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

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Associate Laboratory Director
University Partnerships

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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

Nano-materials - how to develop and use in commercial devices
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

Energy and environment - how to use ‘genome science’ for new strategies
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

<table>
<thead>
<tr>
<th>Generation</th>
<th>Distribution</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fossil</td>
<td>Transmission technology</td>
<td>Buildings</td>
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<td>Fission</td>
<td>Hydrogen</td>
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<td>Transportation</td>
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<tr>
<td>Fusion</td>
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Supporting DOE’s strategic goals for energy security and independence

Energy supply and use - we have huge challenges
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

We need many new devices for protection
Vehicles of cooperation

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- 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
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

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 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

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

Examples of our many collaborative programs
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

http://www.orau.gov/orise/edu/ornl/MEI/index.htm
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
FY2006 workforce planning indicates we will hire in these areas

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<tr>
<th>Degree*</th>
<th>Planned Additions</th>
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<tr>
<td>Bachelors</td>
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<td>Masters</td>
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* Desired degree for all experience levels

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<th>Expertise</th>
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<td>Comp. Sci/ Mathematics</td>
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<td>Physical Sciences</td>
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<td>Life Sciences</td>
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<td>Materials Sciences/Physics</td>
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<tr>
<td>Nuclear Engineering</td>
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<tr>
<td>Accounting/Finance</td>
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<tr>
<td>Environmental Management</td>
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<td>Information Technology</td>
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<tr>
<td>Biological Sciences</td>
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<td>Human Resources</td>
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<table>
<thead>
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<th>Category</th>
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<td>Research</td>
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<tr>
<td>Support</td>
<td>111</td>
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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
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.orau.org/ - Oak Ridge Institute of Science and Education operates many of our student and faculty programs as our close partner

Contact Linda Holmes
HolmesL@orau.gov
http://www.orau.gov/orise.htm