SSGF and CSGF Fellows’ Poster Session
Opening Remarks
Part 2

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The Graduate Fellowship Programs

(1)

• CSGF
  – Computational Science Graduate Fellowships
    • Able to utilize the large DOE/NNSA investments in High Performance Computing
    • Spectacular work being done in many fields of science
    • Jointly sponsored by NNSA and Office of Science
    • One of the major sources for the scientific and technical leadership of the future
The Graduate Fellowship Programs

(2)

• SSGF
  – Stewardship Science Graduate Fellowships
    • NNSA started this just three years ago
    • Emphasis is on three scientific areas:
      – *Low Energy Nuclear Physics*
      – *Materials under Extreme Conditions*
      – *High Energy Density Physics*
    • Stresses novel experimental and theoretical work
    • Hope that we will attract many of you to contribute to solving important problems for the nation
Huge Scientific Opportunities Becoming Available

• Both NNSA and the Office of Science are investing in major new scientific capabilities
  – Hope the nation’s science and engineering leaders of the future (YOU) will address major problems of the country including:
    • National Security
    • Fundamental Science
    • Energy Production and Availability
    • Medicine and Biology
    • ???
Brief Look at New Capabilities (1)

• High Performance Computers
  – Secretary Bodman just announced that Road Runner has cracked the one petaflop barrier!
  – RR will be at Los Alamos
  – Number 2 fastest is now Blue-Gene L at Livermore
  – Ranking of top 500 machines due out tomorrow.
    • DOE machines VERY well represented in the top 10 ten!
    • Machines at Argonne, Berkeley, Oak Ridge, Sandia etc.
    • Faster machines on the drawing board
Cutting-edge Computational Science for Solutions to National Security Issues

Roadrunner: first to break the petaflop barrier

BlueGene/L: 472 teraflop – top of TOP500 since 2004
Opportunities to work on complex problems that matter

Material Science

Nuclear material detection

Seismic Modeling

Nuclear Forensics
Science on BG/L: MD model of Rayleigh-Taylor instability (2007 Gordon Bell Prize Winner)

Time evolution of the development of R-T instability near the fluid interface; blue is Al, red is Cu, at 2,000 K. This calculation used 2 billion atoms.
Brief Look at New Capabilities
(2)

• High Energy Density Physics
  – The National Ignition Facility
    • Completion date March 2009
    • Experimental Program soon after that
    • Scientific Opportunities from fusion to planetary science to element formation to ????
  – The OMEGA Laser
  – ZR at Sandia (Z pinch machine)
  – The Linac Coherent Light Source at Stanford
  – Jupiter, Trident, Beamlet etc.
  – The Relativistic Heavy Ion Collider (RHIC) at Brookhaven
• With NIF, LMJ, ZR, EP, FIREX, LCLS all turning on in the near future, we have a unique opportunity to broaden and strengthen the field of laboratory astrophysics
Brief Look at New Capabilities (3)

• Accelerators (partial list only)
  – LANSCE
    • Los Alamos Neutron Science Center
      – Neutron scattering (materials)
      – Nuclear Physics
      – Radiography
      – Radiation Environment Testing
  – SNS
    • Spallation Neutron Source –Oak Ridge (materials science)
Photon sources for material research

– APS
  • Advanced Photon Source – Argonne
    – Includes high pressure beam line

– ALS
  • Advanced Light Source - Berkeley

– NSLS
  • National Synchrotron Light Source - Brookhaven

– LCLS
  • Linac Coherent Light Source - Stanford
Nuclear and Particle Physics

- **CEBAF**
  - Continuous Electron Beam Accelerator Facility – Thomas Jefferson National Laboratory

- **Tevatron**
  - Fermi National Accelerator Laboratory

- **LHC**
  - Large Hadron Collider – CERN

- **FRIB**
  - Facility for Rare Isotope Beams – TBD soon
Brief Look at New Capabilities (4)

- Microelectronics
  - MESA facility at Sandia
- Nanoscale Science Research Centers
  - Argonne
  - Berkeley
  - Brookhaven
  - Oak Ridge
  - Sandia/Los Alamos
Conclusion

• The Department is doing its part by providing the tools and capabilities for the future.
• The rest is up to you and others like you.
• Think about joining us at one of the DOE Labs
• I look forward to seeing as many of your posters as I can.