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

### Monday, July 25

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:00-8:15 AM</td>
<td>Registration and Breakfast: MNTL Atrium</td>
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<tr>
<td>8:30-8:40 AM</td>
<td>Session Chair: Jimmy Hsia*, Professor of Mechanical Science and Engineering, and Associate Vice Chancellor for Research</td>
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<td></td>
<td>Welcome Remarks</td>
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<td>Ilesanmi Adesida, Dean, College of Engineering</td>
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<tr>
<td>8:40-9:00 AM</td>
<td>nano@Illinois: Center for Nanoscale Science and Technology (CNST) Rashid Bashir*, Director, MNTL and Irfan Ahmad*, Executive Director, CNST, University of Illinois</td>
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<tr>
<td>9:00-9:10 AM</td>
<td>Short Video on Micro and Nanotechnology Laboratory</td>
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<tr>
<td>9:10-9:30 AM</td>
<td>Student Introductions</td>
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<tr>
<td>9:30-10:45 AM</td>
<td>Introduction to Cell Biology Scott Siechen, Natural Sciences, Parkland College</td>
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<tr>
<td>10:45-11:00 AM</td>
<td>Discussion</td>
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<tr>
<td>11:00-11:15 AM</td>
<td>Coffee Break</td>
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<tr>
<td>11:15 AM-12:15 PM</td>
<td>Perfluorocarbon Nanoparticles for Diagnosis and Therapy Samuel Wickline*, School of Medicine, Washington University, Saint Louis</td>
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<tr>
<td>12:15-12:30 PM</td>
<td>Discussion</td>
</tr>
<tr>
<td>12:30-1:15 PM</td>
<td>Lunch and Micro and Nanotechnology Laboratory Safety Session John Hughes, Associate Director Operations, MNTL, University of Illinois</td>
</tr>
<tr>
<td>1:30-5:30 PM</td>
<td>Hands-on Laboratory Modules: Please consult Lab Schedule Detail</td>
</tr>
</tbody>
</table>
Tuesday, July 26

7:45-8:15 AM  Breakfast: MNTL Atrium

8:30 AM-9:45 AM  Basics of Mechanobiology
    Taheer 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
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)

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 Kranert Event: Matuto - Open Air at the UI Research Park
   (For logistical details please contact Atif Irfan at airfan@illinois.edu)

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.

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

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### 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

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### 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

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### 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

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:45-8:15 AM</td>
<td><strong>Breakfast</strong>: MNTL Atrium</td>
</tr>
<tr>
<td>8:30-9:30 AM</td>
<td><strong>Optical Platforms for Detection of Biomolecular Interactions and Sensing of Individual Bacteria and Viruses</strong>&lt;br&gt;&lt;br&gt; <em>Bennett Goldberg</em>, Physics, Boston University</td>
</tr>
<tr>
<td>9:30-9:45 AM</td>
<td><strong>Discussion</strong></td>
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<tr>
<td>9:45-10:00 AM</td>
<td><strong>Coffee Break</strong></td>
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<tr>
<td>10:00-11:00 AM</td>
<td><strong>Label-free and Real-time Impedance Spectroscopic Analysis of Cellular Activities of Oral Cancer Cells</strong>&lt;br&gt;&lt;br&gt; <em>Liju Yang</em>, Pharmaceutical Sciences, North Carolina Central University</td>
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<tr>
<td>11:00-11:15 AM</td>
<td><strong>Discussion</strong></td>
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<tr>
<td>11:15 AM-12:15 PM</td>
<td><strong>Entrepreneurship in Innovative Fluorescence Instrumentation for Life Sciences, Drug Discovery, Material Sciences and Basic Physical-Chemical Research Applications</strong>&lt;br&gt;&lt;br&gt; <em>Ben Barbieri, Founder and President, ISS, Inc.</em></td>
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<tr>
<td>12:15-12:30 PM</td>
<td><strong>Discussion</strong></td>
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<tr>
<td>12:30-1:15 PM</td>
<td><strong>Lunch</strong></td>
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<tr>
<td>1:30-3:00 PM</td>
<td><strong>Session Chairs</strong>: Rashid Bashir and Irfan Ahmad&lt;br&gt;&lt;br&gt; <strong>Closing Session</strong>&lt;br&gt;&lt;br&gt; - Post-event Survey&lt;br&gt;- Recognitions&lt;br&gt;- Certificate Awards and Concluding Remarks</td>
</tr>
<tr>
<td>3:00-5:00 PM</td>
<td><strong>Laboratory Tours</strong> (optional): <em>meet at MNTL Atrium by 3:05 PM</em>&lt;br&gt;&lt;br&gt; Tour Coordinators: Laura Miller, Program Manager; and Atif Irfan&lt;br&gt;&lt;br&gt; - Beckman Institute&lt;br&gt;- FS Materials Research Laboratory&lt;br&gt;- Institute for Genomic Biology <em>(can be arranged on request)</em>&lt;br&gt;- UI Research Park and Enterprise Works <em>(can be arranged on request)</em></td>
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<td>5:15 PM</td>
<td><strong>ADJOURN</strong></td>
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*NSF IGERT and/or NIH/NCI M-CNTC/CCNE collaborator<br><br>For more information, contact Laura Miller at 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
- Colleges of Engineering, Liberal Arts and Sciences, and Veterinary Medicine