

[CONFERENCE SCHEDULE](#)

Foundations of Nanoscience: Self-Assembled Architectures and Devices (FNANO)

April 21-23, 2004 [Snowbird Cliff Lodge](#), [Snowbird](#), UT

Conference Sponsorship: Defense Advanced Research Projects Agency ([DARPA](#))

FNANO04 Conference Webpage: <http://www.cs.duke.edu/~reif/FNANO/FNANO04/>

Conference Schedule Webpage:

<http://www.cs.duke.edu/~reif/FNANO/FNANO04/schedule.html>

FNANO Conference Chair: [John H Reif](#) < > Department of Computer Science, Duke University, Durham, NC 919-660-6568

FNANO Conference Program Committee:

[Leonard Adleman](#) <adleman@usc.edu>, University of Southern California, Los Angeles, CA

[Karl Bohringer](#) <karl@ee.washington.edu>, Department of Electrical Engineering, University of Washington, Seattle, WA

[James R. Heath](#) <heath@caltech.edu>, California Institute of Technology, Los Angeles, CA

[Michael Hecht](#) <hecht@princeton.edu>, Department of Chemistry, Princeton University, Princeton, NJ


[Homme Hellinga](#) <hwh@biochem.duke.edu>, Department of Biochemistry, Duke University, Durham, NC

[Philip J. Kuekes](#) <kuekes@hpl.hp.com>, Hewlett-Packard Corporation, Palo Alto, CA

[Sri Kumar](#) <skumar@darpa.mil>, Information Processing Technology Office ([IPTO](#)), Defense Advanced Research Projects Agency ([DARPA](#)), Arlington, VI

[Kwan Kwok](#) <kkwok@darpa.mil>, Microsystems Technology Office ([MTO](#)), Defense Advanced Research Projects Agency ([DARPA](#)), Arlington, VI

[Jie Liu](#) <j.liu@duke.edu>, Department of Chemistry, Duke University, Durham, NC

[John H. Reif](#) < > (Chair), Department of Computer Science, Duke University, Durham, NC

[George C. Schatz](#) <schatz@chem.northwestern.edu>, Department of Chemistry, Northwestern University, Evanston, IL

[Nadrian Seeman](#) <ncs1@feynman.acf.nyu.edu>, Department of Chemistry, New York University, New York, NY

[Lloyd Smith](#) <smith@chem.wisc.edu>, University of Wisconsin, Madison, WI

[Andrew Turberfield](#) <a.turberfield@physics.ox.ac.uk>, Department of Physics, Oxford University, Oxford UK

[R. Stanley Williams](mailto:stan_williams@hp.com) <stan_williams@hp.com>, Hewlett-Packard Corporation, Palo Alto, CA

Conference Reception: Golden Cliff Room (7:00 PM-9:00 PM April 20)

Conference Schedule Wednesday, April 21, 2004

Continental Breakfast: Outside Ballroom 1 (7:30 AM-8:00 AM April 21)

Opening of FNANO Conference & Announcements: Ballroom 1 (8:00 AM-8:05 AM April 21)

[John H. Reif](#), Conference Chair

FNANO Track on Self-Assembled DNA Nanostructures, Session A: Ballroom 1 (8:05 AM - 9:25 AM April 21)

Track Chair: [Nadrian Seeman](#) <ncs1@feynman.acf.nyu.edu>, Department of Chemistry, New York University, New York, NY

4 Invited Talks:

- **Building Blocks for DNA Self-Assembly (8:05 AM-8:25 AM)**

[Yuriy Brun](#) <ybrun@usc.edu>, Laboratory for Molecular Science, University of Southern California, Los Angeles, CA

- **Self-Assembly of Nanoparticle Arrays by DNA Scaffolding (8:25 AM-8:45 AM)**

[Richard A. Kiehl](#) <kiehl001@umn.edu>, University of Minnesota-Twin Cities, Minneapolis, MN

- **Hierarchical and Serial DNA Self-Assemblies (8:45 AM-9:05 AM)**

[Thom LaBean](#) <thl@cs.duke.edu>, Department of Computer Science, Duke University, Durham, NC

- **Self-assembly of DNA triangles (9:05 AM-9:25 AM)**

[Chengde Mao](#) <mao@purdue.edu>, Department of Chemistry, Purdue University, West Lafayette, IN

Refreshment Break: Outside Ballroom 1 (9:25 AM-9:35 AM April 21)

FNANO Track on Self-Assembled DNA Nanostructures, Session B: Ballroom 1 (9:35 AM - 10:55 AM April 21)**Track Chair: [Nadrian Seeman](#)****4 Invited Talks:****- DNA-mediated nano-hybrid-materials (9:35 AM - 9:55 AM)****[Wolfgang Parak](#) <wolfgang.parak@physik.uni-muenchen.de>, Ludwig Maximilians Universitaet Muenchen, Muenchen, Germany****- DNA Sierpinski Triangles and DNA nanotubes (9:55 AM - 10:15 AM)****[Paul Rothmund](#) <pwkr@dna.caltech.edu>, California Institute of Technology, Los Angeles, CA****- An aptamer-based DNA nanomachine (10:15 AM - 10:35 AM)****[Friedrich Simmel](#) <friedrich.simmel@physik.uni-muenchen.de>, Munich University, Muenchen, Germany****- A Clonable DNA Nano-Octahedron (10:35 AM - 10:55 AM)****[William M. Shih](#) <wmshih@scripps.edu>, Department of Chemistry, The Scripps Research Institute, La Jolla, CA**

Refreshment Break: Outside Ballroom 1 (10:55 AM-11:05 AM April 21)

FNANO Track on Principles and Theory of Self-Assembly, Session A: Ballroom 1 (11:05 AM –12:25 PM April 21)**Track Chair: [Leonard Adleman](#) <adleman@usc.edu>, Laboratory for Molecular Science, University of Southern California. Los Angeles, CA****4 Invited Talks:****- Phase Transitions and Control in Self Assembly (11:05 AM –11:25 PM)****[Ed Coffman](#) <egc@ee.columbia.edu>, Department of Computer Science, Columbia University, NY City, NY****- Self assembling by DNA junction molecules: the theoretical model (11:25 AM –11:45 PM)****[Natasha Jonoska](#) <jonoska@math.usf.edu>, Department of Mathematics, University of Southern Florida, Tampa FL****- Directed Self-Assembly Using Graph Grammars (11:45 AM –12:05 PM)****[Eric Klavins](#) <klavins@ee.washington.edu>, Dept of Electrical Engineering, University of Washington, Seattle, WA****- Flux systems, flows and self-assembly (12:05 PM –12:25 PM)**

[Grzegorz Rozenberg](#) <rozenber@liacs.nl>, Leiden Institute for Advanced Computer Science, Leiden University, Leiden, The Netherlands

Lunch: Golden Cliff Room (12:25 PM-1:10 PM April 21)

Principles and Theory of Self-Assembly Track Chair Overview Talk: Golden Cliff Room:

- **Toward a general theory of Self-assembly (12:35 PM-1:05 PM)**

[Leonard Adleman](#) <adleman@usc.edu>, Laboratory for Molecular Science, University of Southern California. Los Angeles, CA

FNANO Track on Principles and Theory of Self-Assembly, Session B: Error Correction: Ballroom 1 (1:10 PM -2:10 PM April 21)

Track Chair: [Leonard Adleman](#)

3 Invited Talks:

- **Errors and Error-correction in Algorithmic Self-Assembly (1:10 PM-1:30 PM)**

[Erik Winfree](#) <winfree@caltech.edu>, Department of Computer Science, and Department of Computation and Neural Systems, California Institute of Technology, Pasadena, CA

- **Optimal Self-Assembly of Counters at Temperature Two (1:30 PM-1:50 PM)**

[Ashish Goel](#) <ashishg@stanford.edu> (speaker), Qi Cheng and Pablo Moisset de Espanes, Department of Management Science and Engineering, Stanford University, Stanford CA

- **Compact Error-Resilient Computational DNA Tiling Assemblies (1:50 PM-2:10 PM)**

[John H. Reif](#) < >, [Sudheer Sahu](#) <sudheer@cs.duke.edu> (speaker) and [Peng Yin](#) <py@cs.duke.edu>, Department of Computer Science, Duke University, Durham, NC

Refreshment Break: Outside Ballroom 1 (2:10 PM –2:20 PM April 21)

FNANO Track on DNA-Metal Aggregates, Session A: Ballroom 1 (2:20 PM –3:40 PM April 21)

Track Chair: [George C. Schatz](#) <schatz@chem.northwestern.edu>, Department of Chemistry, Northwestern University, Evanston IL

4 Invited Talks:

- DNA directed assembly of nanocrystals (2:20 PM –2:40 PM)

[Yi Cui](mailto:ycui@uclink.berkeley.edu) <ycui@uclink.berkeley.edu> (speaker) and [Paul Alivisatos](mailto:alivis@uclink4.berkeley.edu) <alivis@uclink4.berkeley.edu>, University of California, Berkeley, CA

- Nanoparticles: A new synthesis for programmably creating Biochemical-Nanoparticle linear sequences and applications (2:40 PM – 3:00 PM)

[Joe Jacobson](mailto:jacobson@media.mit.edu) <jacobson@media.mit.edu>, Media Lab, MIT, Cambridge, MA (with [Shuguang Zhang](mailto:shuguang@mit.edu) <shuguang@mit.edu>, Center for Biomedical Engineering)

- DNAzyme-Directed Assembly of Nanoparticles and its Application as Colorimetric Sensors for a Broad Range of Analytes (3:00 PM –3:20 PM)

[Yi Lu](mailto:yi-lu@uiuc.edu) <yi-lu@uiuc.edu>, Department of Chemistry, University of Illinois at Urbana-Champaign, Urbana, IL

- Self-Assembly Driven Metallization of DNA-Templated Nanowires (3:20 PM –3:40 PM)

[Oliver Harnack](mailto:harnack@sony.de) <harnack@sony.de>, Materials Science Laboratories, Sony International (Europe) GmbH, Stuttgart, Germany

Refreshment Break: Outside Ballroom 1 (3:40 PM –3:50 PM April 21)

FNANO Track on DNA-Metal Aggregates, Session B: Ballroom 1 (3:50 PM - 4:50 PM April 21)

Track Chair: [George C. Schatz](mailto:schatz@chem.northwestern.edu) <schatz@chem.northwestern.edu>, Department of Chemistry, Northwestern University, Evanston IL

3 Invited Talks:

- DNA-based fabrication of metallic wires and networks (3:50 PM - 4:10 PM)

[Michael Mertig](mailto:mertig@tmfs.mpgfk.tu-dresden.de) <mertig@tmfs.mpgfk.tu-dresden.de>, Institut für Werkstoffwissenschaft, Technische Universität Dresden, Dresden, Germany

- Polymer-Gold Aggregates (4:10 PM - 4:30 PM)

[Sungho Park](mailto:spark72@chem.northwestern.edu) <spark72@chem.northwestern.edu>, Department of Chemistry, Northwestern University, Evanston IL

- Transistor in a Test Tube - Harnessing Molecular Biology to the Self-Assembly of Functional Electronics (4:30 PM - 4:50 PM)

[Uri Sivan](mailto:phsivan@tx.technion.ac.il) <phsivan@tx.technion.ac.il>, Department of Physics, Technion, Haifa, Israel

Refreshment Break: Outside Ballroom 1 (4:50 PM –5:00 PM April 21)

FNANO Track on Molecular Electronic & Quantum Devices, Session A: Ballroom 1 (5:00 PM-6:00 PM April 21)

[James R. Heath](mailto:heath@caltech.edu) <heath@caltech.edu>, California Institute of Technology, Los Angeles, CA and
[Kwan Kwok](mailto:kkwok@darpa.mil) <kkwok@darpa.mil>, Microsystems Technology Office ([MTO](#)), Defense Advanced Research Projects Agency ([DARPA](#)), Arlington, VI

3 Invited Talks:

- Carbon Nanotube Electronics (5:00 PM-5:20 PM)

[Hongjie Dai](mailto:hdai1@stanford.edu) <hdai1@stanford.edu> (speaker) and [Ali Javey](#), Department of Chemistry, Stanford University, Stanford, CA

- STM spectroscopy on free-standing carbon nanotubes (5:20 PM-5:40 PM)

[Cees Dekker](mailto:dekker@mb.tn.tudelft.nl) <dekker@mb.tn.tudelft.nl>, Delft University of Technology, Department of Applied Physics, The Netherlands

- Four Unimolecular Rectifiers and What Lies Ahead (5:40 PM-6:00 PM)

[R. Metzger](mailto:rmetzger@bama.ua.edu) <rmetzger@bama.ua.edu>, Chemistry Department, University of Alabama, Tuscaloosa, AL

Reception: Golden Cliff Room (6:00 PM-6:30 PM April 21)**Dinner Buffet: Golden Cliff Room (6:45 PM-8:00 PM April 21)****Self-Assembled DNA Nanostructures Track Chair Overview Talk: Golden Cliff Room**

- Not Just the Secret of Life (7:00 PM-7:30 PM)

[Nadrian Seeman](mailto:ncs1@feynman.acf.nyu.edu) <ncs1@feynman.acf.nyu.edu>, Department of Chemistry, New York University, New York, NY

DNA-Metal Aggregates Track Chair Overview Talk: Golden Cliff Room

- Cooperative DNA Melting in DNA Linked Gold Nanoparticle Aggregates (7:30 PM-8:00 PM)

[George C. Schatz](mailto:schatz@chem.northwestern.edu) <schatz@chem.northwestern.edu>, Department of Chemistry, Northwestern University, Evanston IL (paper by Hai Long, Maodu Chen, and George C. Schatz)

[NSF Workshop on Self-Assembled Architectures,](#)

Evening Session A: Solicitation of Ideas for New Research Challenges**Golden Cliff Room (8:00 PM-9:00 PM April 21)**

coChairs: [John H. Reif](#) < >, Duke University and
[K. Birgitta Whaley](#) <whaley@socrates.berkeley.edu>, Department of Chemistry, University of California, Berkeley, CA

Greetings & Overview: [John H. Reif](#) (8:00 PM-8:05 PM)**Dessert (8:05 –8:30 PM)****Open Session on Proposals for New Research Challenges in Self-Assembled Nanostructures Led by NSF Workshop Panel (8:05 PM-9:30)**

Conference Schedule Thursday, April 22, 2004**Continental Breakfast: Outside Ballroom 1 (7:30 AM - 8:00 AM April 22)**

FNANO Track on Molecular Electronic & Quantum Devices, Session B: Ballroom 1 (8:00 AM- 11:15 AM April 22)**Track coChairs:**

[James R. Heath](#) <heath@caltech.edu>, California Institute of Technology, Los Angeles, CA and
[Kwan Kwok](#) <kkwok@darpa.mil>, Microsystems Technology Office ([MTO](#)), Defense Advanced Research Projects Agency ([DARPA](#)), Arlington, VI

9 Invited Talks:**- Hybrid Semiconductor/Molecular Devices (8:00 AM- 8:20 AM)**

[David Bocian](#) <david.bocian@ucr.edu>, University of California at Riverside, Riverside, CA

- Polymer Nanofiber Based Devices (8:20 AM- 8:40 AM)

[Harold G. Craighead](#) <hgc1@cornell.edu>, Cornell University, Ithaca, NY

- Building Block Approaches to Molecular Nanomagnets (8:40 AM- 9:00 AM)

[Kim Dunbar](#) <dunbar@mail.chem.tamu.edu>, Dept. of Chemistry, Texas A&M University, College Station, TX

- **Silicon contacts: A new playground for molecular electronics? (9:00 AM- 9:20 AM)**

[Avik Ghosh](mailto:ghosha@ecn.purdue.edu) <ghosha@ecn.purdue.edu>, School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN

- **Self-Assembly and Lithographic Patterning of DNA Rafts (9:20 AM- 9:40 AM)**

[Marya Lieberman](mailto:mlioberm@nd.edu) <mlioberm@nd.edu>, Department of Chemistry and Biochemistry, University of Notre Dame, Notre Dame, IN

Refreshment Break: Outside Ballroom 1 (9:40 AM -9:55 AM April 22)

- **In-wire Molecular Electronic Devices: Synthesis and Electrical Characterization (9:55 AM- 10:15 AM)**

[Theresa Mayer](mailto:tism2@psu.edu) <tism2@psu.edu>, Pennsylvania State University, University Park, PA

- **Molecular Meccano and Molecular Electronics (10:15 AM- 10:35 AM)**

[Fraser Stoddart](mailto:stoddart@chem.ucla.edu) <stoddart@chem.ucla.edu>, UCLA & California NanoSystems Institute(CNSI), Los Angeles, CA

- **Synthesis and Self-Assembly of Nanostructures (10:35 AM- 10:55 AM)**

[Younan Xia](mailto:xia@chem.washington.edu) <xia@chem.washington.edu>, Department of Chemistry, University of Washington, Seattle, WA

- **Design of Magnetic Spinel Ferrite Nanoparticles for Biological Applications (10:55 AM – 11:15 AM)**

[John Zhang](mailto:john.zhang@chemistry.gatech.edu) <john.zhang@chemistry.gatech.edu>, School of Chemistry & Biochemistry, Georgia Institute of Technology, Atlanta, GA

Refreshment Break: Outside Ballroom 1 (11:15 AM -11:30 AM April 22)

FNANO Track on Molecular Electronics & Quantum Devices, Session C: Ballroom 1 (11:10 AM - 12:30 PM April 22)

Track coChairs: [James R. Heath](#) and [Kwan Kwok](#)

3 Invited Talks:

- **Some Issues of Junction Dynamics (11:30 AM - 11:50 AM)**

[Mark Ratner](mailto:ratner@chem.northwestern.edu) <ratner@chem.northwestern.edu>, Chemistry Department, Northwestern University, Evanston IL

- **Tunneling Spectroscopy of Self-Assembled Monolayers (11:50 AM - 12:10 PM)**

[Mark Reed](#) <mark.reed@yale.edu>, Department of Electrical Engineering, Yale University, New Haven, CT

- **Molecular Electronics: NanoCell Electronic Memories and Direct Covalent Attachment of Molecules to Oxide-Free Silicon for Construction of Hybrid Devices (12:10 PM - 12:30 PM)**

[James Tour](#) <tour@rice.edu>, Department of Chemistry, Rice University, Houston, TX

Lunch: Golden Cliff Room (12:30 PM - 1:20 PM April 22)

Molecular Electronic & Quantum Devices Track Chair Overview Talk: Golden Cliff Room

Molecular Mechanics & Electronics (12:40 PM - 1:10 PM)

[James R. Heath](#) <heath@caltech.edu>, California Institute of Technology, Los Angeles, CA

FNANO Track on Molecular Electronics & Quantum Devices, Session D: Quantum Computing Devices: Ballroom 1 (1:20 PM - 2:20 PM April 22)

Track coChairs: [James R. Heath](#) and [Kwan Kwok](#)

3 Invited Talks:

- **Molecular Wiring of Semiconductor Nanostructures for Quantum Information Processing (1:20 PM - 1:40 PM)**

[David Awschalom](#) <awsch@physics.ucsb.edu> and

[Min Ouyang](#) <ouyang@iquest.ucsb.edu> (speaker), Department of Physics, University of California, Santa Barbara, CA

- **Molecular Quantum-dot Cellular Automata (1:40 PM - 2:00 PM)**

[Craig Lent](#) <lent@nd.edu>, Department of Electrical Engineering, University of Notre Dame, Notre Dame, IN

- **Quantum Computation with Endohedral Fullerenes (2:00 PM - 2:20 PM)**

[Jason Twamley](#) <Jason.Twamley@may.ie>, Department of Mathematical Physics, National University of Ireland Maynooth, Kildare, Ireland

Refreshment Break: Outside Ballroom 1 (2:20 PM - 2:30 AM April 22)

FNANO Track on Peptide and Viral Self-Assembly: Ballroom 1 (2:30 PM - 4:30 PM April 22)

Track Chair: [Michael Hecht](mailto:hecht@princeton.edu) <hecht@princeton.edu>, Department of Chemistry, Princeton University, Princeton, NJ

6 Invited Talks:

- Virus-Based Genetic Toolkit for the Directed Synthesis of Magnetic and Semiconducting Nanowires (2:30 PM - 2:50 PM)
[Angela Belcher](mailto:belcher@mit.edu) <belcher@mit.edu>, MIT, Cambridge, MA

- Chemical and Genetic Tailoring of Virus Particles to Achieve Nanochemical Function (2:50 PM - 3:10 PM)
[M.G Finn](mailto:mgfinn@scripps.edu) <mgfinn@scripps.edu>, Department of Chemistry and The Skaggs Institute for Chemical Biology, Scripps Research Institute, La Jolla, CA

- Self-Assembled Viruses as Nanocontainers (3:10 PM - 3:30 PM)
[William Gelbart](mailto:gelbart@chem.ucla.edu) <gelbart@chem.ucla.edu>, Department of Chemistry, UCLA, Los Angeles, CA

- Assembly and Functionization of an Icosahedral Virus (3:30 PM - 3:50 PM)
[Tianwei Lin](mailto:twlin@scripps.edu) <twlin@scripps.edu>, Scripps Institute, La Jolla, CA -Tianwei Lin <twlin@scripps.edu>, Scripps Institute, La Jolla, CA

- Peptide and Biomimetic Catalysts for Structure-Directed Nanofabrication of Siloxanes, Organometallics and Metallo-oxanes (3:50 PM - 4:10 PM)
[Daniel Morse](mailto:d_morse@lifesci.ucsb.edu) <d_morse@lifesci.ucsb.edu>, Department of Molecular, Cellular and Developmental Biology, UC Santa Barbara, Santa Barbara, CA

- Molecular Biometrics: Building Materials via the Nature's Way, One Molecule at a Time (4:10 PM - 4:30 PM)
[Mehmet Sarikaya](mailto:sarikaya@u.washington.edu) <sarikaya@u.washington.edu>, University of Washington, Seattle, WA

Refreshment Break: Outside Ballroom 1 (4:30 PM-4:40 PM April 22)

FNANO Track on Molecular Motors, Session A: Ballroom 1 (4:40 PM-6:00 PM April 22)

Track Chair: [Andrew Turberfield](mailto:a.turberfield@physics.ox.ac.uk) <a.turberfield@physics.ox.ac.uk>, Department of Physics, Oxford University, Oxford UK

4 Invited Talks:

- Rotaxane- and Catenane-based Molecular Machines and Motors (4:40 PM-5:00 PM)

[Alberto Credi](mailto:acredi@ciam.unibo.it) <acredi@ciam.unibo.it>, Department of Chemistry, University of Bologna, Italy


- Artificial Surface-Mounted Molecular Rotors (5:00 PM-5:20 PM)

[Josef Michl](mailto:michl@eefus.colorado.edu) <michl@eefus.colorado.edu>, Department of Chemistry and Biochemistry, University of Colorado, Boulder, CO

- DNA Nanoactuator in Self-assembly (5:20 PM-5:40 PM)

[Hao Yan](mailto:hy1@cs.duke.edu) <hy1@cs.duke.edu>, Department of Computer Science, Duke University, Durham, NC

- Autonomous DNA Motors and Computing Machines: Experimental Study and Theoretical Constructions (5:40 PM-6:00 PM)

[Peng Yin](mailto:py@cs.duke.edu) <py@cs.duke.edu> (speaker), [Andrew Turberfield](mailto:a.turberfield@physics.ox.ac.uk) <a.turberfield@physics.ox.ac.uk> (Department of Physics, Oxford University, Oxford UK), [Hao Yan](mailto:hy1@cs.duke.edu) <hy1@cs.duke.edu>, [John H. Reif](#) < >, Department of Computer Science, Duke University, Durham, NC

Conference Schedule Thursday Evening, April 22, 2004

Reception & Poster Session: Golden Cliff Room (6:00 PM -6:45 PM April 22)

16 Posters:

DNA Computation Times

[Yuliy Baryshnikov](mailto:yymb@research.bell-labs.com) <yymb@research.bell-labs.com>, Bell Labs, Lucent Technologies, Murray Hill, NJ

Assembly and electrical properties of nanomaterials

[Sung-Wook Chung](mailto:schung@chem.northwestern.edu) <schung@chem.northwestern.edu>, Department of Chemistry & Institute for Nanotechnology, Northwestern University, Evanston, IL

Parallel Computer Architectures Enabled by Self-Assembly

[Chris Dwyer](mailto:dwyer@ece.duke.edu) <dwyer@ece.duke.edu>, Department of Computer Science, Duke University, Durham, NC

Redox-Controllable Shuttling in Bistable [2]Rotaxanes

[Alberto Di Fabio](mailto:adifabio@ciam.unibo.it) <adifabio@ciam.unibo.it>, Department of Chemistry, University of Bologna, Bologna, Italy

Atomic Force Microscopy Movies and Measurements of DNA Crystals

[Rizal F. Hariadi](mailto:hariadi@dna.caltech.edu) <hariadi@dna.caltech.edu>, Department of Computer Science, and Department of Computation and Neural Systems, California Institute of Technology, Pasadena, CA

CAD Support for DNA-Guided Self-Assembly of Nanoelectronics

[Vijeta Johri](mailto:vijeta@cs.duke.edu) <vijeta@cs.duke.edu>, Department of Computer Science, Duke University, Durham, NC

Active and Dynamic Nanomaterials Using Kinesin and Microtubules

[Steven John Koch](mailto:sjkoch@sandia.gov) <sjkoch@sandia.gov>, Biomolecular Materials and Interfaces, Sandia National Laboratories, Albuquerque, NM

Paradigms for computational nucleic acid design

[Robert M. Dirks](mailto:dirks@caltech.edu) <dirks@caltech.edu>, [Milo Lin](mailto:milo@dna.caltech.edu) <milo@dna.caltech.edu>, [Erik Winfree](mailto:winfree@caltech.edu) <winfree@caltech.edu>, and [Niles A. Pierce](mailto:niles@caltech.edu) <niles@caltech.edu>, Applied & Computational Mathematics, California Institute of Technology, Pasadena, CA

Effect of Corrugating Schemes on the Morphologies of DNA Lattices

[Sung Ha Park](mailto:spark@phy.duke.edu) <spark@phy.duke.edu>, Department of Physics, Duke University, Durham, NC

NANA: Nano-scale Active Network Architecture

[Jaidev Patwardhan](mailto:jaidev@cs.duke.edu) <jaidev@cs.duke.edu>, Department of Computer Science, Duke University, Durham, NC

Patterning of DNA using molecular liftoff methodology

[Koshala Sarveswaran](mailto:ksarvesw@nd.edu) <ksarvesw@nd.edu>, Department of Chemistry and Biochemistry, University of Notre Dame, Notre Dame, IN

DNA Hybridization Catalysts and Catalyst Circuits

[Georg Seelig](mailto:seelig@dna.caltech.edu) <seelig@dna.caltech.edu>, California Institute of Technology, Pasadena, CA

Efficient Algorithms for Multistranded Stochastic Kinetic Simulation

[Joseph Schaeffer](mailto:schaeffer@dna.caltech.edu) <schaeffer@dna.caltech.edu>, Department of Computer Science, and Department of Computation and Neural Systems, California Institute of Technology, Pasadena, CA

Rewritable memory by controllable nanopatterning of DNA

[Jong-Shik Shin](mailto:enzymo@acm.caltech.edu) <enzymo@acm.caltech.edu> and [Niles A. Pierce](mailto:niles@caltech.edu), <niles@caltech.edu>, Applied & Computational Mathematics, California Institute of Technology, Pasadena, CA

Immobilization of DNazymes for Sensitive Pb²⁺ Sensors

[Daryl P. Wernette](mailto:dwernett@uiuc.edu) <dwernett@uiuc.edu>, Juewen Liu and Yi Lu, University of Illinois - Urbana Champaign, Urbana, IL

Spin-Dependent Transport in Nanoscale Systems

[K. Birgitta Whaley](mailto:whaley@socrates.berkeley.edu) <whaley@socrates.berkeley.edu>, [Joshua Schrier](mailto:schrier@holmium.cchem.berkeley.edu) <schrier@holmium.cchem.berkeley.edu> and [Laxmidhar Senapati](mailto:senapl@holmium.cchem.berkeley.edu) <senapl@holmium.cchem.berkeley.edu>, Department of Chemistry, University of California, Berkeley, CA

Executive Meeting for Track Chairs: (6:00 PM -6:45 PM April 22)

Agenda: Discussion of plans for future years & Topics for NSF Programs in Self-Assembled Nanostructures

Dinner: Golden Cliff Room (6:45 PM -8:00 PM April 22)

Peptide and Viral Self-Assembly Track Chair Overview Talk: Golden Cliff Room

- Structures and Functions of De Novo Proteins from Designed Combinatorial Libraries (7:00 PM-7:30 PM)

[Michael Hecht](mailto:hecht@princeton.edu) <hecht@princeton.edu> Department of Chemistry, Princeton University, Princeton, NJ

Nanomachines made from DNA (7:30 PM – 8:00 PM)

[Andrew Turberfield](mailto:a.turberfield@physics.ox.ac.uk) <a.turberfield@physics.ox.ac.uk>, Department of Physics, Oxford University, Oxford UK

[NSF Workshop on Self-Assembled Architectures](#),

Evening Session B: Overviews of Study Group Reports

Golden Cliff Room (8:00 PM-9:00 PM April 22)

coChairs: [John H. Reif](#) < >, Duke University and [K. Birgitta Whaley](mailto:whaley@socrates.berkeley.edu) <whaley@socrates.berkeley.edu>, Department of Chemistry, University of California, Berkeley, CA

Greetings & Overview: [John H. Reif](#)

Golden Cliff Room (8:00 PM-8:05 PM April 21)

Dessert (8:05 PM-8:30 PM April 22)

Overviews by Track Chairs of Study Group Reports on Topics for New Research Challenges in Self-Assembled Nanostructures:

Golden Cliff Room (8:05 PM-9:00 PM)

Each Track Chair will give a 5-minute presentation of New Research Challenges in their Track area:

-Principles and Theory of Self-Assembly ([Leonard Adleman](#))

-Molecular Self-Assembly ([Nadrian Seeman](#))

-Self-Assembled Molecular Electronic Quantum Devices ([James R. Heath](#))

-Self-Assembled Molecular Electronics & Quantum Architectures ([Philip J. Kuekes](#) & [R. Stanley Williams](#))

- Self-Assembled Fullerene Nanostructures ([Jie Liu](#))
 - Conformal, Magnetic, Electrostatic & Hydrophobic-Hydrophilic Self-Assembly ([Karl Bohringer](#))
 - Self-Assembled DNA-Metal Aggregates ([George C. Schatz](#))
 - Self-Assembled Surface Chemistry ([Lloyd Smith](#))
 - Peptide and Viral Self-Assembly ([Michael Hecht](#))
 - Self-Assembled Autonomous Molecular Devices ([Andrew Turberfield](#))
 - Self-Assembled Molecular Sensors ([Hemme Hellinga](#))
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Round-Table Discussion by Program Managers of Existing Funding Programs & Proposed Plans for New Funding Programs
Golden Cliff Room (9:00 PM-9:30 PM April 22)

[Sri Kumar](#) <skumar@darpa.mil>, Information Processing Technology Office([IPTO](#)), Defense Advanced Research Projects Agency ([DARPA](#)), Arlington, VI and

[Mitra Basu](#) <mbasu@nsf.gov>, Division of Computing and Communication Foundations, Directorate for Computer and Information Science and Engineering([CISE](#)), National Science Foundation([NSF](#)), Arlington, VI

-[Steven Ho](#) <sho@darpa.mil>, Defense Sciences Office ([DSO](#)), Defense Advanced Research Projects Agency ([DARPA](#)), Arlington, VI

-[Kwan Kwok](#)<kkwok@darpa.mil> Microsystems Technology Office ([MTO](#)), Defense Advanced Research Projects Agency ([DARPA](#)), Arlington, VI

-Thomas Renz <thomas.renz@rl.af.mil>, Information Directorate, Air Force Rome Labs([AFRL](#)), Rome, NY

-[Nikzad \(Benny\) Toomarian](#) <nikzad.toomarian@jpl.nasa.gov>, Bio-Nano Technology Office, Life Detection Science & Technology Program, [NASA Jet Propulsion Laboratory](#), California Institute of Technology, Pasadena, CA

Conference Schedule Friday, April 23, 2004

Continental Breakfast: Outside Ballroom 1 (7:00 AM -7:30 AM April 23)

FNANO Track on Molecular Motors, Session B: Ballroom 1 (7:30 AM - 8:10 AM April 23)

Track Chair: [Andrew Turberfield](#) <a.turberfield@physics.ox.ac.uk>, Department of Physics, Oxford University, Oxford UK

2 Invited Talks:

- Nanodevices integrating biomolecular motors (7:30 AM - 7:50 AM)

[Henry Hess](#) <hhess@u.washington.edu>, Department of Bioengineering, University of Washington, Seattle, WA

- Construction of micro belt conveyers: two approaches (7:50 AM - 8:10 AM)

[Taro Uyeda](mailto:t-uyeda@aist.go.jp) <t-uyeda@aist.go.jp>, Gene Function Research Center, Tsukuba Central, Ibaraki, Japan

FNANO Track on Molecular Sensors (8:10 AM - 9:40 AM April 23)

Track Chair: [Homme Hellinga](mailto:hwh@biochem.duke.edu) <hwh@biochem.duke.edu>, Department of Biochemistry, Duke University, Durham, NC

Track Chair Overview Talk:

- Computational design of protein-based biosensors (8:10 AM -8:40 AM)

[Homme Hellinga](#)

3 Invited Talks:

- Massive Self-Assembly of Carbon Nanotube-Based Integrated Sensor Structures (8:40 AM -9:00 AM)

[Seunghun Hong](mailto:shong@phy.fsu.edu) <shong@phy.fsu.edu>, Department of Physics, Florida State University

- Nanodevices based on linear protein molecular motors: Challenges and opportunities (9:00 AM -9:20 AM)

[Dan Nicolau](mailto:dnicolau@swin.edu.au) <dnicolau@swin.edu.au>, Swinburne Industrial Research Institute, Swinburne University of Technology, Swinburne, Australia

- S-layers as patterning elements for supramolecular structures (9:20 AM -9:40 AM)

[Dietmar Pum](mailto:dietmar.pum@boku.ac.at) <dietmar.pum@boku.ac.at>(speaker) and [Uwe Bernd Sleytr](mailto:uwe.sleytr@boku.ac.at) <uwe.sleytr@boku.ac.at>, Center for Ultrastructure Research, University of Natural Resources and Applied Life Sciences, Gregor Mendel-Strasse 33, A-1180 Wien, Austria

Refreshment Break: Outside Ballroom 1 (9:40 AM - 9:50 AM April 23)

FNANO Track on Conformal, Magnetic, Electrostatic & Hydrophobic-Hydrophilic Self-Assembly: Ballroom 1 (9:50 AM - 11:20 AM April 23)

Track Chair: [Karl Bohringer](mailto:karl@ee.washington.edu) <karl@ee.washington.edu>, Department of Electrical Engineering, University of Washington, Seattle, WA

Track Chair Overview Talk:

Programmable Surfaces: Toward Massively Parallel Self-Assembly at the Micro- and Nano-scale (9:50 AM -10:20 AM)

[Karl Bohringer](#)

3 Invited Talks:

- Programmable Self-Assembly from Nanoparticle Based Devices to Integrated Microsystems (10:20 AM -10:40 AM)

[Heiko Jacobs](mailto:hjacobs@ece.umn.edu) <hjacob@ece.umn.edu>, Dept Electrical and Computer Engineering, U of Minnesota-Twin Cities, Minneapolis, MN

- Magnetic Self-Assembly “Equilibria” at a Macroscopic Scale (10:40 AM -11:00 AM)

[George C. Lisensky](mailto:lisensky@beloit.edu) <lisensky@beloit.edu>, University of Wisconsin, Madison, WI

- Assembly Dynamics Observed in Fluidic Self Assembly (11:00 AM -11:20 AM)

[John Stephen Smith](mailto:jsmith@eecs.berkeley.edu) <jsmith@eecs.berkeley.edu>, Dept EECS, University California Berkeley, Berkeley, CA

Refreshment Break: Outside Ballroom 1 (11:20 AM - 11:50 AM April 23)

FNANO Track on Self-Assembled Surface Chemistry, Session A: Ballroom 1 (11:30 AM-12:30 PM April 23)

Track Chair: [Lloyd Smith](mailto:smith@chem.wisc.edu) <smith@chem.wisc.edu>, Department of Chemistry, University of Wisconsin, Madison, WI

2 Invited Talks:

- Oriented Immobilization of Single DNA Molecules as a Tool for Surface Structuring on the Nanometer Scale (11:50 AM-12:10 PM)

[Frank F. Bier](mailto:frank.bier@ibmt.fraunhofer.de) <frank.bier@ibmt.fraunhofer.de>, Fraunhofer Institute for Biomedical Engineering and University of Potsdam, Bergholz-Rehbruecke, Germany

- Patterning Self-assembled monolayers using a scanning probe: Technique and Utility (12:10 PM-12:30 PM)

[Christopher Gorman](mailto:chris_gorman@ncsu.edu) <chris_gorman@ncsu.edu>, Department of Chemistry, North Carolina State University, Raleigh, NC

Lunch: Golden Cliff Room (12:30 PM -1:20 PM April 23)

Self-Assembled Surface Chemistry Track Chair Overview Talk: Golden Cliff Room:

Surface Assembly of a Quaternary Nucleic (12:40 PM - 1:10 PM)

[Lloyd Smith](mailto:smith@chem.wisc.edu) <smith@chem.wisc.edu>, Department of Chemistry, University of Wisconsin, Madison, WI

FNANO Track on Self-Assembled Surface Chemistry, Session B: Ballroom 1 (1:20 PM –2:00 PM April 23)

Track Chair: [Lloyd Smith](mailto:smith@chem.wisc.edu)

2 Invited Talks:

- **Creating Nanostructures through Self- and Directed Assembly (1:20 PM –1:40 PM)**

[Paul Weiss](mailto:stm@psu.edu) <stm@psu.edu>, Pennsylvania State University, University Park, PA

- **Spontaneous Formation of ~5 Å Ordered Phase-Separated Domains on the ligand shell of mixed Monolayer Protected Metal Nanoparticles (1:40 PM –2:00 PM)**

[Francesco Stellacci](mailto:frstella@mit.edu) <frstella@mit.edu>, Department of Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA

Refreshment Break: Outside Ballroom 1 (2:00 PM –2:10 PM April 23)

FNANO Track on Molecular Electronics Architectures: Ballroom 1 (2:10 PM - 3:40 PM April 23)

Track coChairs:

[Philip J. Kuekes](mailto:kuekes@hpl.hp.com) <kuekes@hpl.hp.com>, Hewlett-Packard Corporation, Palo Alto, CA and
[R. Stanley Williams](mailto:stan_williams@hp.com) <stan_williams@hp.com>, Hewlett-Packard Corporation, Palo Alto, CA

Track Chairs' Overview Talk:

Integrated Bottom-Up and Top-Down Architecture and Manufacturing (2:10 PM -2:40 PM April 22)

[Philip J. Kuekes](mailto:kuekes@hpl.hp.com) and [R. Stanley Williams](mailto:stan_williams@hp.com)

3 Invited Talks:

- **System Architectures & System Simulations for Molecular Electronic Nanomemories and Nanoprocessors (2:40 PM – 3:00 PM)**

[James Ellenbogen](mailto:ellenbgn@mitre.org) <ellenbgn@mitre.org> and [Carl A. Picconatto](mailto:picconatto@mitre.org) <picconatto@mitre.org> (speaker), MITRE Corporation, McLean VA

- **Integration for Molecular Electronics (3:00 PM – 3:20 PM)**

[Paul Franzon](mailto:paulf@unity.ncsu.edu) <paulf@unity.ncsu.edu>, Department of Electrical and Computer Engineering, North Carolina State University, Raleigh, NC

- **Circuit and System Architecture for DNA-Guided Self-Assembly of Nanoelectronics (3:20 PM – 3:40 PM)**

[Alvin Lebeck](mailto:alvy@cs.duke.edu) <alvy@cs.duke.edu>, Department of Computer Science, Duke University, Durham, NC

Refreshment Break: Outside Ballroom 1 (3:40 PM – 3:50 PM April 23)

FNANO Track on Fullerene Nanostructures: Ballroom 1 (3:50 PM – 6:00 PM April 23)**Track Chair:** [Jie Liu](mailto:j.liu@duke.edu) <j.liu@duke.edu>, Department of Chemistry, Duke University, Durham, NC**Track Chair Overview Talk:** Direct Growth of Long and Aligned Single Walled Carbon Nanotubes for Nanoscale Electronic Applications (3:50 PM – 4:20 PM)[Jie Liu](#)**5 Invited Talks:****- Simulations of nanotube-based structures and devices (4:20 PM – 4:40 PM)**[Jerry Bernholc](mailto:bernholc@ncsu.edu) <bernholc@ncsu.edu>, Department of Physics, North Carolina State University(NCSU), Raleigh, NC**-Fundamental Properties and Applications of Semiconducting Carbon Nanotubes (4:40 PM – 5:00 PM)**[Michael Fuhrer](mailto:mfuhrer@physics.umd.edu) <mfuhrer@physics.umd.edu>, Department of Physics, University of Maryland, College Park, MD**- Growth of SWNT with controlled structure by tailoring catalyst composition and reaction environment (5:00 PM – 5:20 PM)**[Daniel E. Resasco](mailto:resasco@ou.edu) <resasco@ou.edu>, School of Chemical Engineering and Materials Science, University of Oklahoma, Norman, OK**- Designing Carbon-Based Nanotechnology on a Supercomputer (5:20 PM – 5:40 PM)**[David Tomanek](mailto:tomanek@pa.msu.edu) <tomanek@pa.msu.edu>, Department of Physics and Astronomy, Michigan State University, East Lansing, MI**- Controlled assembly of carbon nanotube structures and devices (5:40 PM – 6:00 PM)**[Otto Zhou](mailto:zhou@physics.unc.edu) <zhou@physics.unc.edu>, Material Science, Department of Physics, University of North Carolina (UNC), Chapel Hill, NC

Closing of Conference & Announcement of Plans for Next Year's FNANO Conference: Ballroom 1 (6:00 PM April 23)[John H. Reif](#), Conference Chair