Merced
- **Ann Nardulli**, Professor, Molecular and Integrative Physiology, School of Molecular and Cellular Biology, College of Liberal Arts and Sciences, University of Illinois
- **Taher Saif**, Professor, Mechanical Science and Engineering, University of Illinois
- **Stephen Sligar**, Biochemistry, Chemistry, and Biophysics, University of Illinois

### Laboratory Leads:

Jennifer Amos, Jianjun Cheng, Brendan Harley, John Hughes, JoAnne Manaster, Larry Millett, and Susan Steenbergen

### BNSI Summer Institute Sponsored by:

**U.S. National Science Foundation and National Cancer Institute**

### Co-sponsors:

- [NSF Integrative Graduate Education and Research Traineeship \(IGERT\) on Cellular and Molecular Mechanics and BioNanotechnology \(CMMB\), University of Illinois](#)
- [NIH/NCI Midwest Cancer Nanotechnology Training Center \(M-CNTC\), University of Illinois](#)
- [Micro and Nanotechnology Laboratory \(MNTL\)](#)
- [Center for Nanoscale Science and Technology \(CNST\)](#)
- [Center for Cellular Mechanics \(CCM\)](#)
- [Mechanical Science and Engineering \(MechSE\)](#)
- [Bioengineering \(BioE\)](#)
- [NSF Center on Emergent Behaviors of Integrated Cellular Systems \(EBICS\)](#), at University of Illinois at Urbana-Champaign, Massachusetts Institute of Technology (MIT), and Georgia Institute of Technology
- [Center for Agricultural, Biomedical, and Pharmaceutical Nanotechnology \(CABPN\)](#), an NSF Industry/University Cooperative Research Center
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