

Illinois-Tsinghua Nanotechnology Symposium

Jointly held with the CNST 12th Annual Nanotechnology Workshop

April 16-17, 2014

University of Illinois at Urbana-Champaign

SPONSORS



- Center for Nanoscale Science and Technology, University of Illinois
- Tsinghua-Foxconn Nanotechnology Research Center, Tsinghua University, China
- Micro and Nanotechnology Laboratory, University of Illinois

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- Rashid Bashir**, CNST/MNTL/Bioengineering /Electrical and Computer Engineering, *Chair*
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TSINGHUA UNIVERSITY:

- Shoushan Fan**, Director, Tsinghua-Foxconn Nanotechnology Research Center, *Co-Chair*
Kaili Jiang, Physics, Tsinghua University
Dongsheng Liu, Chemistry, Tsinghua University

ABOUT THE TSINGHUA-FOXCONN NANOTECHNOLOGY RESEARCH CENTER

Tsinghua-Foxconn Nanotechnology Research Center is a cooperation with Foxconn Group, working toward the establishment of an international advanced nanotechnology research base, leveraging Tsinghua University's sciences and talents and Foxconn Group's industrialization. Located at Tsinghua University in Beijing, China, the Center conducts research on basic and applied nanotechnology to create new technology and push nanotechnology achievements for industrialization and promote new talents.



ABOUT THE UNIVERSITY OF ILLINOIS CENTER FOR NANOSCALE SCIENCE AND TECHNOLOGY

The Center for Nanoscale Science and Technology (CNST) works toward a seamless integration of interdisciplinary research from atoms and materials to devices and systems. Campus faculty members, graduate and undergraduate students, industry partners and collaborating scientists from government laboratories and higher education institutions around the world come together through the Center, a leader in groundbreaking nanotechnology research. The CNST also has ongoing linkages with University Research Park, the Illinois Technology and Enterprise Corporation, state legislature, and private industry.

Developed by the CNST, curriculum for nanotechnology education reaches across a number of campus departments and units. Exceptional students with interest in nanotechnology projects have been awarded fellowships, collaborations have been fostered, and several promising projects have been seeded.

CNST has led nationwide and global partnerships with projects in nanomedicine, nanofabrication, and training of the next-generation workforce.



THE ILLINOIS-TSINGHUA CONNECTION

Members of the faculty and administration at the University of Illinois at Urbana-Champaign visited Tsinghua University, Beijing, China, in Summer 2012, including the Tsinghua-Foxconn Nanotechnology Research Center, directed by Dr. Shoushan Fan. Dr. Fan and his group developed carbon nanotube-based technology that is being used in liquid crystal displays, an example of their success in conducting translational research and establishing commercial partnerships. During the visit, discussions led to the idea of holding a joint nanotechnology event at Illinois to identify complementary strengths and explore possibilities for collaborations. The 2014 joint symposium is the result of those efforts by the University of Illinois and Tsinghua University.



WORKSHOP AGENDA

Wednesday, April 16, 2014

LOCATION: Micro and Nanotechnology Laboratory, 208 N. Wright St., Urbana

7:00-8:00 AM **REGISTRATION AND BREAKFAST** *MNTL Atrium*

8:00-10:00 AM **PLENARY SESSION**

Co-Chairs: **Rashid Bashir**, Bioengineering/CNST, University of Illinois
Jimmy Hsia, Mechanical Science and Engineering, University of Illinois
Shoushan Fan, Physics, Tsinghua University

8:00 AM **INTRODUCTORY REMARKS**

nano@Illinois: Center for Nanoscale Science and Technology (CNST)

8:05 AM **WELCOME REMARKS**

Ilesanmi Adesida, Provost and Vice Chancellor for Academic Affairs,
University of Illinois

Sidney Lu, CEO, Foxconn Interconnect Business Technology Group

Shoushan Fan, Director, Tsinghua-Foxconn Nanotechnology Research Center

Brian Cunningham, Interim Director, Micro and Nanotechnology
Laboratory, University of Illinois

Rashid Bashir, Co-Director, CNST, and Department Head, Bioengineering,
University of Illinois

Irfan Ahmad, Executive Director, CNST, and Research Faculty,
Agricultural and Biological Engineering, University of Illinois

- 8:35 AM** **Introduction to Tsinghua-Foxconn Nanotechnology Research Center**
Shoushan Fan, Director, TFNRC; and Professor, Physics, Tsinghua University
- 9:10 AM** **Functional DNA Nanotechnology: Precise Spatial and Dynamic Control of Nanomaterials Assembly and Applications in Sensing, Imaging and Medicine**
Yi Lu, Professor, Chemistry, University of Illinois
- 9:35 AM** **DISCUSSION, GROUP PHOTO, BREAK**
- 10:20 AM-noon** **TECHNICAL SESSION I: Nanomaterials and Nanomanufacturing**
Co-Chairs: **David Ruzic**, Nuclear, Plasma, and Radiological Engineering,
University of Illinois
Kaili Jiang, Physics, Tsinghua University
- 10:20 AM** **Capillary Forming of Carbon Nanotubes**
Sameh Tawfik, Assistant Professor, Mechanical Science and Engineering,
University of Illinois
- 10:45 AM** **Multiform Large-strain Bendings from Carbon Nanotube Bucky paper-polymer Bilayer Electrothermal Actuators**
QingWei Li, Research Associate, Physics, TFNRC, Tsinghua University

- 11:10 AM** **Micro Transfer Printing**
Placid Ferreira, Professor and Department Head, Mechanical Science and Engineering, University of Illinois
- 11:35 AM** **Digital Manufacturing**
William King, Professor, Mechanical Science and Engineering, University of Illinois, and CTO, Digital Lab for Manufacturing, Chicago
- Noon-2:00 PM** **LUNCH AND POSTER SESSION**
CNST Graduate Students Initiative and Tsinghua
- 2:00-5:15 PM** **TECHNICAL SESSION II: Bionanotechnology and Nanomedicine**
Co-chairs: **Princess Imoukhuede**, Bioengineering, University of Illinois
Dongsheng Liu, Chemistry, Tsinghua University
- 2:00 PM** **Biomedical Micro and Nanotechnology: From Lab-on-a-chip to Building Systems with Cells**
Rashid Bashir, Professor and Department Head, Bioengineering, and Co-Director, CNST, University of Illinois
- 2:25 PM** **Tuning Enzyme Cascade Reaction by DNA Molecular Machine**
Dongsheng Liu, Professor, Chemistry, Tsinghua University
- 2:50 PM** **Development of Anticancer Polymeric and Silica Nanoconjugates**
Jianjun Cheng, Associate Professor, Materials Science and Engineering, University of Illinois

- 3:15 PM** **DISCUSSION AND BREAK**
- 3:40 PM** **Fabrication of All-carbon Nanotube Electronic Devices on Flexible Substrates**
Qunqing Li, Professor, Physics, Tsinghua University
- 4:05 PM** **Optical Sensors in Life Science and Medicine**
Brian Cunningham, Professor, Electrical and Computer Engineering, Bioengineering, and Interim Director, Micro and Nanotechnology Lab, University of Illinois
- 4:30 PM** **Bionano Systems for Molecular Manipulation, Sensing, and Delivery**
G. Logan Liu, Assistant Professor, Electrical and Computer Engineering, and Bioengineering, University of Illinois
- 4:55-5:30 PM** **OPEN DISCUSSION**
- 5:45-7:00 PM** **POSTER SESSION AND RECEPTION** *MNTL Atrium*
- 7:30-9:00 PM** **DINNER** (By invitation only) *Beckman Institute Atrium*

Thursday, April 17, 2014

LOCATION: Micro and Nanotechnology Laboratory, 208 N. Wright St., Urbana

- 7:00-8:00 AM** **BREAKFAST** *MNTL Atrium*
- 8:00 AM-noon** **TECHNICAL SESSION III: Nanoelectronics and Nanophotonics**
Co-Chairs: **J. P. Leburton**, Electrical and Computer Engineering,
University of Illinois
Qunqing Li, Physics, Tsinghua University
- 8:00 AM** **Recent Advances in Microcavity Plasma Science and Applications in
Lighting, Water Disinfection, and Displays**
J. Gary Eden, Professor, Electrical and Computer Engineering, MNTL and CSL,
University of Illinois
- 8:25 AM** **Direct Identification of Metallic and Semiconducting Single-walled
Carbon Nanotubes in Scanning Electron Microscopes**
Kaili Jiang, Professor, Physics, Tsinghua University
- 8:50 AM** **3D III-V Nanowire Transistors**
Xiuling Li, Associate Professor, Electrical and Computer Engineering,
MNTL, University of Illinois
- 9:15 AM** **DISCUSSION AND BREAK**
- 9:35 AM** **Improving the Performance of Nanotube Thin-Film Transistors (TBC)**
Joseph Lyding, Professor, Electrical and Computer Engineering,
and Beckman Institute, University of Illinois

- 10:00 AM** **Efficient Fabrication of Field Emitters from Super-aligned Carbon Nanotube Arrays**
Yang Wei, Associate Professor, Physics, Tsinghua University
- 10:25 AM** **Bio-Integrated Electronics and Bio-Inspired Devices**
John Rogers, Professor, Materials Science and Engineering, and Director, FS Materials Research Laboratory, University of Illinois
- 10:50 AM** **DISCUSSION, GROUP PHOTO, AND BREAK**
- 11:15 AM** **Nano Laser for Energy/Data-efficient Optical Interconnect**
Milton Feng, Professor, Electrical and Computer Engineering, and MNTL, University of Illinois
- 11:40 AM** **Methods and Devices for Electronic-Photonic Integration**
John Dallesasse, Professor, Electrical and Computer Engineering, and MNTL, University of Illinois
- 12:05-1:00 PM** **DISCUSSION AND LUNCH**
- 1:15-2:55 PM** **TECHNICAL SESSION IV: Nanobiomechanics and Computation**
Chair: **Arif Masud**, Civil and Environmental Engineering, University of Illinois
- 1:15 PM** **Mechanobiology of Neurons**
Taher Saif, Professor, Mechanical Science and Engineering, University of Illinois

- 1:40 PM** **Mechano-epigenetics of Tumor Repopulating Cells**
Ning Wang, Professor, Mechanical Science and Engineering,
University of Illinois
- 2:05 PM** **Modeling of Self-Assembling Structures**
K. Jimmy Hsia, Professor, Mechanical Science and Engineering,
University of Illinois
- 2:30 PM** **Computational Nanofluidics**
Narayana Aluru, Professor, Mechanical Science and Engineering, and
Director, Computational Science and Engineering, University of Illinois
- 2:55 PM** **DISCUSSION AND BREAK**
- 3:15-5:20 PM** **TECHNICAL SESSION V: NanoEnergy**
Co-Chairs: **David Cahill**, Materials Science and Engineering,
University of Illinois
Jiaping Wang, Physics, Tsinghua University
- 3:15 PM** **Ultra-high-power Rechargeable Batteries and Photonic Crystal LED:
Two Systems Where Deterministic 3D Nanostructures Dramatically
Enhance Properties**
Paul Braun, Professor, Materials Science and Engineering,
University of Illinois

- 3:40 PM** **Template-directed Oxide Growth on Aligned CNTs and its Application in Lithium Ion Batteries**
Yang Wu, Research Associate, Physics, Tsinghua University
- 4:05 PM** **All-carbon Graphene Electronics**
Sungwoo Nam, Assistant Professor, Mechanical Science and Engineering, University of Illinois
- 4:30 PM** **Carbon Nanotubes for High-performance Lithium Ion Batteries**
Jiaping Wang, Associate Professor, Physics, Tsinghua University
- 4:55 PM** **Addressable Micro-heater Array Made with Carbon Nanotube Film**
Peng Liu, Associate Professor, Physics, Tsinghua University
- 5:20 PM** **DISCUSSION AND BREAK**
- 5:35-6:30 PM** **CONCLUDING SESSION**
Moderators: **Rashid Bashir** and **Shoushan Fan**
Rapporteurs: **Irfan Ahmad** and **Qunqing Li**
Workshop Report 2014
Next Steps
Strategic Partnerships
Concluding Remarks
Andreas Cangelaris, Dean, College of Engineering,
and M.E. Van Valkenburg Professor in Electrical and Computer
Engineering, University of Illinois
- 6:30-7:30 PM** **RECEPTION**



FEATURED SPEAKERS



Ilesanmi Adesida

*Vice Chancellor for Academic Affairs and Provost
Professor, Electrical and Computer Engineering, Micro and
Nanotechnology Lab, and Coordinated Science Lab
University of Illinois at Urbana-Champaign*

Ilesanmi Adesida earned B.Sc., M.Sc., and Ph.D. degrees in Electrical Engineering from the University of California, Berkeley. Prior to being named UI provost, he was the 13th dean of the College of Engineering at the University of Illinois at Urbana-Champaign. He originally joined the Illinois faculty in 1987 and currently is a Donald Biggar Willett Professor of Engineering, Professor of Electrical and Computer Engineering, and Professor of Materials Science and Engineering. He is a former Director of the Micro and Nanotechnology Laboratory and Associate Director for Education of the NSF Engineering Research Center for Compound Semiconductor Microelectronics. He was the Founding Director of the University of Illinois Center for Nanoscale Science and Technology. His research interests include nanofabrication processes and ultra-high-speed optoelectronics. Adesida has extensive experience in the development of novel processes for wide bandgap materials such as silicon carbide and gallium nitride. He also has worked on ultra-high-speed photodetectors and photoreceivers in various materials systems. He is a Fellow of the Institute of Electrical and Electronic Engineers (IEEE), American Association for the Advancement of Science (AAAS), American Vacuum Society (AVS) and Optical Society of America. He is past president of IEEE Electron Devices Society, and is a member of the National Academy of Engineering. Previously he worked in various capacities at what is now known as the Cornell Nanofabrication Facility and the School of Electrical Engineering, Cornell University, Ithaca, NY, and he was the head of the Electrical Engineering Department at Tafawa Balewa University, Nigeria.

**Sidney Lu**

*CEO, Foxconn Interconnect Technology Business Group
Corporate Executive Vice President, Foxconn Technology Group, China*

Sidney Lu earned his B.S. in Mechanical Science and Engineering, and Mathematics from the University of Illinois at Urbana-Champaign. In 1990 he joined Foxconn in Beijing, China, and now serves as CEO of the Foxconn Interconnect Technology Group. As the head of the business group serving Foxconn's worldwide connector and cable customers, Lu is responsible for products that include connectors, cables, wire harnesses, switches, antennas, and burn-in test sockets for numerous industries. Previously Lu was with AMP and the Packard Electric Division of GMC in North America. At Foxconn, he has been instrumental in introducing scientific analysis and total quality systems throughout engineering, product development, and manufacturing operation processes, and he has made Foxconn the leader in the contract manufacturing services industry.

**Shoushan Fan**

*Director, Tsinghua-Foxconn Nanotechnology Research Center
Professor, Department of Physics, Tsinghua University, China*

Shoushan Fan graduated from Tsinghua University and then earned his M.Sc. in physics there. Also in 1981, he joined the faculty at Tsinghua. He is a professor in Physics and Director of the Tsinghua-Foxconn Nanotechnology Research Center and has been a visiting scientist at MIT, Harvard and Stanford. His recent research interests are focused on the synthesis, characterization and applications of nanomaterials and nanodevices. Fan received the Cheung Kong Scholar Achievement Award in 1999 and was elected a Member of the Chinese Academy of Science in 2003.



Andreas Cangellaris

Dean, College of Engineering

*M.E. Van Valkenburg Professor in Electrical and Computer Engineering
University of Illinois at Urbana-Champaign*

Andreas Cangellaris earned his M.S. and Ph.D. degrees in Electrical Engineering at the University of California, Berkeley. In August 2013, Cangellaris became the 14th dean of the College of Engineering. He is broadly recognized for his research in applied and computational electromagnetics and applications to the signal integrity of integrated electronic circuits and systems. His research has produced several design methods and computer tools that are used widely in the microelectronics industry. He has written or co-written more than 250 papers. He is affiliated with the Beckman Institute for Advanced Science and Technology and with the Coordinated Science Laboratory at the University of Illinois. Cangellaris earned his doctorate in electrical engineering at the University of California, Berkeley in 1985. He joined the faculty at Illinois in 1997. He is the M.E. Van Valkenburg Professor in Electrical and Computer Engineering and served as the head of the department from 2008-2013. He was an Associate Provost Fellow on the Urbana campus from 2006 to 2008, a role in which he oversaw the review and revision of guidelines for recruitment, promotion and tenure; worked on campuswide interdisciplinary initiatives; and broadened campus outreach activities. Cangellaris is a fellow of the Institute of Electrical and Electronics Engineers. He received a Humboldt Foundation Research Award and the U.S. Army Research Laboratory Director's Coin.



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WEBSITE

nano.illinois.edu/Illinois_Tsinghua

