UT-BATTELLE

Overview of Oak Ridge National Laboratory

Presented to

First Meeting of JUSTIPEN

LACM

by

Glenn R. Young

Physics Division Director

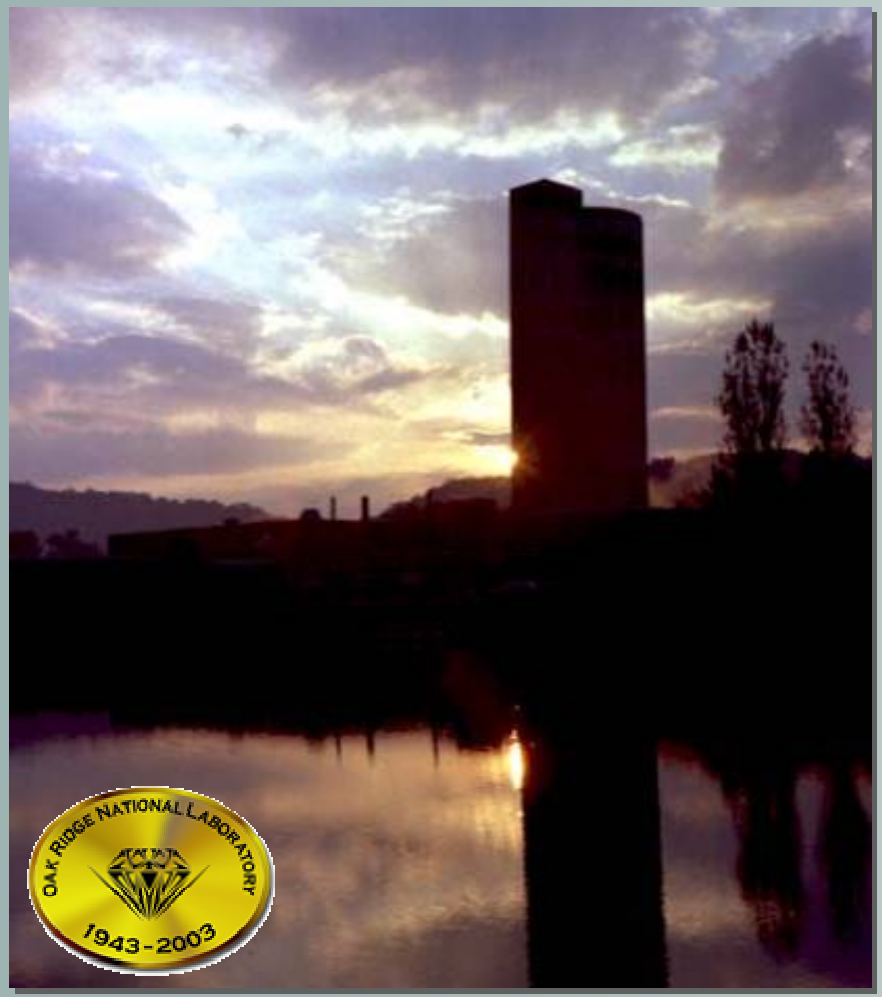
Oak Ridge National Laboratory

March 5, 2007

Oak Ridge, Tennessee

OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

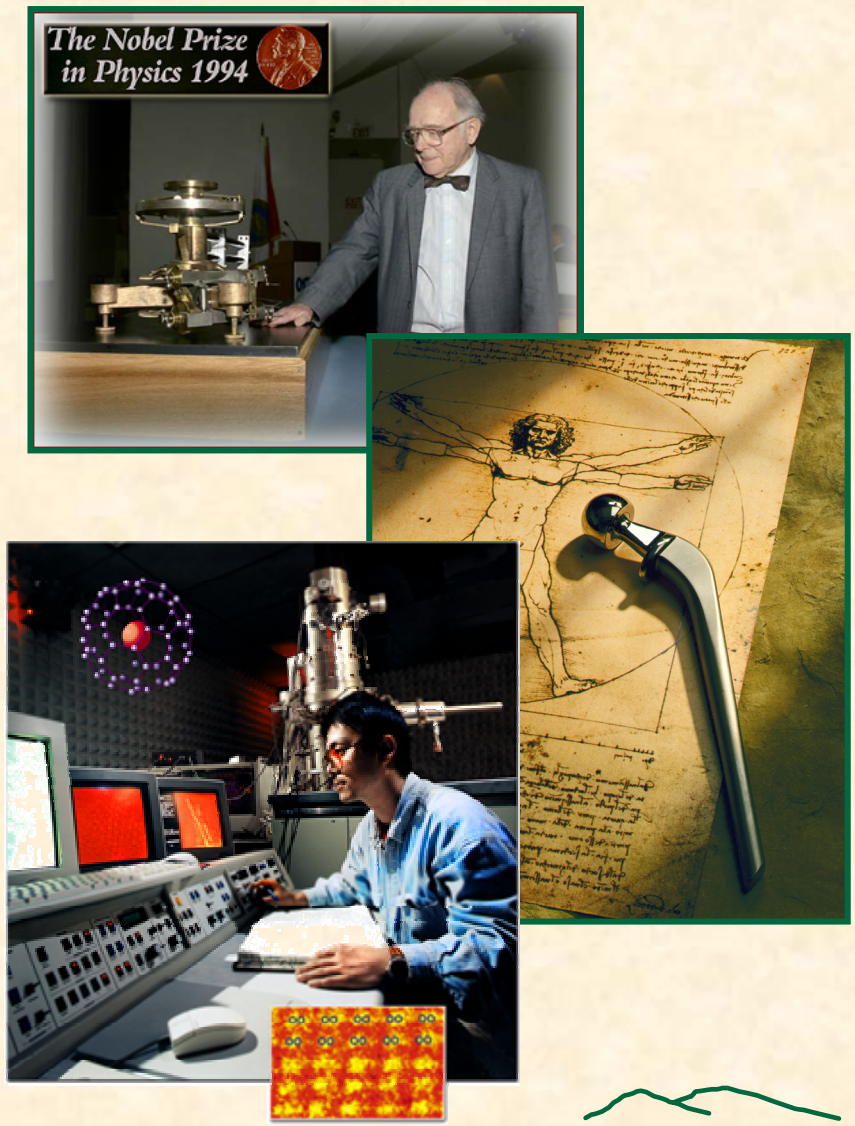
Oak Ridge National Laboratory



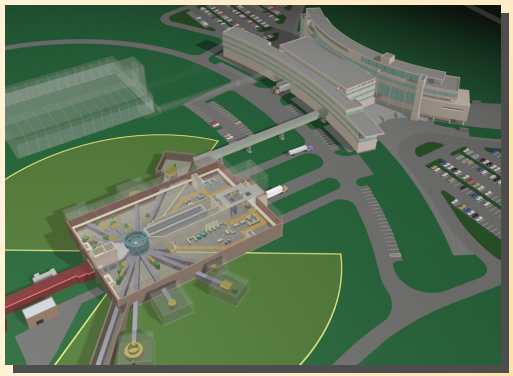
- DOE's largest multiprogram science laboratory
- Nation's largest energy R&D laboratory
- Nation's largest concentration of open source materials research
- World-class computing facilities
- Spallation Neutron Source $1.4 billion
- $300 million modernization program
- $1 billion budget
- 4000 employees
- 4000 research guests annually

Some Historical R&D Accomplishments at ORNL

- Development of neutron scattering for materials research (Nobel Prize, 1994)
- Early development of fundamental chemistry using molecular beams (Fermi prize, 2000)
- Development and commercialization of advanced alloys and ceramics
- Early development of ion implantation
- Development of atomic resolution scanning electron microscopy
- Development of analytical techniques including neutron activation analysis, trapped-ion mass spectrometry, and lab-on-a-chip technology
- Development and production of radioisotopes for medicine, industry, and research



Our Science and Technology Agenda



Become the world's foremost research center for neutron sciences

Provide leadership in open scientific computing

Become center of excellence for understanding complex biological systems

Build mutually beneficial partnerships

Provide the S&T for secure and reliable energy

Become a key resource for homeland and national security

Continue as a leading materials research lab

ORNL will become the world's foremost center for neutron sciences

Spallation Neutron Source

- World's most powerful pulsed spallation source
- World's leading facility for neutron scattering
- Best-in-class instruments (10-100x better than current instruments)
- Commissioning; 1 GeV achieved
- $1.4B project cost

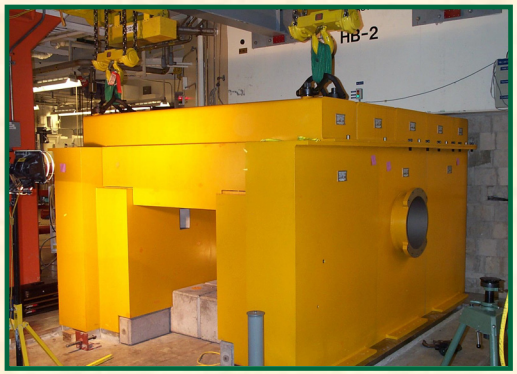
High Flux Isotope Reactor

- World's highest steady-state thermal neutron flux
- World-class cold source
- World-class instruments for neutron scattering
- National resource for isotope production, materials irradiation, and neutron activation analysis
- $800M replacement value

Joint Institute for Neutron Sciences

- $8M facility to be funded by the State of Tennessee
- Intellectual center (workshops, outreach, collaborations)
- User support center (housing)

World class instrumentation at HFIR

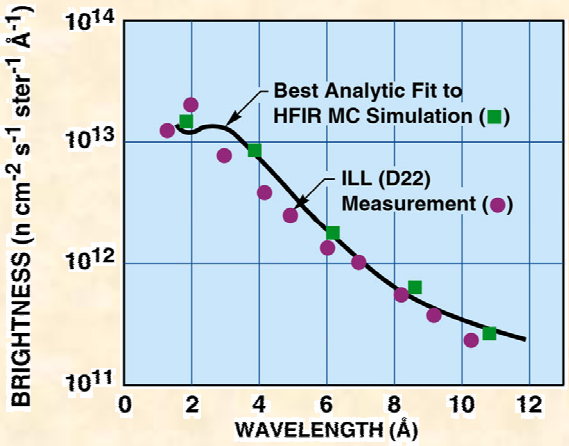


The HB-2 shielding tunnel will support 4 high-flux instruments

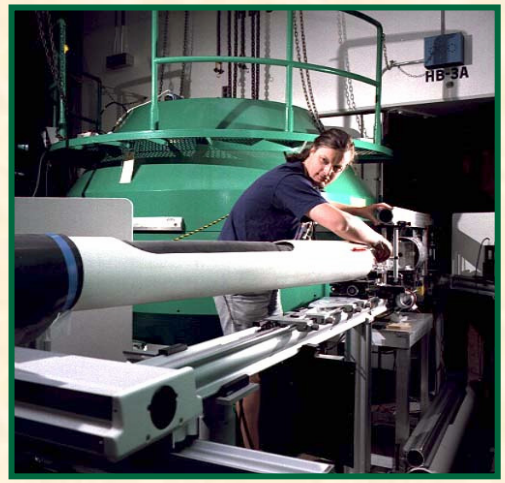
- High brightness cold source
- New shielding tunnel and guide hall (6 additional instruments)
- Every instrument world class
- Complementary to SNS

HB-1 triple-axis spectrometer (world's highest intensity)

Powder diffractometer (12 new detectors, 10x improvement)



HFIR cold source (brightness comparable to the world's best)



Reflectometer (100x signal-to noise)

Supporting DOE's energy mission

Generation

- Distributed energy resources
- Hydrogen
- Fusion
- Nuclear

Distribution

- High-temperature superconductors
- Transmission technology

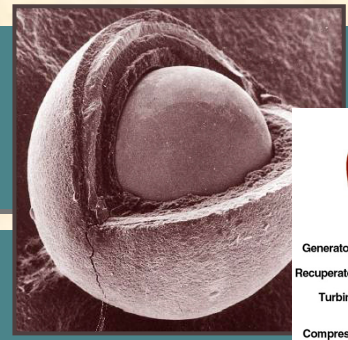
Consumption

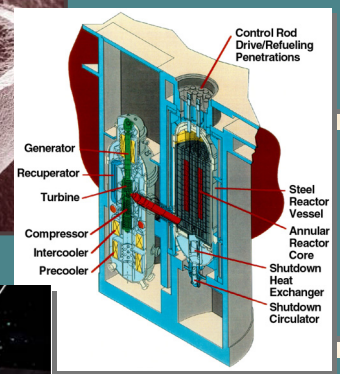
- Buildings
- Transportation
- Industry

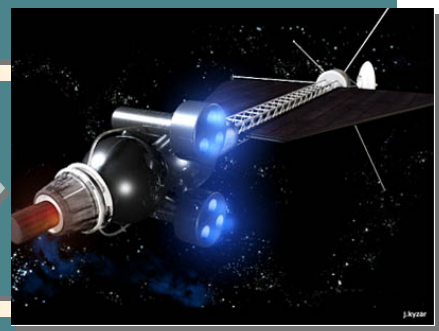
ORNL's science base

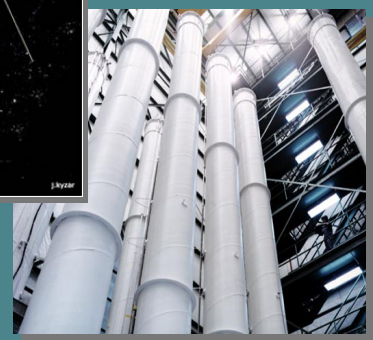
Nuclear Energy

- Fuel fabrication research
- Technology partner with U.S. industry for GT-MHR team
- Key role in NASA's space fission systems
- Advanced Gas Centrifuge R&D
- Participant in international fuel cycle initiatives



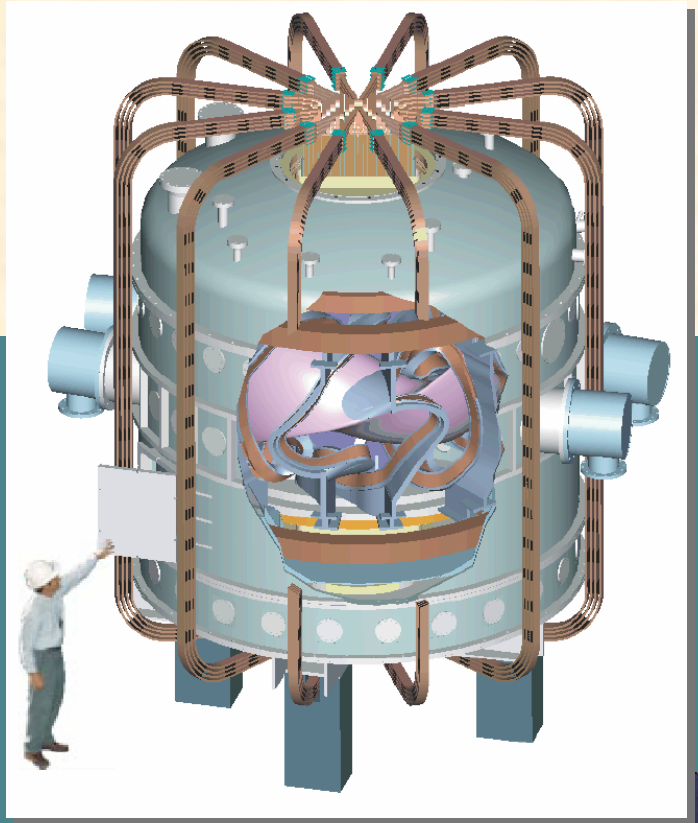






Fusion Energy

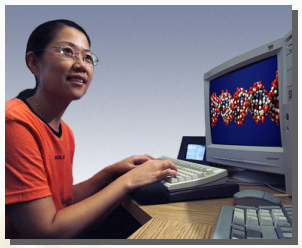
- Designing the Quasi-Poloidal Stellarator
- Constructing a radio-frequency antenna for the Joint European Torus
- Developing a fusion topical computing center



Energy Efficiency and Renewable Energy

- Industrial technologies
- Building technologies
- Distributed energy, electricity infrastructure, and reliability
- High-temperature superconductor cables and tapes
- FreedomCAR and vehicle technologies
- Hydrogen and infrastructure

ORNL will be a center of excellence for understanding complex biological systems



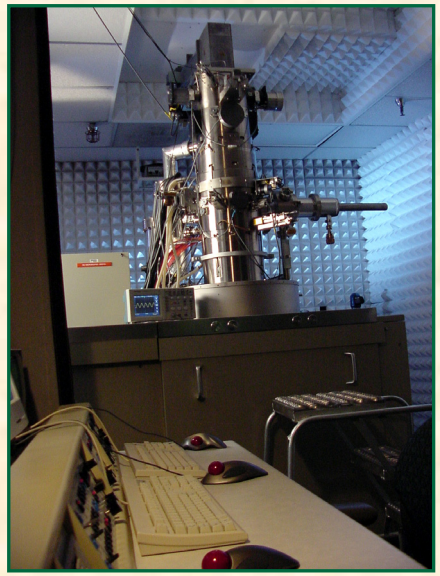
- Building a new Laboratory for Comparative and Functional Genomics
- Designing a state-funded facility for the Joint Institute for Biological Sciences
- Developing experimental, theoretical, and computational capabilities for understanding and predicting the functions of biological systems

A leading materials research laboratory

- Fundamental research and energy applications
- Integration with technology programs
- Extensive synthesis and microanalytical capabilities
  - Metals and alloys
  - Ceramics
  - Electronic/magnetic materials
  - Carbon-based materials
  - Thin films and interfaces
  - Electron microscopy
  - Neutron scattering
  - Laser and IR processing
- Building DOE's first nanoscience center

High Temperature Materials Laboratory

World's highest-resolution electron microscope



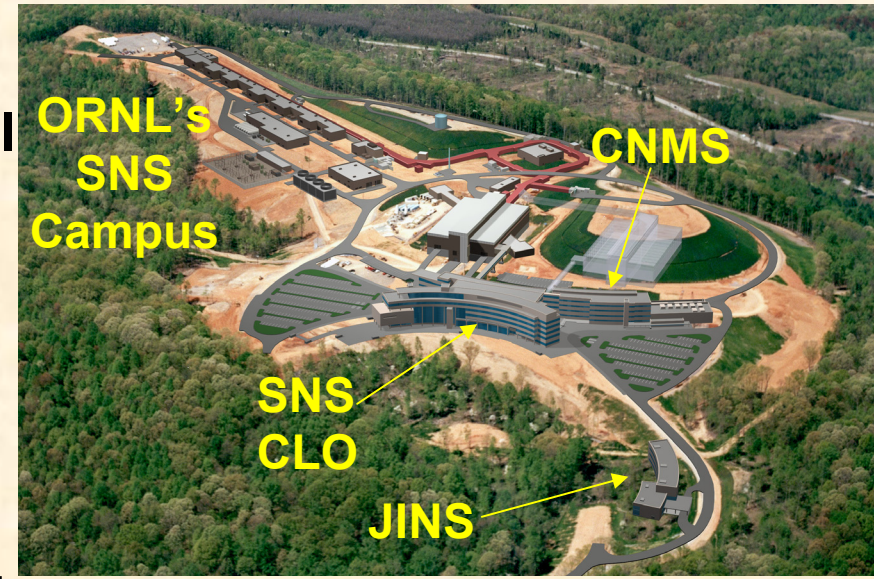
World's most powerful infrared lamp

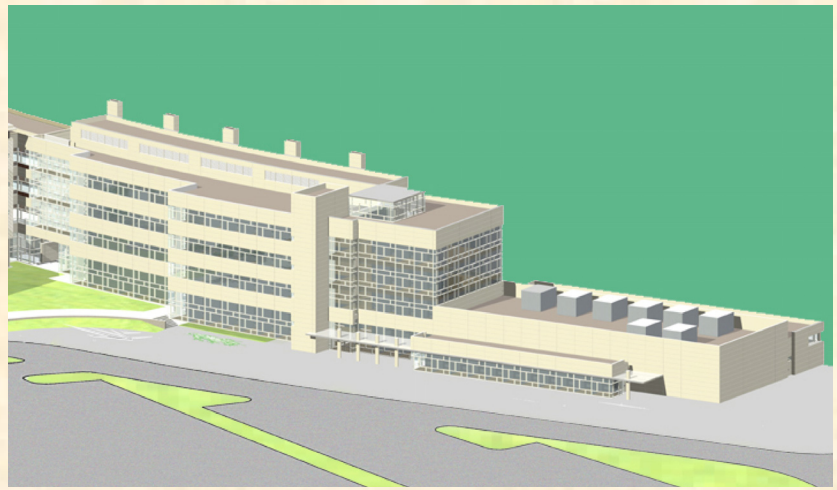
Center for Nanophase Materials Sciences

- Integrates materials, chemical, biological, neutron, and computational sciences in a state-of-the-art facility
  - Complex nanophase materials
  - Macromolecular systems
  - Synthesis and nanofabrication
  - Theory, modeling, and simulation
- Strong partnerships with universities
  - 61 universities represented at second planning workshop
- FY 03 construction start

New research initiatives

- *Nanoscale cooperative phenomena*
- *Nanocatalysis*
- *Self-assembled nanotube crystals*
- *Nanoscale solid/liquid interfaces*

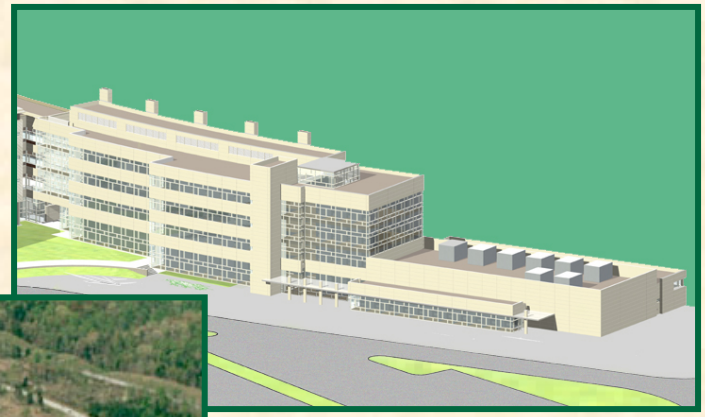




Center for Nanophase Materials Sciences

10 major new facilities completed at ORNL

Main Campus: 5 new research buildings (2003-2005)

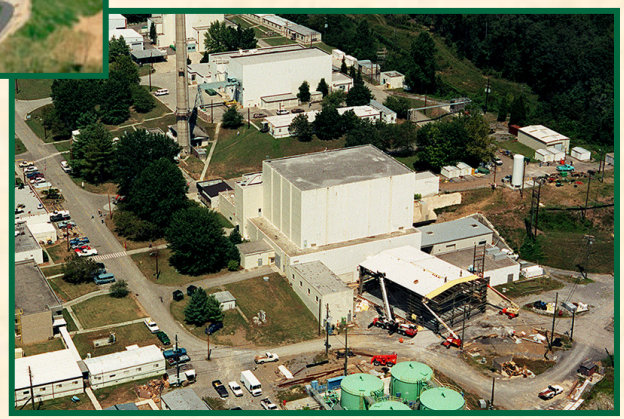


Center for Nanophase Materials Sciences (2005)

Spallation Neutron Source (2006)

Functional Genomics Laboratory (2003)

Advanced Materials Characterization Lab (2004)



Cold Guide Hall at the High Flux Isotope Reactor (2003)

Summary

- ORNL has a broad and diversified science and technology portfolio
- New capabilities in neutron scattering, computational science, nanoscale science, materials science, and genomics/proteomics will drive our science agenda
- Increased technology investments are foreseen in nuclear energy, fusion, and other advanced energy sources (hydrogen, fuel cells, etc.)
- We are building an entirely new research campus
- Our future has never looked brighter