

11th Foresight Conference on Molecular Nanotechnology

**October 9-12, 2003
San Francisco, CA**

***Learn how the emerging
nanotechnologies of today
will enable the
nanosystems of tomorrow***

Topics Covered

Nanodevices • Molecular Machines
Nanostructures • Scanning Probes
Nanotubes • Nanoelectronics
Biomolecular Machinery • Sensors
Nanomaterials • Self-Assembly
Supramolecular Chemistry
Computational Chemistry

Scientific Tutorial October 9, 2003

Tutorial Chair: **Hicham Fenniri**, Purdue University

Topics Covered

The Chemistry and Physics of Molecules, Assemblies, and Devices
Cherie Kagan, IBM Watson

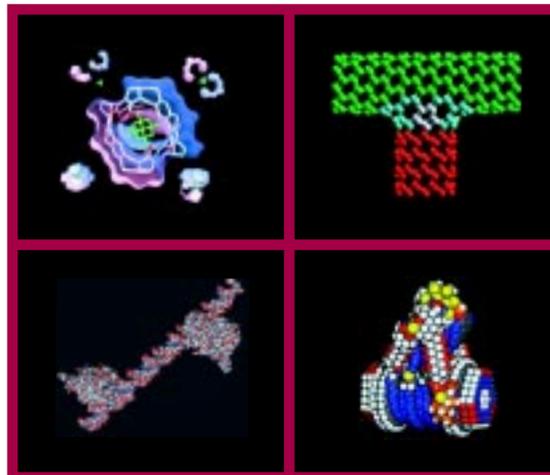
A Top-Down Look at Bottom's Up Electronics
Mark S. Lundstrom, Purdue University

*Implications of Nanotechnology on Energy and
Environmental Remediation*
Thomas E. Mallouk, The Pennsylvania State University

An Integrated Systems-Oriented Approach to Molecular Electronics
Fraser Stoddart, University of California at Los Angeles

Self-Assembly Approaches to Nanoscale Materials
Steven C. Zimmerman, University of Illinois

Conference Co-chairs: **James Spencer**, Syracuse University
Chris Gorman, North Carolina State University



Keynote Speakers

Fraser Stoddart, University of California at Los Angeles
*Meccano on the NanoScale: A Blueprint for Making
Some of the World's Tiniest Machines*

Tobin J. Marks, Northwestern University
Nanophotonic Structures by Molecular Self-Assembly

2003 Foresight Institute Feynman Prize Winners
*Recipients of the Theory and Experimental prestigious
prizes will present their nanotechnology research*

Invited Speakers

Hicham Fenniri, Purdue University
*Organic Nanotubes with Tunable Dimensions
and Properties*

Jan Genzer, North Carolina State University
*Material Templating through Substrate-bound Molecular
and Macromolecular Gradients*

Cherie Kagan, IBM Watson
*Layer-by-layer Construction of Molecular Materials and
Devices*

Mayra Liberman, Notre Dame
*Molecular Quantum-dot Cellular Automata: Computation
without Current*

Mark S. Lundstrom, Purdue University
*Carbon Nanotube Electronics: Device Physics,
Technology, and Applications*

Seth Marder, University of Arizona
Two-Photon Micro and Nanofabrication of 3D Structures

Susan Sinnott, University of Florida
Nanometer-Scale Engineering of Composites

Donald A. Tomalia, Central Michigan Univ. &
Dendritic Nanotechnologies Ltd.
*Nanoscale Structure Control Within and Beyond
Poly(amidoamine) Dendrimers*

11th Foresight Conference on Molecular Nanotechnology

Rapid advances in our ability to probe, image, and manipulate the properties of matter at the atomic scale—together with emerging insights into structure, function and self-assembly in biological systems—is bringing to fruition the tremendous promise of nanotechnology first recognized by Richard Feynman over 40 years ago.

In the next decade, current research into the science and technology of nanostructures will have a major impact on fields ranging from consumer electronics to space exploration and medicine.

Foresight Institute's 1st Conference on Nanotechnology, which predated the National Nanotechnology Initiative by a decade, was the first comprehensive conference on the subject. Foresight-sponsored events continue to be the premiere venue for discussing new and innovative multidisciplinary research in nanotechnology. Last year's conference attracted over 400 researchers from academic, government and industrial laboratories worldwide, and included papers from the electronics, biological, medical, and computing communities. Foresight's 11th Conference will again provide a forum in which leaders from all disciplines delving into nanoscale science and technology present and discuss their latest ideas and results.

About the Keynote Speakers:

Fraser Stoddart is the Saul Winstein Professor of Chemistry at UCLA and the Scientific Co-Director of the California NanoSystems Institute. He has pioneered the development of molecular recognition-cum-self-assembly processes and template-directed protocols in, respectively, noncovalent and covalent synthesis with supramolecular assistance, for the construction of NEMS and the fabrication of nanoelectronic devices.

Tobin J. Marks' pioneering research in inorganic and organometallic chemistry has spanned many areas. He is the recipient of numerous awards including the American Chemical Society's Award in Inorganic Chemistry, the Centenary Medal from the Royal Society of Chemistry, the Willard Gibbs Medal, and the Linus Pauling Medal. He is also a member of the U.S. National Academy of Sciences.

2003 Foresight Institute Feynman Prize Winners

Recipients of the prestigious Theory and Experimental Feynman prizes will present their research talks on Sunday morning, Oct. 12. The prizes will be awarded at the Saturday evening banquet, Oct. 11.

Poster Session

The conference poster session will be held on Friday, October 10, at 5:30 PM, and representatives for each poster will be available for discussion during that time. There will be additional time on Saturday, October 11, for poster viewing and discussion.

3rd Annual Panel on Venture Capital for Nanotechnology—Oct. 10

Due to the rapid increase in interest from the venture funding community, there will be a panel discussion on nanotechnology funding featuring venture capital representatives active in nanotechnology.

Abstracts

Abstracts for both oral presentations and posters are due **June 2, 2003** and should be submitted on the web at: (www.foresight.org/Conferences/MNT11SpeakerInfo.html#ConfAbst). If you have questions, contact the conference co-chairs, James Spencer, jtspace@sy.edu or Chris Gorman Chris_Gorman@ncsu.edu.

Topics Covered

The Foresight Conference covers the key topics required for an integrated understanding of molecular nanotechnology:

Products and goals

Nanostructures underlie all nanotechnologies. Their diverse physical, chemical and electronic properties determine what nanotechnologies can do.

Nanomaterials gain special mechanical, optical, and electronic properties from their nanoscale structure.

Nanodevices—including sensors, transistors, actuators, and others—will be components of the first early products, and later of advanced nanosystems.

Nanoelectronics is a natural extension of the microelectronic technologies of today, expected to be a crucial application of emerging nanotechnologies.

Enabling technologies, tools, and parts

Sensors at the nanoscale can be used to recognize molecules and to probe the properties of surfaces and objects at the atomic scale.

Nanotubes provide strong, stiff building blocks with diverse electronic properties, suiting them for use in a wide range of nanoelectromechanical systems (NEMS).

Biomolecular machinery evolved by nature—such as the bacterial flagellar motor and the actin-myosin system of muscle—has shown the feasibility of molecular machine systems and may provide prefabricated working components.

Scanning probe instruments have led the way in imaging and manipulating molecular structures on surfaces.

Computational chemistry enables designers of molecular systems to understand which designs will produce which results, helping synthetic chemists to produce devices that will function properly in systems.

Molecular machines produce controlled motion on a molecular scale. By bringing other molecules together in a controlled way, they will one day be used to control the sequences of chemical reactions that will enable molecular manufacturing of complex nanosystems.

Enabling sciences and principles

Supramolecular chemistry—by moving beyond the traditional concern with individual molecules to a focus on building larger structures from assemblages of molecules—is a key enabling technology for a wide range of nanosystems.

Self-assembly—the principle behind supramolecular chemistry and the assembly of the molecular machinery of living systems—is central both to many present-generation nanotechnologies and to anticipated pathways toward complex nanosystems.

Feynman Prizes & Awards—Oct. 11

The 2003 Foresight Institute Feynman Prizes in Nanotechnology (Theory and Experimental) will be awarded to the person or group whose recent research has made the most significant contribution to the advancement of nanotechnology. An award of \$5,000 will be given in each category to the top submission selected by a prize committee of past winners. Nominations or submissions must be received by **July 31, 2003**. (www.foresight.org/FI/2003Feynman.html)

The Saturday evening awards banquet will include presentation of prizes and acceptance speeches by the 2003 Foresight Institute Feynman Prize winners, and presentation of the 2003 Foresight Institute Distinguished Student Award (www.foresight.org/FI/StudentAward6.html), and Foresight Institute 2003 Communication Prize (www.foresight.org/FI/communicationprize3.html)

2003 IMM Prizes in Computational Nanotechnology

The Institute for Molecular Manufacturing will award this year's IMM Prizes for Design, Analysis, Rendering, and Simulation. These prizes are designed to encourage advances in molecular machine design. (www.imm.org/prizes)

For the latest information on the conference:
www.foresight.org/conference

Pre-conference Tutorial

Scientific Tutorial Thursday, Oct. 9 (9:00 AM to 6:00 PM)

Tutorial Chair: Hicham Fenniri, Purdue University

Goal

To bring the conference attendees up to speed on major areas of nanoscale science and technology and provide a scientific background to understand and evaluate emerging trends in this field. A particular focus is a critical but basic discussion of recent research on key topics.

Who Should Attend

Researchers and technologists with a basic science or engineering background.

Topics and Instructors

The Chemistry and Physics of Molecules, Assemblies, and Devices

CHERIE KAGAN is a research staff member at the IBM T. J. Watson Research Center in Yorktown Heights, NY. Her research focuses on understanding the chemistry and physics of molecular assemblies and the fabrication of molecular electronic and memory devices. She received the MIT TR10 in 2000 and was recognized by the ACS as one of the top women chemists in 2002.

A Top-Down Look at Bottom's Up Electronics

MARK S. LUNDSTROM is the Scifres Distinguished Professor of Electrical and Computer Engineering at Purdue University. He is the founding director of the NSF Network for Computational Nanotechnology and also serves on the leadership councils of the MARCO Focus Center on Materials, Structures, and Devices and the NASA Institute for Nanoelectronics and Computing. His recent research interests have been applying the insights and methods being developed in molecular electronics to semiconductor transistors at the scaling limit and in exploring new devices that might complement gigascale Si CMOS. His work with his colleague, Supriyo Datta, on these topics was recently recognized by the 2002 IEEE Cleo Brunetti Award.

Implications of Nanotechnology for Energy and Environmental Remediation

THOMAS E. MALLOUK is DuPont Professor of Materials Chemistry at The Pennsylvania State University. His research involves the synthesis of materials from nanoscale building blocks, and he is credited with some of the earliest experiments in the area of inorganic self-assembly. He is currently interested in the development of functional materials from nanoscale components and their applications in solar energy conversion, environmental remediation, molecular electronics, fuel cells and catalysis, chemical sensing, and separations. Mallouk is a co-founder of Molecular Electronics Corp., is Chief Scientist of NuVant Systems, Inc., and serves as Associate Editor of the Journal of the American Chemical Society.

An Integrated Systems-Oriented Approach to Molecular Electronics

FRASER STODDART is the Saul Winstein Professor of Chemistry at UCLA and the Scientific Co-Director of the California NanoSystems Institute. He has published over 650 scientific papers and is currently one of the 100 most highly cited chemists. He has pioneered the development of molecular recognition-cum-self-assembly processes and template-directed protocols in, respectively, noncovalent and covalent synthesis with supramolecular assistance, for the construction of NEMS and the fabrication of nano-electronic devices. His research has taken our fundamental knowledge of chemical bonding into the realm of smart mechanical bonds, which can be directed to control the movements of motor-molecules and the operations of molecular switches. He is a fellow of the Royal Society of London and the German Academy of Natural Sciences.

Self-Assembly Approaches to Nanoscale Materials

STEVEN C. ZIMMERMAN is the William H. and Janet G. Lycan Professor of Chemistry at the University of Illinois at Urbana-Champaign. He is a synthetic organic chemist whose research lies at the interface of chemical biology and polymer chemistry. The current efforts of his group are focused on molecular recognition and self-assembly processes involving DNA, DNA base analogs, dendrimers, and other polymeric materials.

Registration

Registration fees include: Thursday evening welcoming reception; general session which begins on Friday morning and ends Sunday afternoon; poster session reception; and Friday and Saturday lunch. (There is a "no lunch" option that does not include lunch on Friday or Saturday; see back page.)

The registration for the tutorial is separate from the conference registration. The tutorial registration fee includes Thursday lunch. You may register for the conference only, the tutorial only, or both the conference and tutorial.

Tutorial space is limited. Early registration is recommended. For additional information, see the web site or contact the Conference Office at +1(650) 917-1122, foresight@foresight.org or Hicham Fenniri hf@purdue.edu

An **optional item** at the conference is the annual Feynman Prize Banquet Dinner. The Banquet Dinner is held on Saturday, October 11, from 6:00 to 8:00 PM and includes the presentation of prizes and acceptance speeches by the 2003 Feynman Prize Winners. See the Registration page for pricing information.

A **Foresight Policy Forum** held on Friday, October 10, (8:00 to 10:00 PM) will be open to all conference attendees at no charge.

Amounts over \$175 are tax-deductible in the U.S. as a charitable contribution, excluding optional items.

Site and Accommodations

San Francisco Airport Marriott Hotel

1800 Old Bayshore Highway • Burlingame, CA 94010 • USA

Reservations: Phone: +1(650) 692-9100 • Fax: +1(650) 692-8016 • 1(800) 228-9290 in the US and Canada. (www.marriott.com) Attendees are responsible for making their own reservations. Mention the *Foresight Nanotechnology Conference*.

Group Rate: Through Monday, **Sept. 15, 2003** there will be a limited number of rooms available at the Group Rate of \$119 plus tax—single or double occupancy. Please reserve early.

The hotel is centrally located on the San Francisco Bay, just 1-mile south of the San Francisco International Airport, 15 minutes from downtown San Francisco, and 20 minutes to the Silicon Valley.

Airport Transportation: Complimentary Hotel Airport Shuttle is available 24 hours a day to and from San Francisco International Airport.

Refund Policy

Refunds of registration fees can only be made upon receipt of a written request, dated no later than Monday **Sept. 15, 2003**, and are subject to a \$75 administrative fee.

Special Needs

Participants with special needs should notify the organizers at least one month in advance. Please contact Foresight Institute foresight@foresight.org, +1(650) 917-1122, fax +1(650) 917-1123.



Sponsored by



Foresight Institute and Institute for Molecular Manufacturing are non-profit organizations focused on nanotechnology education and research and are funded primarily through Senior Associate donations. Senior Associates receive discounts for all Foresight and IMM sponsored events. For more information about the Senior Associates Program including our annual meetings see www.foresight.org/SrAssoc

Conference & Tutorial Registration

Please **print clearly** and fax or mail this form to:
 Foresight Institute • Box 61058 • Palo Alto CA 94306 USA
 Tel: +1(650) 917-1122 • Fax: +1(650) 917-1123

Name: _____

Address: _____

City, State: _____

Zip/Postal Code, Country: _____

Phone: _____

Fax: _____

Email: _____

Position (Professor, Director, Programmer, etc.): _____

Organizational affiliation (for your badge): _____

- Yes, include my contact information: name, badge affiliation, and email on an attendee list.**
- No, do not include my contact information on an attendee list.**

Senior Associates of Foresight Institute or IMM may register at the academic rate, regardless of their employment status. For more information about becoming a Senior Associate, see www.foresight.org/SrAssoc.

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 University of Kentucky • Molecular Manipulator Design: A Fine Motion Controller, by K. E. Drexler, Inst.
 for Molecular Manufacturing • Supramolecular Chemistry of Addressable Biostructures, by J. Wendel
 and S. Smith, City of Hope Medical Center

Conference Fee with LUNCHES included: (Oct. 10-12)
Conference fees include: Welcome reception, bagels, coffee, poster reception.

	by Aug. 1	after Aug. 1
Academic, Nonprofit, Govt., Sr. Assoc.	<input type="checkbox"/> \$475	<input type="checkbox"/> \$595
Corporate, Individual	<input type="checkbox"/> \$595	<input type="checkbox"/> \$725
Full-time Student**	<input type="checkbox"/> \$225	<input type="checkbox"/> \$325
One day <input type="checkbox"/> Fri <input type="checkbox"/> Sat <input type="checkbox"/> Sun	<input type="checkbox"/> \$175	<input type="checkbox"/> \$225

Conference Fee with NO LUNCHES (Oct. 10-12)
Conference fees include: Welcome reception, bagels, coffee, poster reception.

	by Aug. 1	after Aug. 1
Academic, Nonprofit, Govt., Sr. Assoc.	<input type="checkbox"/> \$345	<input type="checkbox"/> \$465
Corporate, Individual	<input type="checkbox"/> \$465	<input type="checkbox"/> \$590
Full-time Student**	<input type="checkbox"/> \$ 95	<input type="checkbox"/> \$195

No lunches option omits lunch on Friday & Saturday.

** Full-time students must fax a copy of **current** university student ID with the registration form or Academic Fee will be charged.

Tutorial Fees include lunch (Oct.9)

Scientific Tutorial—9:00 AM - 6:00 PM	<input type="checkbox"/> \$475	<input type="checkbox"/> \$595
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Feynman Prize Banquet (Oct. 11) 6:30 PM	<input type="checkbox"/> \$ 60	<input type="checkbox"/> \$ 75
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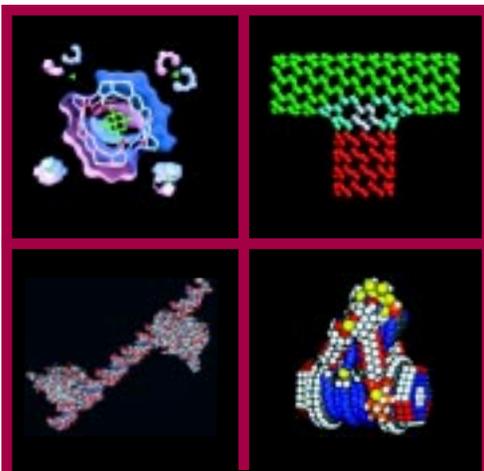
Conference	\$ _____
Tutorial	\$ _____
Feynman Prize Banquet	\$ _____
TOTAL	\$ _____

Please make checks payable to Foresight Institute. Checks and bank drafts must be in U.S. dollars drawn on a U.S. bank.

VISA or MasterCard Number: _____ Exp. Date: _____

Signature _____

Printed Name _____



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