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*** PRELIMINARY PROGRAM***

National Nanotechnology Initiative
Workshop on Grand Challenges in Nano-electronics, -photonics, and -magnetics

February 11-13, 2004

Holiday Inn Arlington at Ballston
4610 N. Fairfax Dr., Arlington, VA 22203

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Wednesday, February 11, 2004

8:00 a.m.   Coffee

8:30 a.m.   Opening Plenary Session,   BALLSTON ROOM

8:30 – 8:40 a.m.   *Welcome*
                              Gernot Pomrenke (AFOSR)

8:40 – 9:00 a.m.   *Purpose of the Workshop*
                              Mike Roco (NNI/NSF)

9:00 – 9:30 a.m.   *Keynote Address*
                              Horst Stormer (Columbia/Lucent)

9:30 – 9:40 a.m.   Discussion

9:40 – 10:25 a.m.   *Outbriefs from Previous NNI Workshops*
        9:40 – 9:55 a.m.   Grand Challenge Workshop on Nanomaterials
                                            Robert Hull (U. of Virginia)
        9:55 – 10:10 a.m.   Silicon Nanoelectronics and Beyond Workshop
                                            Ralph Cavin (SRC)
        10:10 – 10:25 a.m.   Grand Challenge Workshop on Nanometrology
                                            Mike Postek (NIST)

10:25 – 10:45 a.m.   Coffee break

10:45 – 11:10 a.m.   *Plenary I: Nanomagnetics & Spintronics*
                                  David Awschalom (UC Santa Barbara)
11:10 – 11:15 a.m.   Discussion

11:15 – 11:40 a.m.   *Plenary II: Nanophotonics*
                                  Shaya Fainman (UC San Diego)
11:40 – 11:45 a.m.   Discussion

11:45 – 12:10 a.m.   *Plenary III: Nanoelectronics -- Evolutionary*
                                  Alan Seabaugh (Notre Dame)
12:10 – 12:15 a.m.   Discussion

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12:15 – 1:30 p.m.	**Lunch**

1:30 – 1:55 p.m.	*Plenary IV: Nanoelectronics -- Revolutionary*
	Mark Reed (Yale)
1:55 – 2:00 p.m.	Discussion
2:00 – 2:25 p.m.	*Plenary V: Architecture and Systems Integration*
	Philip Kuekes (HP Labs)
2:25 – 2:30 p.m.	Discussion
2:30 – 2:55 p.m.	*Plenary VI: Fabrication and Manufacturing*
	Hank Smith (MIT)
2:55 – 3:00 p.m.	Discussion

3:00 – 3:20 p.m.	**Coffee Break**

3:20 – 5:30 p.m.	**First Breakout Sessions**

The goals for each of the first breakout sessions are to identify a few key research areas that are potential "Grand Challenges." Discussions in each breakout session should include "technology pull" (applications) and education.   Some writing will be done in each session for possible use in preparing the final report of the Workshop. We anticipate that there will be considerable overlap in the potential Grand Challenges identified by each of the first breakout groups. The following plenary sessions and further breakout sessions are intended to consolidate and refine these concepts into a small number of Grand Challenges in Nanoelectronics.

Session 1.   <u>BALLSTON ROOM</u>
Acquiring - sense the environment in real time and transduce the status into processable signals
> Extend range and robustness of chem/bio sensors
> Increased sensitivity
> Diversity for reduction of false positive/negative
> Higher frequency EM response
> Compact arrays
> Close to zero consumed power

Session 2.   <u>ARLINGTON ROOM</u>
Storing - memory to store data in non-volatile, compact media
> Bit density
> Read/write speed
> Radiation hardness

Session 3.   <u>FAIRFAX ROOM</u>
Processing - logic circuitry to transform rapidly data into information
> Device density
> Speed
> Interconnections (parallel processing)
> Multilevel logic

Session 4.   <u>WILSON ROOM</u>
Transmitting - interconnections to send data rapidly across chip, between chips
and through space
      Higher frequency
      Wider Bandwidth
      Lesser delay
      Lower consumed power

Session 5.   <u>GLEBE ROOM</u>
Systems Level integration
      Mixed signal
      Computing algorithms and circuits with potentially defective devices
      Architectures for the 'Billion Transistor' chip

5:30 – 6:00 p.m.   Breakout Session Leaders Conference,   <u>ARLINGTON ROOM</u>

6:00 p.m.   Adjourn for day

<u>Thursday, February 12, 2004</u>

8:00 a.m.   Coffee

8:30 a.m.   Plenary Session (Cont'd),   <u>BALLSTON ROOM</u>

8:30 – 8:55 a.m.   *Plenary VII: Modeling, Simulation and Design*
                    Mark Lundstrom (Purdue)
8:55 – 9:00 a.m.   Discussion

9:00 – 9:25 a.m.   *Plenary VIII: NEMS, Nanosensors and Nanofluidics*
                    Axel Scherer (Cal Tech)
9:25 – 9:30 a.m.   Discussion

9:30 – 9:55 a.m.   *Plenary IX: Power and Thermal Management in Nanosystems*
                    Rama Venkatasubramanian (RTI)
9:55 – 10:00 a.m.   Discussion

10:00 – 10:20 a.m.   Coffee Break

10:20 – 12:00 a.m.   Report Back from 1st Breakout Sessions, <u>BALLSTON ROOM</u>
    *All participants will hear reports from the first set of breakout sessions and begin
the process of collective identification of potential Grand Challenges.*

      10:20 – 10:30 a.m.   Report from Breakout Session 1
      10:30 – 10:40 a.m.   Report from Breakout Session 2
      10:40 – 10:50 a.m.   Report from Breakout Session 3
      10:50 – 11:00 a.m.   Report from Breakout Session 4
      11:00 – 11:10 a.m.   Report from Breakout Session 5

11:10 – 12:00 p.m.   Discussion: Preliminary Identification of Grand Challenges

12:00 – 1:00 p.m.   Lunch

1:00 p.m. – 3:00 noon   Second Breakout Sessions
       These sessions will discuss each of the potential Grand Challenges, with the goal of defining and describing each one. Some writing will be done in each session for possible use in preparing the final report of the Workshop.

    Session 1: BALLSTON ROOM
    Session 2: ARLINGTON ROOM
    Session 3: FAIRFAX ROOM
    Session 4, WILSON ROOM
    Session 5, GLEBE ROOM

3:00 – 3:15 p.m.   Coffee Break

3:15 – 4:05 p.m.   Report Back from 2nd Breakout Sessions, BALLSTON ROOM
       All participants will hear reports from the first set of breakout sessions and begin the process of collective identification of potential Grand Challenges.

    3:15 – 3:25 p.m.   Report from Breakout Session 1
    3:25 – 3:35 a.m.   Report from Breakout Session 2
    3:35 – 3:45 a.m.   Report from Breakout Session 3
    3:45 – 3:55 a.m.   Report from Breakout Session 4
    3:55 – 4:05 a.m.   Report from Breakout Session 5

4:05 – 5:30 p.m.   **Discussion and Refinement of Grand Challenges**

5:30 – 6:00 p.m.   **Plenary Session for Writing Subgroups, ARLINGTON ROOM**
       Discussion of format of the report & assignment of individual writing subgroups

6:00 p.m.   Adjourn for day.

Friday, February 13, 2004

8:00 a.m.   Coffee

8:30 a.m.   Report Writing Session   NSF ROOM 330

8:30 – 10:00 a.m.   Drafting report

10:00 – 10:15 a.m.   Coffee Break

10:15 – 11: 30 a.m.   Writing groups reconvene as needed

12:00 p.m.   Draft Report completed, Workshop adjourns.