

**National Nanotechnology Initiative (NNI)**

**Workshop on  
Societal Implications of Nanoscience and Nanotechnology  
National Science Foundation  
4201 Wilson Blvd., Arlington, VA 22230  
December 3-5, 2003  
Room 375, and breakout (panel session) rooms: 340, 360, 365, 370 and 380  
*Preliminary Agenda***

**DAY 1 (December 3, 2003), Plenary Session**

12-1:00 Refreshments  
1:00 Welcome, Rita Colwell, Director, National Science Foundation  
Introductions / Goals / Charge to the workshop, M. Roco, NSET, NSF

*We will start with a set of visionary presentations focusing on the future of the field.*

1:15 – 3:15 Tentative topic (speaker)

**A. National Endeavor**

**1:15 Nanotechnology: a national endeavor**

John Marburger, Director, Office of Science and Technology Policy

**1:30 Technological and economic goals**

Phil Bond, Undersecretary for Technology, U.S. Dept. of Commerce

**1:55 Science and education vision for nanoscience and nanotechnology**

George Whitesides, Harvard Univ.

2:20 – 2:35 Coffee

**B. Technological and Societal Goals**

**2:35 Industry implications of nanotechnology**

T. Theis, IBM

**2:55 Nanotechnology and society,**

Roger Kasperson, Clark University, Stockholm Environment Institute

**3:15 Social science approaches for assessing nanotechnology**

Lynn Zucker, UCLA

3:35 – 3:50 Coffee

**C. Broader Implications**

**3:50 Technological convergence from the nanoscale (NBIC)**

James Spohrer, IBM

**4:10 Nanotechnology Implications on quality of life: Medicine, environmental, cognition, communication and other areas**

Carlo Montemagno, UCLA

**4:30 Ethical, philosophical issues**

V. Weil, IIT

**4:50 Legal, regulatory and interaction with the public: "Navigating Nano through Society"**

D. Baird, USC

**5:30 – 6:30 Reception – The Front Page Grille in the NSF Building Atrium**

**6:30 Group Dinner – Hilton Hotel Banquet Room (Hilton connected via skywalk to NSF)  
“Vision” speaker – Senator John Warner, invited**

**DAY 2 (December 4, 2003)**

*We will next break into five separate (parallel) panels to explore future opportunities and potential breakthroughs in selected sub-fields. For this part of the program, participants are encouraged to come prepared with two pages and two slides (maximum) for a five-minute (maximum) presentation on their ideas for the future of the relevant field.*

**8:00 – 11:00 Panels, A: Current Issues/Topics in Setting a Research Agenda:**

**1. Impact of nanotechnology on productivity and equity**

**Moderators:** M. Roco (NSET, NSF) and Marie Thursby (GIT)

**Contributors:** Evelyn Hu (UCSB), Georg G. A. Böhm (Bridgestone / Firestone Research), George Thompson (Intel), Mark Andrews (Caterpillar), Mark Modzelewski (NBA); John Belk (Boeing), S. Mark Davis (ExxonMobil, invited), Gregory Tassej (NIST), Jeff Stanton (Syracuse Univ.), Brian Valentine (DOE), William Boulton (Auburn Univ.), Ray Tsui (Motorola), Louis Hornyak (Univ. of Denver), Peter Hébert (Lux Capital), James Canton (Institute for Global Futures), Jim Adams (RPI), Brad DeLong (Berkeley), Jared Bernstein (EPI), Sarah Turner (Univ. of Virginia), Richard Freeman (Harvard)

**2. Nanotechnology implications on quality of life (medical, environmental, cognition, communication, etc.): nanotechnology goals and unintended consequences**

**Moderators:** Carlo Montemagno (UCLA) and Michael Heller (UCSD)

**Contributors:** Steven Papermaster (Powershift Ventures, PCAST representative), Samuel Stupp (NU, Invited), David A. Diehl (PPG Industries, Inc.), Cheryl L. Sabourin (GE, invited), Rosalyn Berne (UVA), Toby Ten Eyck (Michigan State), Robert Beoge (ASTRA, invited), Barbara Karn (EPA); Kristen Kulinowski (Rice Univ.), Jeff Schloss (NIH), Hongda Chen (USDA), Donald Marlowe (FDA), Stan Brown (FDA), Sean Murdock (Atomworks), Dick Livingston (DOT/FHWA), Richard Smith (Nanotechnology Policy Forum), Elaine Bernard (Harvard Law), Tanwin Chang (NBER), Nila Bhakuni (Harvard), Stephan Herrera (The Economist)

**3. Ethical, historical, governance, philosophical implications, risk and uncertainty**

**Moderators:** V. Weil (IIT) and Rachelle Hollander (NSF)

**Contributors:** M. Kathleen Behrens (RS Investments, PCAST representative), Albert Teich (AAAS), Eleanor Singer (U. of Michigan), Deb Newberry (The NanoTechnology Group, Inc), Carol Lynn Alpert (Boston Museum of Science); Philip Sayre (EPA); Dan Jones (National Endowment for the Humanities), Sheila Jasanoff (Harvard), Julia Moore (NSF), Jane

Macoubrie (NCSU), Frank Laird (Univ. of Denver), Arthur Caplan (Univ. of Pennsylvania), Daniel Goroff (Harvard), Jack Trumbour (Harvard Law), Bruce Lewenstein (Cornell)

#### **4. Converging technologies and their societal implications**

**Moderators:** John Sargent (DOC) and Lynne Zucker (UCLA)

**Contributors:** James R. von Ehr II (Zyvex), Judith Klein-Seetharaman (CMU), Robert McGinn (Stanford), Ilesanmi Adesida (UIUC), Sonia E. Miller (Converging Technologies Bar Association), Roger Kasperson (Clark University, Stockholm Environment Institute), David Rejeski (Woodrow Wilson Center), Sharon Levin Univ. of Missouri), Paula Stephan (Georgia State Univ.), Cyrus Mody (Cornell)

#### **5. National security, space exploration**

**Moderator:** Delores Etter (DOD) and Jim Murday (ONR)

**Contributors:** James Batterson (NASA, invited), Judith Reppy (Cornell), Michael Goldblatt (Functional Genetics, invited), John T. Neer (Lockheed Martin), W.M. Tolles (consultant); Jim Murday (ONR, NSET), Scott McNeil (SAIC), Minoo Dastoor (NASA), Martin Carr (DCI), Keith Ward (DHS), Cliff Lau (DOD), George Borjas (Harvard), Ron Oaxaca (Univ. of Arizona), Grant Black (Georgia State Univ.)

**Coffee Break at 9:30 a.m.**

**11:00-12:30 Plenary presentations of summaries 1-5**

**12.30 – 1.30 Working Lunch (lunch brought in the room)**

**1.30 - 4.00 Panels, B**

#### **6. Interaction with the public, Social networks**

**Moderators:** D. Baird and Cate Alexander (NNCO)

**Contributors:** Steven Papermaster (Powershift Ventures, PCAST representative), Albert Teich (AAAS), Eleanor Singer (U. Michigan), Susanna Priest (TAMU), Julia Moore (NSF), Toby Ten Eyck (MSU), Jane Macoubrie (NCSU), Carol Lynn Alpert (Boston Museum of Science), Barbara Karn (EPA), Mark Modzelewski (NanoBusiness Alliance), Rosalyn Berne (UVA), Dan Jones (National Endowment for the Humanities), D.M. Berube (Univ. of South Carolina), Bruce Lewenstein (Cornell), David Rejeski (Woodrow Wilson Center), Elaine Bernard (Harvard Law), Jared Bernstein (EPI), Cyrus Mody (Cornell)

#### **7. Future economic scenarios**

**Moderators:** Gregory Tassef (NIST) and Michael Darby (UCLA)

**Contributors:** Michael Metha (U. Sask), Mark Andrews (Caterpillar), Robin Hanson (GMU), Ilesanmi Adesida (UIUC); Scott McNeil (SAIC), Georg G. A. Böhm (Bridgestone / Firestone Research), S. Mark Davis (ExxonMobil, invited), Judith Reppy (Cornell), Brian Valentine (DOE), Hongda Chen (USDA), David Mowery (Univ. of California at Berkeley), Sean Murdock (Atomworks), Linda Parker (NSF), Peter Hébert (Lux Capital), Jim Adams (RPI), Brad DeLong (UC Berkeley), Richard Freeman (NBER)

**8. Future social scenarios**

**Moderators:** Bill Bainbridge (NSF) and Roger Kasperson (Clark Univ.)

**Contributors:** Irwin Feller (Penn State, invited to contribute before the workshop), Frank Laird (Univ. of Denver), Rosalyn Berne (UVA); Jeff Schloss (NIH), John Belk (Boeing), Jeff Stanton (Syracuse Univ.), John Miller (DOE), James Canton (Institute for Global Futures), Dick Livingston (DOT/FHWA), Arthur Caplan (Univ. of Pennsylvania), Jack Trumbour (Harvard Law), Stephan Herrera (The Economist)

**9. Public policy, legal (patents, civic, etc.) and international aspects**

**Moderator:** Evelyn Hu (UCSB) and James Rudd (NSF)

**Contributors:** Sonia E. Miller (Converging Technologies Bar Association), Sheila Jasanoff (Harvard), Robert Beoge (ASTRA, invited), Philip Sayre (EPA), George Thompson (Intel), James R. von Ehr II (Zyvex), V. Weil (IIT), Robert McGinn (Stanford), Catherine Woytowicz (Dept. of State), W.M. Tolles (consultant), William Boulton (Auburn Univ.), E. Jennings Taylor (Faraday Technology, Inc.), Stan Brown (FDA), Ray Tsui (Motorola), Richard Smith (Nanotechnology Policy Forum), Nila Bhakuni (Harvard), Michael Heller (UCSD)

**10. Education and human development**

**Moderators:** Michael Gorman (U. VA) and William Frascella (NSF)

**Contributors:** Paul Petersen (RIT), Bruce Seely (MTU), James Batterson (NASA, invited), Deb Newberry (The NanoTechnology Group, Inc), Kristen Kulinowski (Rice Univ.), Paula Stephan (Georgia State Univ.), Sharon Levin (Resource Group), Ron Oaxaca (Univ. of Arizona), George Borjas (Harvard), Tanwin Chang (NBER), Daniel Goroff (Harvard), Sarah Turner (Univ. of Virginia), Judith Klein-Seetharaman (CMU), John T. Neer (Lockheed Martin), John Sargent (DOC)

**4:10 – 5:00 Plenary presentations**

**4:10. Economical trends and nanotechnology development**

**Brad deLong (UC Berkeley)**

**4:35. Human resources for nanotechnology**

**Paula Stephan (Georgia State Univ.)**

**5:00- 6:30 Plenary presentations of summaries 6-10**

**7:00 Group dinner – The Front Page Restaurant & Grille in NSF Building Atrium**

**DAY 3 (December 5, 2003)**

**8.00 - 9.15 Plenary discussion**

Definition of research and education challenges

Recommendations for future R&D, infrastructure and education needs, societal preparation, etc.

Plan for report preparation and agenda for the remainder of the day (M. Roco)

**9:15 coffee break, disburse to breakout rooms**

**9:30 - 11:00** Dec. 4 panels meet individually to refine summaries presented at end of previous days' discussions and agree on report drafting assignments for report chapters that will arise from each panel session.

**11:00 - 12:00** Plenary session: each of the ten panels present refined summary and outline/report writing assignments to the full group back in Rm. 375 (~5 minutes for each group). Plenary discussion to provide feedback, mid-course correction to these proposed outlines and assignments.

**12:00 - 2:00 Optional Luncheon Session: Institutional Implications of Government Science Initiatives (15 minute prepared talks plus five minutes for questions/discussion after each talk)**

12:00 box lunches available; please take one and take a seat in Rm. 375 if you wish to participate in this session

12:20 Historical Comparisons for Anticipating Public Reactions to Nanotechnology  
(Christopher Toumey, Univ. of South Carolina)

12:40 Past Experiences (Alex Roland, Duke Univ.)

1:00 Present Adjustments (Toby Smith, AAU)

1:20 Future Perspectives (Tom Kalil, UC Berkeley)

1:40 Congressional Perspective: Societal Implications Issues in the Nanotechnology Act  
(Congressional speaker TBD)

**2:00 Re-group to breakout rooms for resumption of drafting sessions**

**3:45 Plenary session; concluding remarks (M. Roco, C. Teague)**

**4:00 Adjourn**

Suggested Tables for the Report:

**Table 1. R&D challenging areas and key priorities**

| <b>R&amp;D challenging areas</b> | <b>Key priorities/Goals</b> | <b>Recommended modes of support &amp; Agency</b> | <b>Transition term (Timeline)*</b> |
|----------------------------------|-----------------------------|--|------------------------------------|
|                                  |                             |  |                                    |
|                                  |                             |  |                                    |
|                                  |                             |  |                                    |
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(\*) The R&D areas of opportunities for transition of fundamental research to commercial products may be separated into short term (1-5 years), mid-term (5- 10 years) and long-term (10-20 years) categories.

