

Oak Ridge National Laboratory - its programs and the ways to connect

Lee Riedinger
Associate Laboratory Director
University Partnerships

December 13, 2005

OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

Vehicles of cooperation

- **Programs at user facilities**
- **Office of Science funded student - teacher programs:**
 - Science Undergraduate Laboratory Internship
 - Research Alliance in Math and Science
 - Faculty and Student Teams
 - Community College Institute
 - Pre-Service Teacher Internships
 - Laboratory Science Teacher Professional Development Program
 - Sabbatical program for faculty from minority institutions
- **Programs for faculty at ORNL:**
 - Collaborations with research groups
 - Joint appointments - *Joint Faculty*
 - Summer appointments for faculty from minority institutions
 - Special facilities and centers
- **Hiring at ORNL**

ORNL is a large DOE multipurpose science laboratory

- \$1 billion budget
- 3800 employees
- 3000 research guests annually
- \$300 million modernization
- 18 user facilities
- Nation's largest science facility: the \$1.4B Spallation Neutron Source
- Nation's largest concentration on materials research
- Nation's largest energy laboratory
- Nation's largest unclassified scientific computing facility



We operate user facilities that serve an international research community



**Mouse
Genetics
Research
Facility**



**High Flux
Isotope
Reactor**



**High
Temperature
Materials
Laboratory**



**Metals
Processing
Laboratory
User Center**



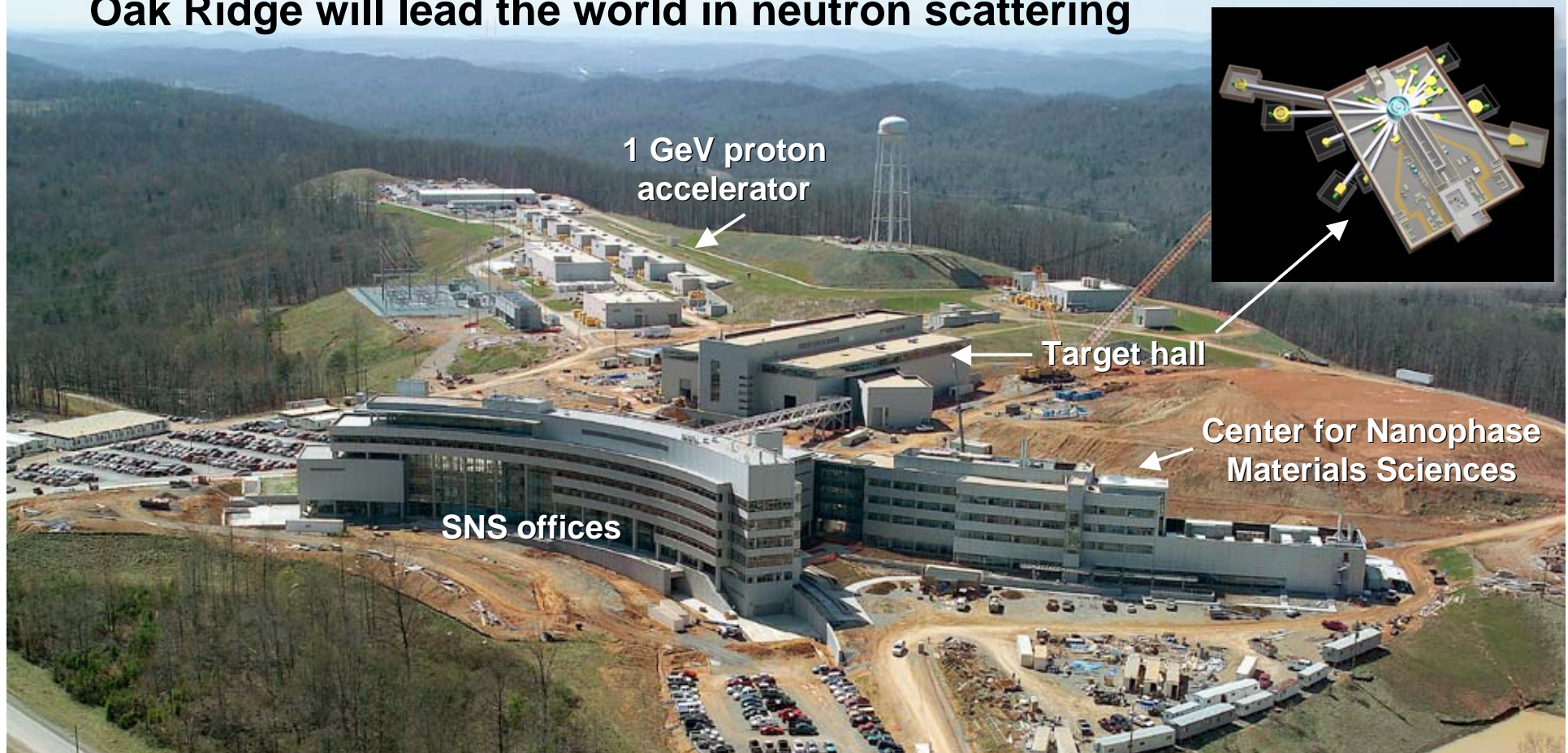
**Holifield
Radioactive
Ion Beam
Facility**

Providing access to unique and expensive tools and facilities
for cutting-edge research

The Spallation Neutron Source (SNS)

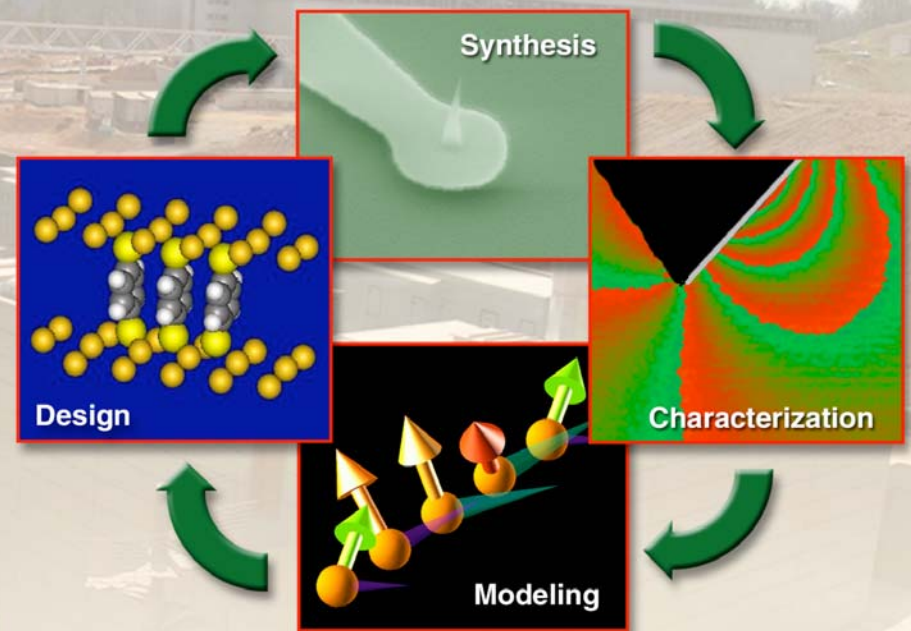
Total cost: \$1.4 billion

- Operational in 2006
- World's most powerful pulsed neutron source
- With complementary resources at the High Flux Isotope Reactor, Oak Ridge will lead the world in neutron scattering



DOE's first nanoscale research facility: Center for Nanophase Materials Sciences

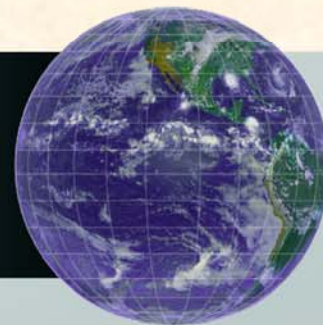
- **Providing distinctive research capabilities:**
 - Materials synthesis and characterization
 - Nanofabrication
 - Theory and modeling
 - Nanomaterials design
- **\$65M in buildings and equipment**
- **Available to universities and industry based on competitive peer review**
- **Open for users October 2005**



Our science program includes genome biology

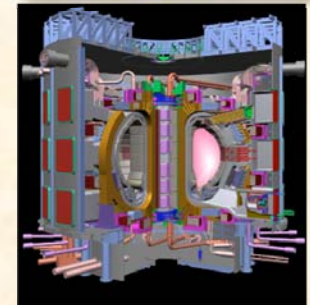
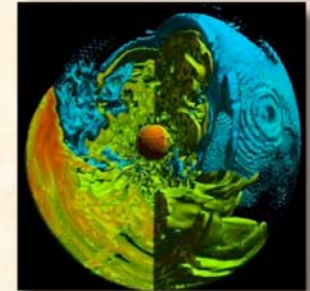
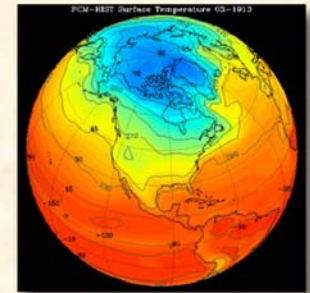
Challenge: Integrate biology and ecology based on the foundation of understanding molecular-level interactions

- Identify the composition and function of “molecular machines”
- Use biological processes to
 - Produce clean energy
 - Sequester carbon
 - Help clean up the environment
- Understand how living organisms react to their environments
- Determine the genetic basis for complex traits

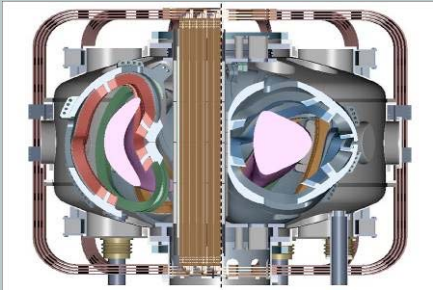




At ORNL we are building the large ultrascale computing facility

- **Leading the partnership to develop the National Leadership Computing Facility**
 - Leadership-class scientific computing capability
 - 100 teraflops by 2006; 250 teraflops by 2007
- **Attacking key computational challenges**
 - Climate change
 - Nuclear astrophysics
 - Fusion
 - Materials sciences
 - Biology
- **Providing access to our computational resources through high-speed networking**



We address the energy challenges of the present and the future

Generation	Distribution	Consumption
Fossil Fission Renewables Fusion	Transmission technology Hydrogen Distributed energy resources	Buildings Industry Transportation
		
Supporting DOE's strategic goals for energy security and independence		

We apply our S&T resources to national and homeland security

- Detecting, preventing, and reversing the proliferation of weapons of mass destruction
- Deploying integrated systems for incident awareness, detection, and response
- Providing technology for detecting explosives at the part-per-trillion level
- Delivering enhanced protection and new capabilities to first responders and warfighters



OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

**We need many new
devices for protection**



Vehicles of cooperation

- **Programs at user facilities**
- **Office of Science funded student - teacher programs:**
 - Science Undergraduate Laboratory Internship
 - Research Alliance in Math and Science
 - Faculty and Student Teams
 - Community College Institute
 - Pre-Service Teacher Internships
 - Laboratory Science Teacher Professional Development Program
 - Sabbatical program for faculty from minority institutions
- **Programs for faculty at ORNL:**
 - Collaborations with research groups
 - Joint appointments - *Joint Faculty*
 - Summer appointments for faculty from minority institutions
 - Special facilities and centers
- **Hiring at ORNL**

Student internships at ORNL - 230 in FY05

- **SULI – Science Undergraduate Laboratory Internship - administered by ORISE, funded by DOE Office of Science – 63 this year**
- **RAMS – Research Alliance in Math and Science – 21 undergrads - funded by DOE OASCR**
- **NESLS - Nuclear Engineering Student Laboratory Synthesis – 9 undergrads, 10 grad students this summer**
- **UT science internships – 7 undergrads this summer**
- **HERE – Higher Education Research Experiences - administered by ORISE, funded by groups at ORNL - 62 undergrads, 51 grad students**
- **ORCAS – 9 grad students in research and policy studies - summer**
- **ORNL coop program – 3 at present, building to 20**
- **Community College Institute – 8 this summer – funded by DOE**
- **Pre-Service Teacher Internships - 6 this summer – funded by DOE**



DOE SULI program provides enhanced research experiences for undergraduates

- **10 weeks in summer or 16 weeks during fall or spring**
- **Research experiences guided by expert mentors**
- **Enhancement activities:**
 - Seminar series
 - Brown Bag Lunch programs
 - Weekend activities
 - Student poster session
 - Graduate fair
 - Possibility of publication in the DOE Journal of Undergraduate Research
- **Weekly stipend**
- **Housing provided**

**FY05:
456 across all labs
81 at ORNL**



PST program helps prepare the next generation of science teachers

- 10 weeks in summer
- Research experience guided by expert mentors
- Enhancement activities
- Special mentoring by a master teacher
- Workshops that link research with pedagogy
- Weekly stipend
- Housing provided



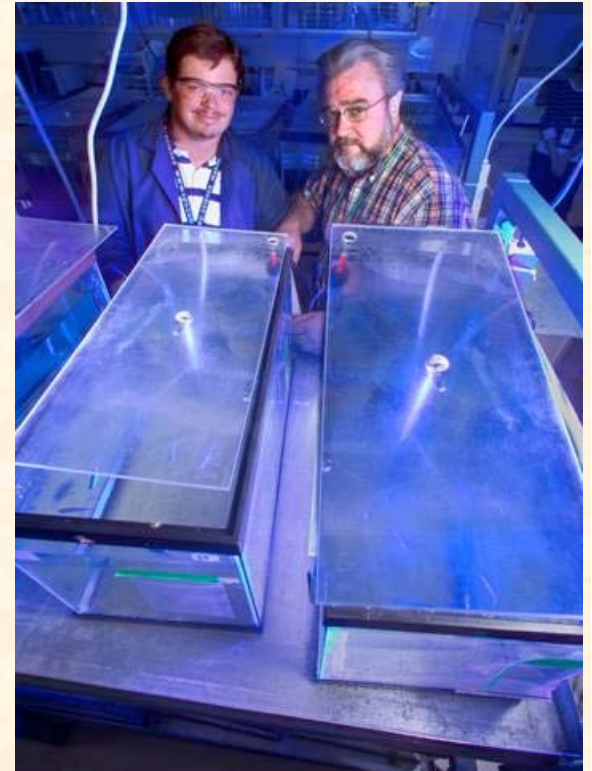
**FY05:
52 across all labs
6 at ORNL**

OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY



DOE funds a Laboratory Science Teacher Professional Development Program

- **Format - research and training:**
 - 34 hours of research each week
 - 4 hours/week of interaction with University of Tennessee faculty
 - 2 hours/week of enhancements
 - Seminars
 - Tours
 - Brown bag lunches
 - Session
- **The teachers continue interactions with Laboratory after summer ends**
 - Attended a AAAS meeting
 - Incorporated research activities with their students
 - Maintained regular contact with mentors



OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

FY05:
90 across all labs
8 at ORNL

We are committed to broad university partnerships

The long relationship with the University of Tennessee is the model for interacting with other universities



The University of Tennessee
Knoxville, Tennessee



Battelle
Columbus, Ohio

The UT-Battelle partnership includes universities

**Oak Ridge
Associated
Universities**



**Seven “core university” partners:
Duke, Florida State, Georgia Tech,
North Carolina State, Vanderbilt,
Virginia, Virginia Tech**



**New relationships
with minority
educational
institutions**



OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

**The next generation of
researchers is a big issue**



Our academic partnerships take many forms

Examples of our many collaborative programs

- **New coop program**
- **HBCU faculty summer research program:**
 - 54 faculty from 30 schools since 2001
 - Leads to ongoing research partnerships



- **Joint faculty hired:**
 - UT - 34
 - Core universities - 9
 - NC A&T - 1
- **Joint faculty with other universities planned**
- **Joint research proposals and programs**
- **Access to our user facilities**
- **Opportunities for undergrad and grad student appointments**

- **Oak Ridge Center for Advanced Studies**
- **A policy center with ORAU, UT, core universities**



Our summer program for HBCU/MEI faculty builds research bridges

- **ORNL and ORAU have sponsored 84 summer research visits by 54 faculty from 31 institutions in last five years**
- **Strong collaborations with FAMU, North Carolina A&T, Jackson State, Clark Atlanta, Prairie View A&M, Tenn. State, and others have resulted**
- **Builds staff/faculty relationships essential for R&D partnerships, student flow, and recruiting**
- **Great feedback from faculty**
- **A joint faculty appointment with North Carolina A&T has resulted - Dhananjay Kumar**



Dhananjay
Kumar
NC A&T

<http://www.ornl.gov/orise/edu/ornl/MEI/index.htm>

OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY



DOE has a sabbatical program for faculty from minority institutions

- **Sabbaticals for faculty from HBCUs and MEIs**
- **Faculty spend a sabbatical year at a national lab**
- **DOE program provides half of salary for academic year**
- **We have two such appointments now at ORNL:**
 - **Jiandi Zhang, physics faculty from Florida International University**
 - **Shubha Kale Ireland, biology faculty from Xavier University, New Orleans**

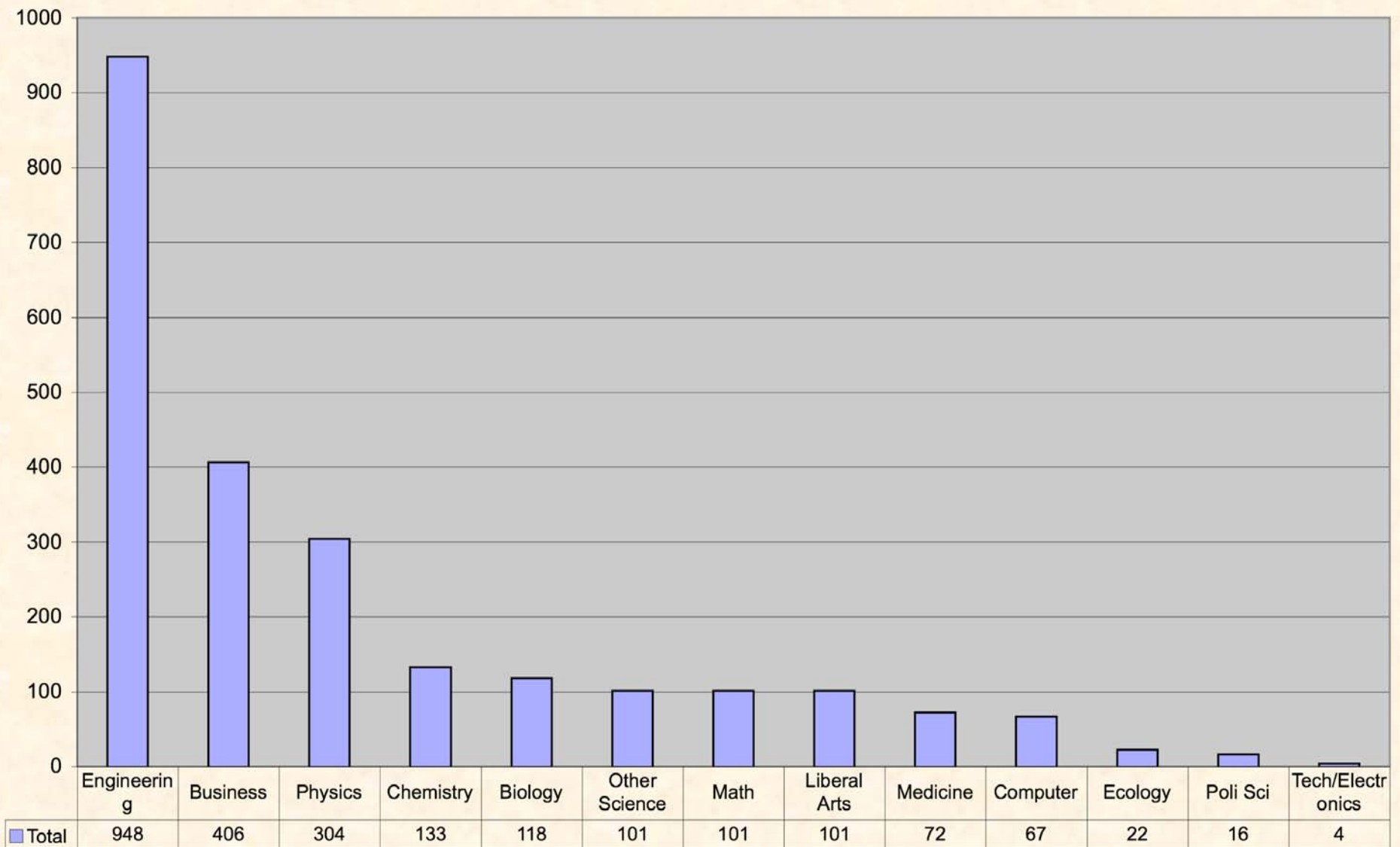


Developing and recruiting the next generation workforce are big challenges

- **ORNL is well positioned as a strong national lab and will continue to grow**
- **Talented scientists and engineers will continue to be difficult to find and will require more aggressive recruiting**
- **The critical skills we are seeking this year are in high demand, for example:**
 - neutron scattering
 - computational science and engineering
 - microbial biology and proteomics
 - energy science and technology
 - science-based security
 - nuclear nonproliferation



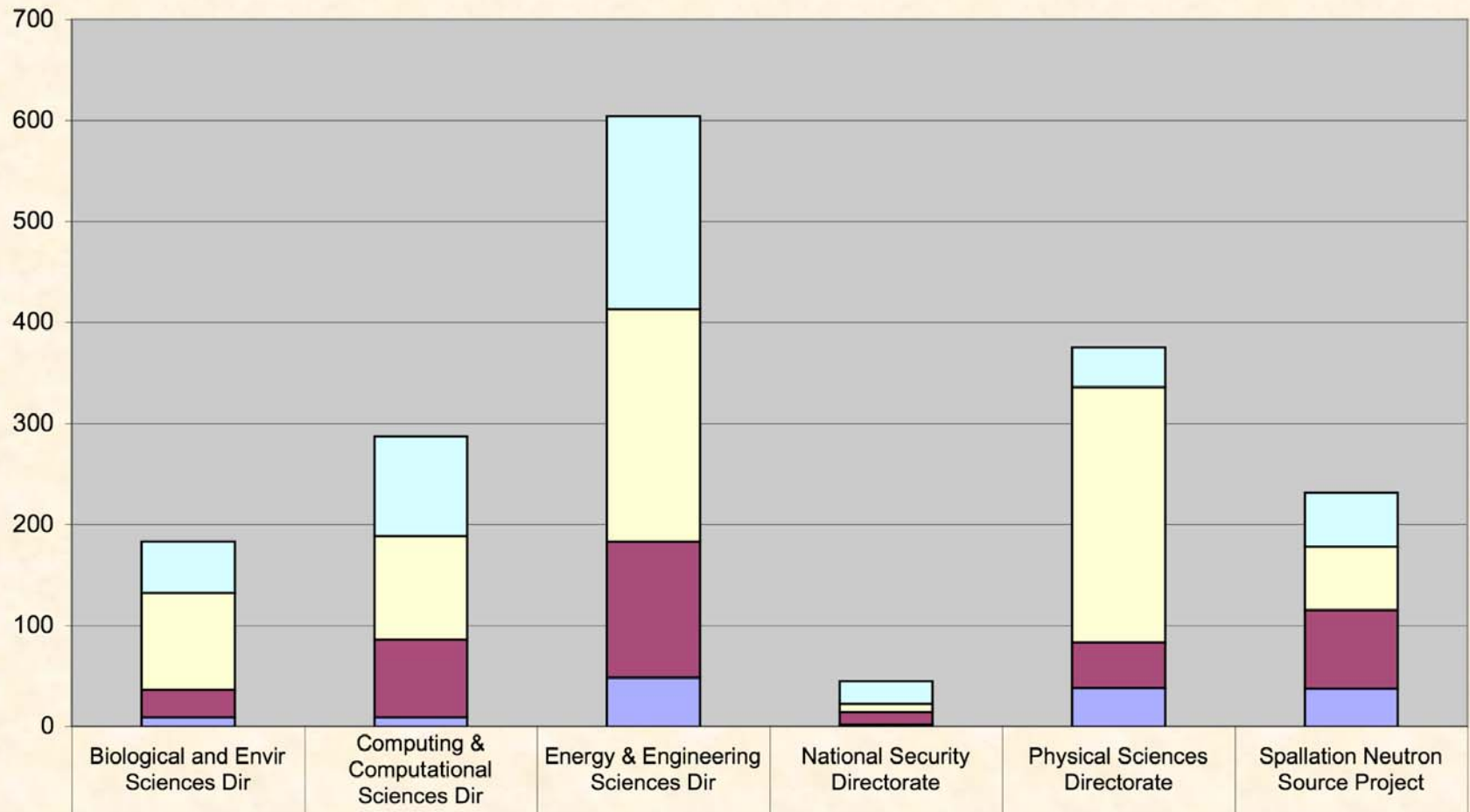
Current Employees by Major



OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

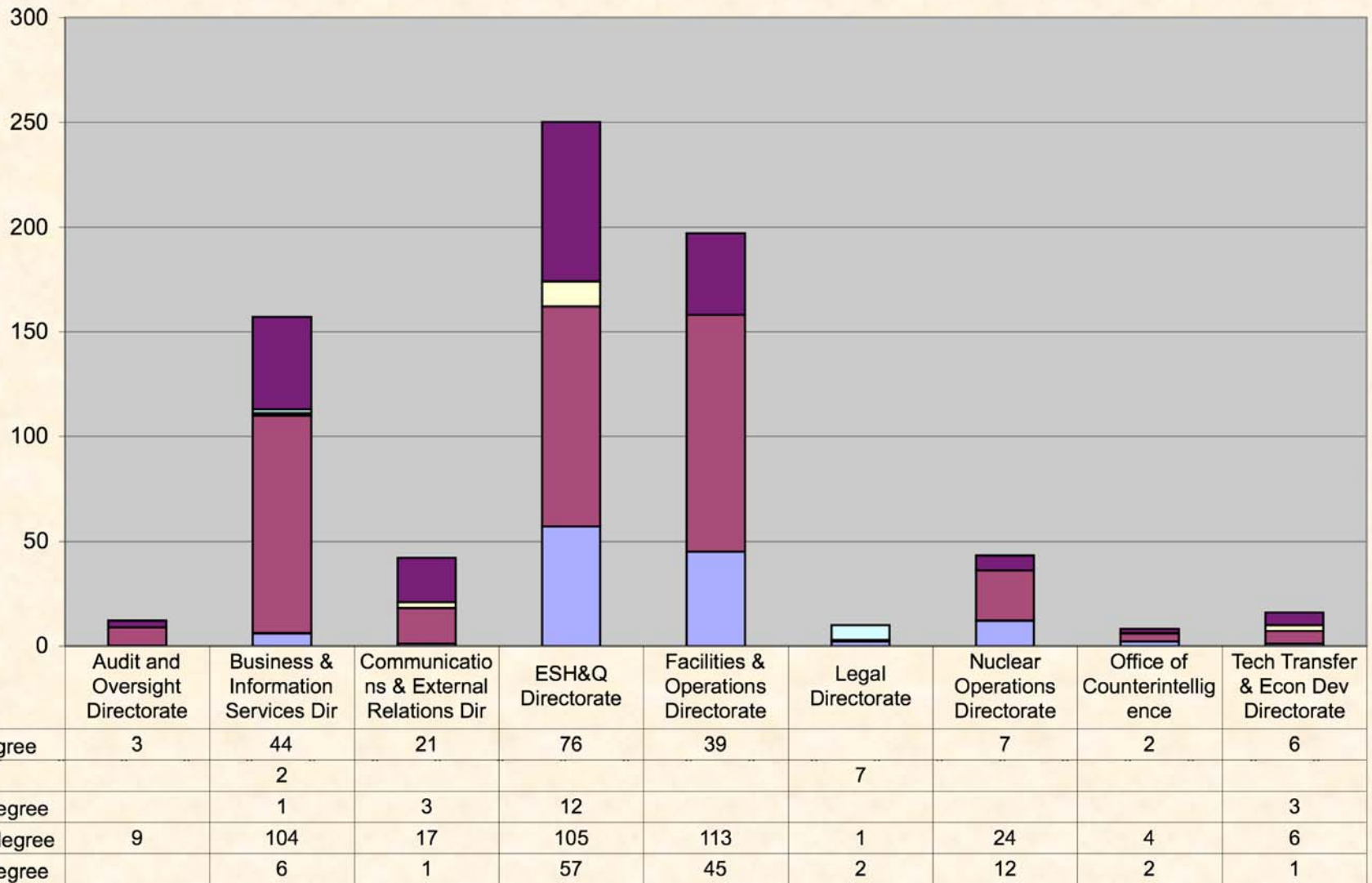


Current Employees by Degree Level (R&D Directorates)



Master's degree	51	99	191	23	39	53
Doctorate degree	96	102	230	8	253	63
Bachelor's degree	27	77	135	12	45	78
Associate degree	9	9	48	2	38	37

Current Employees by Degree Level (Support Directorates)



FY2006 workforce planning indicates we will hire in these areas

Degree*	Planned Additions
Bachelors	77
Masters	65
PhD	122
Not defined	92

* Desired degree
for all experience levels

Category	Planned Additions
Research	245
Support	111

Expertise	Planned additions
Comp. Sci/Mathematics	66
Physical Sciences	46
Life Sciences	23
Materials Sciences/Physics	20
Engineering (not defined)	19
Nuclear Engineering	18
Accounting/Finance	13
Environmental Management	9
Information Technology	8
Biological Sciences	7
Human Resources	6

Day of Science on October 10 was a success

Purpose

- Increase the number of minority students taking our internships
- Get faculty more aware of the programs and possibilities at ORNL

Event

- 127 students and 52 faculty from 29 universities including 17 HBCUs/MEIs and 4 core universities and UT at ORNL for a day
- Talks about the lab and interactions with research exhibitors
- Interview with each student; session with faculty
- Graduate recruiting table for each core university and for UT



Postdoctoral appointments help us recruit talent to ORNL

- **Wigner Fellows** – any area of laboratory research – seven positions
- **Shull Fellows** – neutron scattering – up to 10 positions
- **ORNL Postdoctoral Research Associates** – administered by ORISE, funded by groups at ORNL - 200 at present
- **Householder Fellows** – scientific computing – funded by DOE OASCR – one slot



OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

A poster for the Wigner Fellowship Program. It features a large portrait of a man on the left. The title "Wigner FELLOWSHIP PROGRAM" is at the top in a stylized font. Below it, the subtitle "ATTRACTING SCIENTIFIC SUPERSTARS" is in a purple banner. The main text describes the program's history and purpose. There are three small inset photos: a woman with a dog, a man, and a woman. At the bottom, there are links to the program's website and the ORNL logo.

Wigner FELLOWSHIP PROGRAM

ATTRACTING SCIENTIFIC SUPERSTARS

Oak Ridge National Laboratory seeks applicants for the Eugene P. Wigner Fellowship Program, established in 1975 to honor the Nobel Laureate (1963) and first Director of Research & Development at ORNL (1946-47).

The Wigner Fellowship provides an opportunity for outstanding new life, physical, and social scientists and engineers from around the world to select and pursue fundamental or applied research in areas of global interest.

Fellows must be exceedingly well qualified and no more than three years beyond the doctorate.

Highlights of the program and fellows can be found at: http://www.ornl.gov/info/ornreview/v38_2_05/index.shtml
For information on the program please go to: <http://www.ornl.gov/adm/employment/wigner/index.htm>

OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

Meeting the needs of the future science and engineering workforce in the U.S.

Science and Engineering Indicators 2004:

- **The number of jobs requiring science or engineering degrees is growing at three times the rate of other jobs in the U.S.**
- **The number of bachelor's degrees in the physical sciences, mathematics, and engineering is no greater today than in 1980**
- **More than half the U.S. Ph.D.s in mathematics, computer science, and engineering are granted to foreign nationals**
- **Twenty-five percent of the current science and engineering workforce is over 50**

Web sites to help you find more information

- **<http://www.science.doe.gov/>**
 - **http://www.science.doe.gov/feature/Workforce_Development.htm**
- **<http://www.ornl.gov/ornlhome/education.shtml>**
- **<http://see.ornl.gov/>** - Oak Ridge Institute of Science and Education operates many of our student and faculty programs as our close partner

Contact Linda Holmes
HolmesL@ornl.gov
<http://www.ornl.gov/orise.htm>