

BNL-SBU NSLS II Workshop BNL Overview

Doon Gibbs
May 18, 2011

BROOKHAVEN
NATIONAL LABORATORY

a passion for discovery

 **Office of
Science**
U.S. DEPARTMENT OF ENERGY



Outline of this talk

- Welcome
- Plan of the Day
- Introduce Working Group and SBU Leaders
- Workshop Goals
- BNL Vision/Strategy
 - Major Initiatives
 - Role of NSLS II
 - Connection to SBU

Plan of the Day

- Welcome and Overview, Gibbs
- NSLS II Overview, Shen
- SBU Overview and General Interests, Hsiao, Parise and Haltiwanger
- Overview of Breakout Sessions, Working Group
- Breakout Sessions, All
 - Berkner
- Closeout
 - Hamilton
- Wine and Cheese
 - Hamilton

NSLS II Working Group and SBU Leaders

- Working Group
 - Lynne Ecker, BNL Nuclear Science and Technology
 - Jeff Fitts, BNL Environmental Sciences
 - Doon Gibbs, BNL Director's Office (Chair)
 - Jason Graetz, BNL Sustainable Energy Technologies
 - John Hill, BNL CMP/MSD
 - Ben Hsiao, SBU Chemistry
 - Lisa Miller, NSLS II
 - Allen Orville, BNL Biology
 - Ron Pindak, NSLS II
 - Jose Rodriguez, BNL Chemistry
 - Qun Shen, NSLS II
- SBU
 - Ben Hsiao, Chemistry
 - John Parise, Geosciences
 - Bob Haltiwanger, Biochemistry

Workshop Goals

- Promote interactions within/across BNL's directorates and with Stony Brook, BNL's principal strategic partner
- Learn about status/capabilities of NSLS II, including access
- Learn about (and refine) BNL/SBU research interests, needs in NSLS II based programs
 - Breakout sessions
- Feed back to Laboratory Strategy
 - Further meetings of Working Group
 - White Paper

Workshop Goals (cont)

- Institutional level look at developing NSLS II based research programs, eg,
 - What are emerging interests, strengths?
 - Are there gaps in BNL/SBU capabilities, research programs, including personnel and infrastructure, relative to NSLS II based research goals?
 - Are there gaps in planned NSLS II capabilities relative to BNL/SBU interests?
 - Are there further opportunities/strategies for collaborations within/across directorates and with Stony Brook?
 - Are there further industrial opportunities, especially in NYS?
 - What are funding opportunities?
 - Comments on new aspects of access policy?
 - Others?

Early Result of Working Group

- Emerging NSLS II based BNL/SBU themes
 - Correlated and Magnetic Systems
 - Energy Storage
 - Extreme Environment Materials
 - Soft Matter, Nanomaterials
 - Catalysis
 - Earth and Environmental Sciences
 - Structural Biology
 - Biological Imaging

Compare to Science Village themes

- **Condensed Matter Physics**
 - Correlated and Magnetic Systems
- **Materials Science and Engineering**
 - Energy Storage
 - Extreme Environment Materials
- **Chemistry/Catalysis**
 - Catalysis
- **Environmental and Heterogeneous Science**
 - Earth and Environmental Sciences
- **Structural Biology and Soft Matter**
 - Soft Matter, Nanomaterials
 - Structural Biology
 - Biological Imaging

- **Preliminary Analysis:** There is a reasonable correspondence between BNL/SBU interests and planned NSLS II capabilities
 - But, let's dig deeper

Major Research Areas and Facilities



National Synchrotron Light Source



National Synchrotron Light Source II



Center for Functional Nanomaterials

- Photon Sciences
- Nuclear & Particle Physics
- Energy
- Environment & Life Sciences
- National Security



Relativistic Heavy Ion Collider



New York Blue Supercomputer

Vision

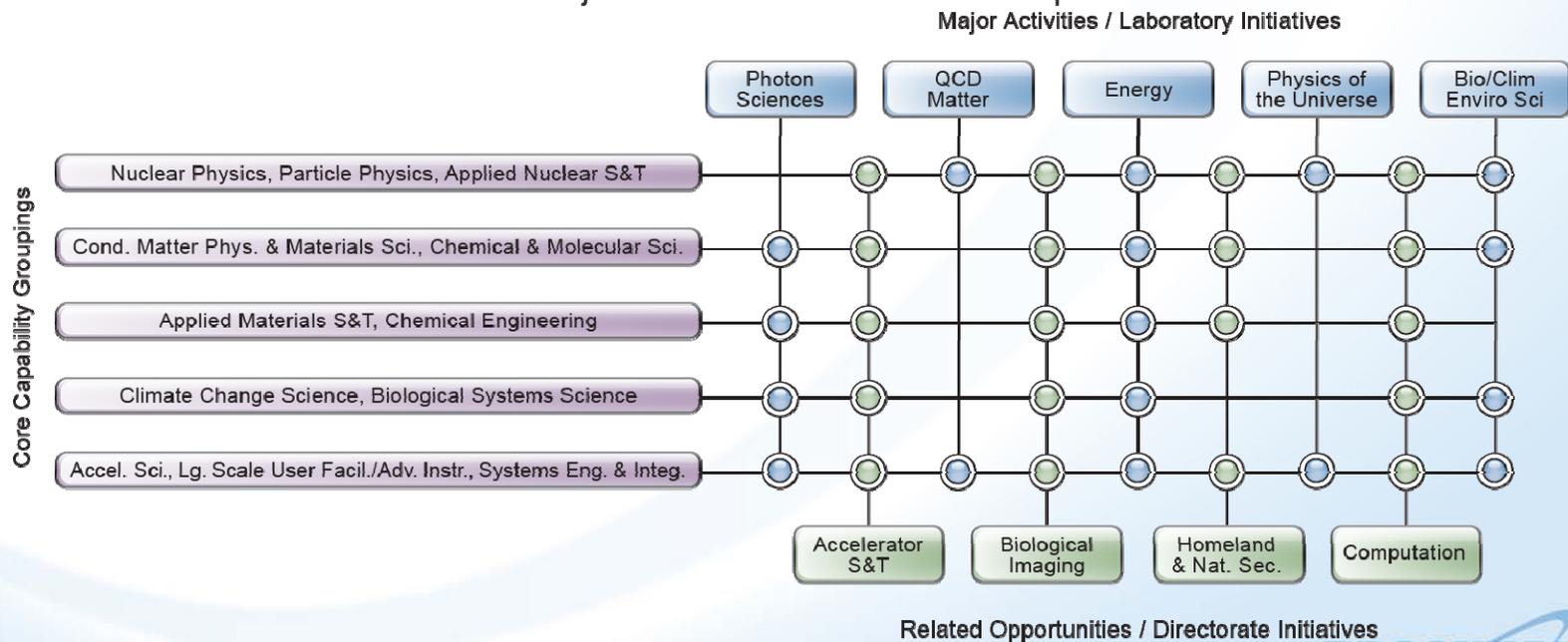
To be the provider of choice for world-class science and facilities in support of the DOE Office of Science's mission to enable breakthroughs that ensure our Nation's future

Mission

- Advance photon sciences, energy, and environment-related research and apply them to 21st Century problems of critical importance to the Nation
- Advance fundamental research in nuclear and particle physics to gain a deeper understanding of matter, energy, space, and time

Strategy

- Position BNL's two largest user facilities – National Synchrotron Light Source (NSLS) and Relativistic Heavy Ion Collider (RHIC) – for continued leadership roles
- Focus on five Major Activities built on Core Capabilities



NSLS II

- The Lab's highest priority and itself an initiative
- At the center of Lab's Energy, ELS initiatives (together with CFN, NYCCS, etc.)
- At the center of related opportunities in Bio-imaging, Computation, Accelerator S&T, and National Security
 - Couples to remaining Lab initiatives in NPP through Accelerator S&T
- Together with RHIC/eRHIC, NSLS II is key to Lab's business for next 20 years

SBU—Principle Strategic Partner

- BSA partner (with Battelle)
 - President Stanley is Chair of the BSA Board
 - Core universities: Columbia, Princeton, Yale, Cornell, Harvard, MIT
- Strategic partners in all BNL Major Initiatives
- Largest user (by far) of all BNL facilities
 - 7% of NSLS users
- Together, we have unique opportunities to change our game (like SLAC/Stanford and LBL/UC-Berkeley)
 - Complementary strengths, facilities, students, NYS, ...
- Many existing connections, eg,
 - Grass roots collaborations
 - > 20 Joint Appointments
 - 6 Joint BNL/SBU Centers: AEC, Bio-Imaging, JPSI, CASE, NYCCS

JPSI

▪ Vision

- A joint SBU/BNL institute in photon sciences to capitalize on the unique capabilities of NSLS-II, especially in advancing discovery to deployment opportunities within NY State and beyond

▪ Mission

- Develop and enhance S&T programs that take optimal advantage of NSLS II and related BNL/SBU capabilities toward global impact
- Serve as a gateway to NSLS II, especially for NYS universities and industry
- Educate and train the next generation of leaders and practitioners in synchrotron radiation research
- Develop and enhance multidisciplinary approaches and identify enabling technologies to support NSLS II use

JPSI (cont)

- Successful workshops, including industrial input
 - Microelectronics
 - Energy Storage
 - Planned (eg, drug synthesis)
- Status
 - Partial funding rec'd for a building from NYS
 - SBU/BNL working together to refine scope and governance, including reduction of construction scope from a new building to enhanced LOB (Gibbs, Hsiao)
 - SBU/BNL will approach NYS with a new proposal
 - SBU leading an effort to write an NSF-STC proposal in complex materials, entitled “Center for Advanced Photon Science and Technology” (Hsiao)
 - Input welcome

Brookhaven Collaborative Approach

Basic Research, Applied Research, and Industry Working Together

BNL Resources



BNL
Research



NY State Consortia/Resources

ENERGY CHALLENGES: New York and Beyond

- Electric Systems (SBU/AEC)
- Sustainable Fuels

DOE ALIGNMENT/LEVERAGE

- DOE Priority Research Directions
- 4 Energy Frontier Research Centers

Collaborators/Joint Appointments



Rensselaer



GE



R.I.T



SYRACUSE



COLLEGE OF NANOSCALE
SCIENCE & ENGINEERING
UNIVERSITY AT ALBANY State University of New York



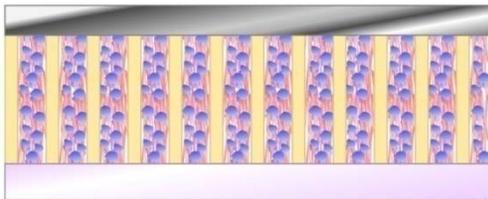
BROOKHAVEN
NATIONAL LABORATORY

Electric Grid Research and Development

Generation

Organic photovoltaics

- Inexpensive for large scale deployment
- Issue of efficiency



- **BNL Contribution**
- Nano-structured PV with double the efficiency per active unit area

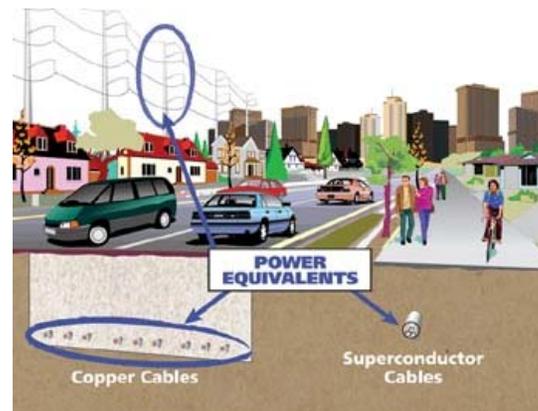


Brookhaven Science Associates

Transmission

Superconducting Lines

- Power density driver



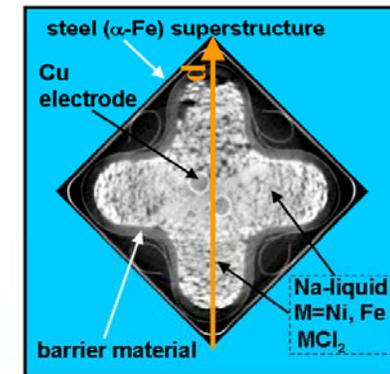
- **BNL Contribution**
- Reel-to-reel growth of superconducting



Storage

Batteries

- X-ray probes, materials



- **BNL Contribution**
- X-ray tools probing real batteries in operation
- **SMES**
- Grid scale storage

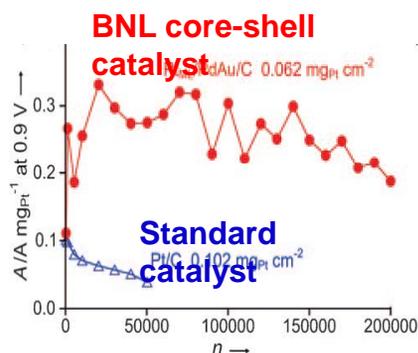
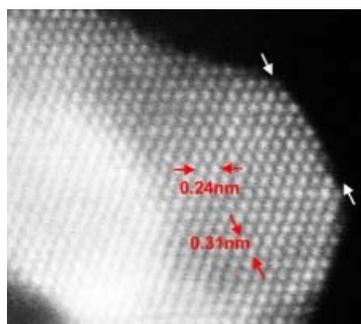


Sustainable Fuel Research and Development

Catalytic Conversions

Fuel cell nano-catalysts

- Issue of Pt expense

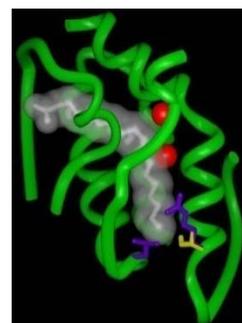


- **BNL Contribution**
- Core-shell nanocatalysts, 10X lower Pt loading, better performance

Biofuels

Plant engineering

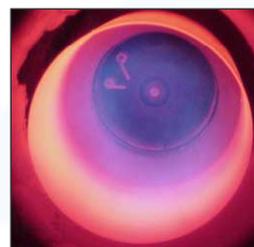
- **BNL Contribution:**



Redesigning enzymes to make renewable chemical feedstocks

Fuel use optimization

- Burner optimization
- **BNL Contribution:** Burner efficiency research (NYSERDA supported)



- \$25B savings
- 162M MT CO₂ saved



Honeywell



Climate/Environmental/BioSciences

Seeking to understand relationships among climate change, sustainable energy, and ecosystems aligned with DOE mission and goals:

Understand the roles that **aerosols and clouds** play in the Earth's **climate**

Advance the science to increase **energy density of biomass** and translate to solutions for bio-based products

Draw on distinctive capabilities in **atmospheric science**, plant and microbial **systems biology**, **genetics**, **structural biology**, **radiochemistry**, **bio-imaging** and **computation**

Leverage distinctive facilities at BNL and partner with **Stony Brook University**, **Cold Spring Harbor Laboratory**, etc.



New Frontiers
in Characterizing Biological Systems
Report from the May 2009 Workshop

U.S. DEPARTMENT OF ENERGY OFFICE OF SCIENCE

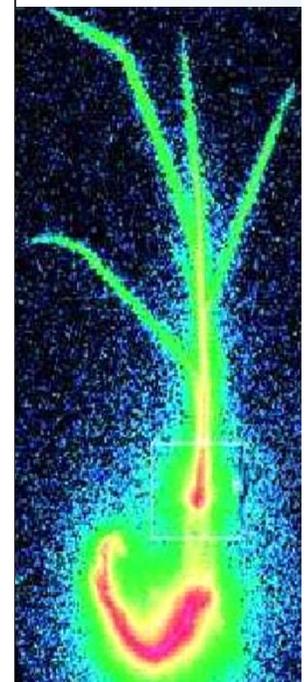
Organisms in Ecosystems

Microbial Communities and Plant Tissues

Cellular Systems

Molecular and Subcellular Systems

U.S. DEPARTMENT OF ENERGY Office of Science
Office of Biological and Environmental Research



Agenda

- Hamilton Seminar Room – 1:00 – 3:15 pm
 - Laboratory Overview
 - NSLS II Overview
 - SBU Interests
- Berkner Hall Breakout Sessions 3:30 – 5:30 pm
 - Session 1 (3:30-4:30)
 - Soft Matter / Nano-materials (Ron Pindak, Berkner Room A)
 - CMPMS - Correlated Systems (John Hill, Berkner, Room C)
 - Structural Biology (Allen Orville, Berkner, Room B)
 - Materials Science and Engineering—Extreme Environment Materials (Lynne Ecker, Berkner Room D)
 - Session 2 (4:30-5:30)
 - Catalysis/Chemistry (Jose Rodriguez, Berkner, Room A)
 - CMPMS - Energy Storage (Jason Graetz, Berkner, Room C)
 - Earth and Environmental Sciences (Jeff Fitts, Berkner, Room B)
 - Biological Imaging (Lisa Miller, Berkner, Room D)
- Hamilton Seminar Room
 - Summary/Closeout 5:30 – 6:00
 - Wine and Cheese Reception – 6:00 pm