



# BioSensing BioActuation BioNanotechnology Summer Institute 2012

University of Illinois at Urbana-Champaign  
July 30 – August 10, 2012

## Summer Institute Program

*Please note that this program is tentative and subject to change.*

**Venue:** [Micro and Nanotechnology Laboratory \(MNTL\)](#) First Floor Atrium and Room 1000

**University of Illinois at Urbana-Champaign**

208 N. Wright Street, Urbana, IL 61801

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

The BioSensing BioActuation BioNanotechnology Summer Institute 2012 introduces participants to the basics of mechanobiology, biosensing and dynamic control of engineered systems, cancer biology, and cell mechanics. Biological and engineering/physical science experimental methods are taught using a hands-on approach in the laboratory.

<https://bsbasi-2012.mechse.illinois.edu/>

*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. 8/22/2012 9:30 AM

### Monday, July 30

- |                   |  |
|-------------------|--|
| 7:00-8:30 AM      | <b>Registration and Breakfast</b>  |
| 8:30-8:40 AM      | <b>Session Chair:</b> Jimmy Hsia, Associate Vice Chancellor for Research and Professor of Mechanical Science and Engineering<br><b>Welcome Remarks</b>   |
| 8:40-9:00 AM      | <b>nano@Illinois: Center for Nanoscale Science and Technology (CNST)</b><br><i>Rashid Bashir, Director, MNTL, University of Illinois</i><br><i>Irfan Ahmad, Executive Director, CNST, University of Illinois</i> |
| 9:00-9:10 AM      | <b>Short Video on Micro and Nanotechnology Laboratory</b>  |
| 9:10-9:30 AM      | <b>Summer Institute Evaluation</b><br><i>Lizanne Destefano, Director, I-STEM, University of Illinois</i><br><i>Ayesha Tillman, College of Education, University of Illinois</i>                                  |
| 9:30-9:45 AM      | <b>Student Introductions</b>   |
| 9:45-10:45 AM     | <b>Lecture 1 – Introduction to Cell Biology, Part I</b><br><i>Scott Siechen, Natural Sciences, Parkland College</i>  |
| 10:45-11:00 AM    | <b>Discussion</b>  |
| 11:00-11:15 AM    | <b>Break</b>   |
| 11:15 AM-12:15 PM | <b>Lecture 2 – Introduction to Cell Biology, Part II</b><br><i>Scott Siechen, Natural Sciences, Parkland College</i>   |
| 12:15-12:30 PM    | <b>Discussion</b>  |
| 12:30-1:15 PM     | <b>Lunch and Mandatory Micro and Nanotechnology Laboratory Safety Session</b><br><i>John Hughes, Associate Director of Operations, MNTL, University of Illinois</i>  |
| 1:30-5:30 PM      | <b>Hands-on Laboratory Modules:</b> Please consult Lab Schedule Detail   |

## Tuesday, July 31

- 7:30-8:30 AM **Breakfast**
- 8:30-9:30 AM **Lecture 3 – The Intellectual and Physical Interface Between Technology and Neuroscience**  
*Tom Daniel, Department of Biology, University of Washington*
- 9:30-9:45 AM **Discussion**
- 9:45-10:15 AM **Group Photo**
- 10:15-10:30 AM **Break**
- 10:30 AM-12:30 PM **Speed Networking: Get to Know Your Class Members Professional Interests**
- 12:30-1:30 PM **Lunch**
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail

## Wednesday, August 1

- 7:30-8:30 AM **Breakfast**
- 8:30 AM-12:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail
- 12:30-1:30 PM **Lunch**
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail

## Thursday, August 2

- 7:30-8:20 AM **Breakfast**
- 8:20-8:30 AM **Evaluation of Summer Institute Week I**
- 8:30-9:45 AM **Lecture 4 – Basics of Cancer Biology**  
*Ann Nardulli, Molecular and Integrative Physiology, University of Illinois*
- 9:45-10:00 AM **Discussion**
- 10:00-10:15 AM **Break**
- 10:15-11:15 AM **Lecture 5 – Circumventing Barriers to Nanoparticle Delivery In Vivo**  
*Susan Clare, Department of Surgery, Indiana School of Medicine*
- 11:15-11:30 AM **Discussion**
- 11:30 AM-1:30 PM **Lunch and Poster Session I – Group B**  
**Session Chairs:** Lizanne DeStefano, Director of I-STEM, University of Illinois, and Ayesha Tillman, I-STEM, University of Illinois
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail
- 6:30-8:30 PM **Special Program: Picnic and Social at Crystal Lake Park**

### Friday, August 3

- 7:30-8:30 AM **Breakfast**
- 8:30-9:30 AM **Lecture 6 – Translational Cancer Nanomedicine: From Diagnostic Imaging to Targeted Therapies**  
*Mansoor Amiji, Department of Pharmaceutical Sciences, Northeastern University*
- 9:30-9:45 AM **Discussion**
- 9:45-10:00 AM **Break**
- 10:00-11:15 AM **Lecture 7 – Mechanobiology of Neuronal Development**  
*Taher Saif, Mechanical Science and Engineering, University of Illinois*
- 11:15-11:30 AM **Discussion**
- 11:30 AM-1:30 PM **Lunch and Poster Session II – Group A**  
**Session Chairs:** Lizanne DeStefano, Director of I-STEM, University of Illinois, and Ayesha Tillman, I-STEM, University of Illinois
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail

### Saturday, August 4

- 8:00 AM-10:00 PM **Suggested Activity** (optional): **Day Trip to Chicago** – if you have not signed up, there may still be room on the bus (please check at the registration table)

### Sunday, August 5

**Free Day** – rest and prepare for week 2

### Monday, August 6

- 7:00-8:00 AM **Breakfast**
- 8:00-9:00 AM **Lecture 8 – Precision Measurements of Neutrophil Motility in Medicine**  
*Daniel Irimia, BioMEMS Resource Center, Massachusetts General Hospital*
- 9:00-9:15 AM **Break**
- 9:15-10:15 AM **Demonstration by Daniel Irimia – Microfluidic Device for Measuring Cell Migration**
- 10:15-10:30 AM **Break**
- 10:30-11:30 AM **International Collaboration Panel**
- 11:30 AM-1:30 PM **Lunch and Poster Session III – Group D**  
**Session Chairs:** Lizanne DeStefano, Director of I-STEM, University of Illinois, and Ayesha Tillman, I-STEM, University of Illinois
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail

## Tuesday, August 7

- 7:00-8:00 AM **Breakfast**
- 8:00-9:00 AM **Lecture 9 – Physics and Scaling Prospects of pH-based Genome Sequencers**  
*Ashraf Alam, Electrical and Computer Engineering, Purdue University*
- 9:00-9:15 AM **Discussion**
- 9:15-9:30 AM **Break**
- 9:30-10:30 AM **Lecture 10 and Discussion – Quantitative Fluorescent Biosensors in Neuroscience, Cardiovascular Disease, and Cancer**  
*Princess Imoukhuede, Bioengineering, University of Illinois*
- 10:30-11:30 AM **Lecture 11 and Discussion – Electrical Counters on Chip for Molecules and Cells**  
*Rashid Bashir, Electrical and Computer Engineering and Bioengineering, University of Illinois*
- 11:30 AM-1:30 PM **Lunch and Poster Session IV – Group C**  
**Session Chairs:** Lizanne DeStefano, Director of I-STEM, University of Illinois, and Ayesha Tillman, I-STEM, University of Illinois
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail

## Wednesday, August 8

- 7:00-8:00 AM **Breakfast**
- 8:00 AM-8:00 PM **Day Trip to Springfield, Illinois** – bus leaves MNTL at 8:00 AM

## Thursday, August 9

- 7:30-8:30 AM **Breakfast**
- 8:30-9:30 AM **Lecture 12 – Microengineered Hydrogels for Stem Cell Bioengineering and Tissue Regeneration**  
*Ali Khademhosseini, Division of Health Sciences and Technology, Harvard Medical School*
- 9:30-9:45 AM **Discussion**
- 9:45-10:00 AM **Break**
- 10:00-11:00 AM **Lecture 13 – Nanofabrication and Material Design for Stem Cell Differentiation**  
*Jennifer Lu, School of Engineering, UC Merced*
- 11:00-11:15 AM **Discussion**
- 11:15 AM-12:15 PM **Lecture 14 – Nanoplasmonic Resonance Enabled Ultrasensitive Biosensing**  
*Logan Liu, Electrical and Computer Engineering, University of Illinois*
- 12:15-12:30 PM **Discussion**
- 12:30-1:30 PM **Lunch Conversation with a Budding Biomedical Device(s) Entrepreneur**  
*Adam Booher, IPT, UI Research Park*
- 1:30-5:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail

## Friday, August 10

- 7:30-8:30 AM **Breakfast**
- 8:30 AM-12:30 PM **Hands-on Laboratory Modules:** Please consult Lab Schedule Detail
- 12:30-1:30 PM **Lunch**
- 1:30-2:30 PM **Closing Session**
- Post-event Survey
  - Recognitions
  - Certificate Awards
  - Concluding Remarks
- 2:30-5:00 PM **Laboratory Tours** (optional)
- Materials Research Lab
  - Veterinary Medicine
- 5:15 PM **ADJOURN**

*For more information, contact Laura Miller at [arriola@illinois.edu](mailto:arriola@illinois.edu)*

## BioSensing BioActuation BioNanotechnology Summer Institute 2012

The BioSensing BioActuation BioNanotechnology Summer Institute (B3SI) 2012 is a collaboration between the [University of Illinois](#) and [National Taiwan University](#) that will provide training in nanotechnology and biology research tools to address interdisciplinary research needs in biosensing bioactuation, cancer biology, and cell mechanics. B3SI integrates the National Science Foundation (NSF) and National Science Council of Taiwan (NSC) BioSensing BioActuation Summer Institute (BSBA) with the NSF and National Institutes of Health (NIH) sponsored BioNanotechnology Summer Institute (BNSI), to create a 2-week training experience on the University of Illinois at Urbana-Champaign campus.

### About BSBA

The U.S. [National Science Foundation](#) (NSF) and the [National Science Council](#) (NSC) of Taiwan funded BSBA Summer Institute 2012 is part of a six year series (initial funding for three years), with alternate institutes planned in the U.S. and Taiwan. US Summer Institutes will be held at the [University of Illinois at Urbana-Champaign](#) (2010, 2012, 2014). The Taiwanese Summer Institutes will be held at the [National Taiwan University](#) (2011, 2013, 2015).

## 2012 Summer Institute Organizing Committee

- **Jimmy Hsia**, Professor of Mechanical Science and Engineering, Associate Vice Chancellor for Research, University of Illinois, Event Chair
- **Irfan Ahmad**, Executive Director of CNST, Research Faculty in Agricultural and Biological Engineering, University of Illinois
- **Rashid Bashir**, Director of MNTL and Professor of Electrical and Computer Engineering, and Bioengineering, University of Illinois
- **Shuo Hung Chang**, Professor of Mechanical Engineering, National Taiwan University
- **Lizanne DeStefano**, Professor of Education Psychology, and Director of I-STEM, College of Education, University of Illinois
- **Martha Gillette**, Professor of Cell and Developmental Biology, College of Liberal Arts and Sciences, University of Illinois
- **Valerie Leppert**, Associate Professor, School of Engineering, University of California, Merced
- **Laura A. Miller**, Program Manager, CMMB IGERT and M-CNTC, University of Illinois
- **Hao-Ming Hsiao**, Professor of Mechanical Engineering, National Taiwan University
- **Emily E. Morehouse**, Program Coordinator, CNST, University of Illinois
- **Ann Nardulli**, Professor of Molecular and Integrative Physiology, College of Liberal Arts and Sciences, University of Illinois
- **Taher Saif**, Professor of Mechanical Science and Engineering, University of Illinois

## Laboratory Module Leads

- **Jennifer Amos**, Mechanobiology 2 Module, Bioengineering, University of Illinois
- **Jennifer Bailey**, Cell Biology Module, Bioengineering, University of Illinois
- **Jianjun Cheng**, Therapeutic Nanotechnology Module, Materials Science and Engineering, University of Illinois
- **John Hughes**, Micro and NanoFabrication Module, Micro and Nanotechnology Lab, University of Illinois
- **Larry Millet**, Microfluidics and Enabling Technologies Module, Micro and Nanotechnology Lab, University of Illinois
- **Susan Steenbergen**, Molecular Biology Module, Pathobiology, University of Illinois

## Sponsored by:

- [National Science Foundation](#)
- [National Science Council of Taiwan](#)
- [National Institutes of Health](#)

## Co-sponsors:

- [Center for Nanoscale Science and Technology](#) (CNST)
- [Micro and Nanotechnology Laboratory](#) (MNTL)
- NSF Integrative Graduate Education and Research Traineeship (IGERT) on [Cellular and Molecular Mechanics and BioNanotechnology](#) (CMMB)
- NIH/NCI [Midwest Cancer Nanotechnology Training Center](#) (M-CNTC)
- NSF [STC on Emergent Behaviors of Integrated Cellular Systems](#) (EBICS)
- Department of [Mechanical Science and Engineering](#) (MechSE)
- [Center for Agricultural, Biomedical, and Pharmaceutical Nanotechnology](#) (CABPN), an NSF Industry/University Cooperative Research Center
- [Center for Cellular Mechanics](#) (CCM)
- University of Illinois Colleges of [Engineering](#), [Liberal Arts and Sciences](#), and [Veterinary Medicine](#)

## Sponsors:

### NSF-NSC SUMMER INSTITUTE ON BIOSENSING & BIOACTUATION



**IGERT** Cellular and Molecular Mechanics and BioNanotechnology

**M-CNTC** Midwest Cancer Nanotechnology Training Center



NCI Alliance for  
**Nanotechnology**  
in Cancer

**CNST** University of Illinois Center for Nanoscale Science and Technology

**nano@illinois**  
*nano solutions for mega problems*