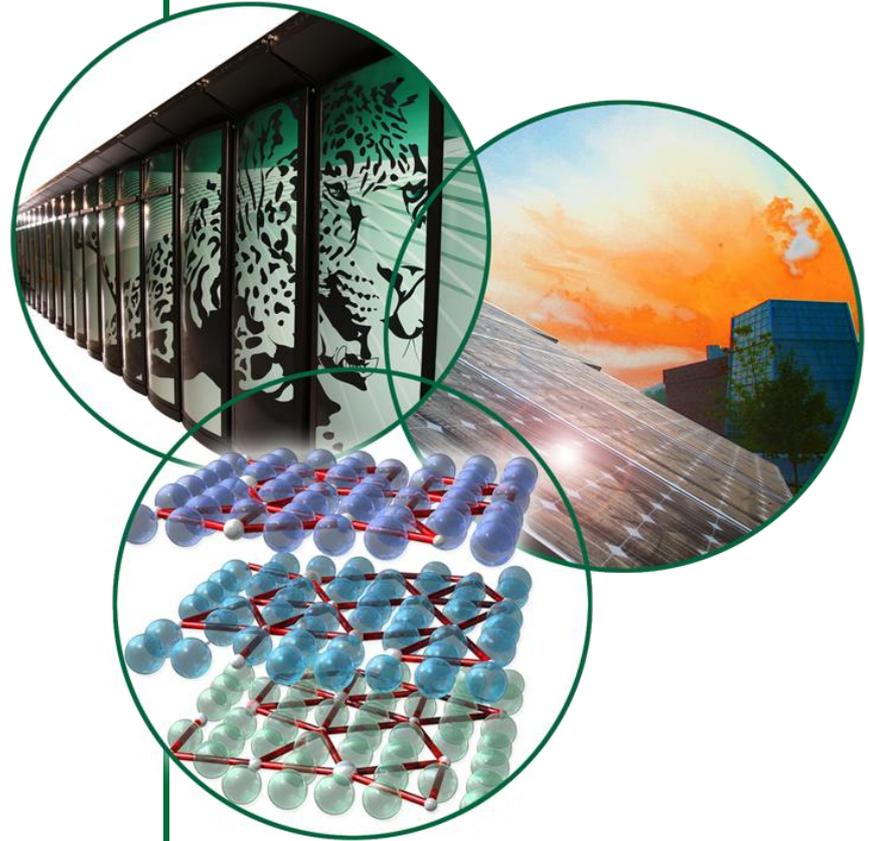


ORNL University Outreach

Women In Nuclear Region II Conference

February 8, 2011

Bernie Kirk
Reactor and Nuclear Systems Division



Outline

- **Education Outreach Targets**
- **Education Outreach Programs**
- **Grade School and High School Outreach**
- **University Outreach**
- **Curriculum Development**
- **Conclusions**

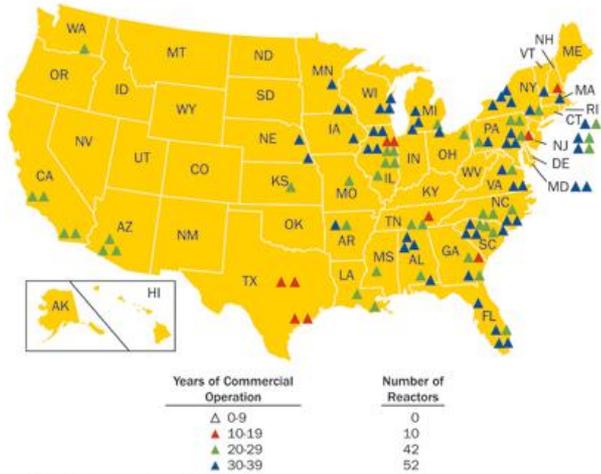
The nuclear workforce represents a diversity of expertise and environment.

Disciplines	Employers in US
<ul style="list-style-type: none">• Engineers (nuclear, electrical, chemical, mechanical, materials, civil/structural)• Health physics• Radiation protection technicians• Chemists• Physicists• Instrumentation and control experts• Materials science• Computational scientists• Medical physicists• Skilled workers• Others	<ul style="list-style-type: none">• National laboratories• Universities• Government agencies<ul style="list-style-type: none">– DOE– NRC– DoD– DHS– EPA– NIH• Industry<ul style="list-style-type: none">– 103 commercial nuclear power plants (NPPs)– Engineering design firms– Fuel fabricators– Fuel vendors and suppliers

US Power Reactors and Research Reactors

<http://www.nrc.gov>

U.S. Commercial Nuclear Power Reactors—Years of Operation



Source: U.S. Nuclear Regulatory Commission

U.S. Nuclear Research and Test Reactors



Source: U.S. Nuclear Regulatory Commission

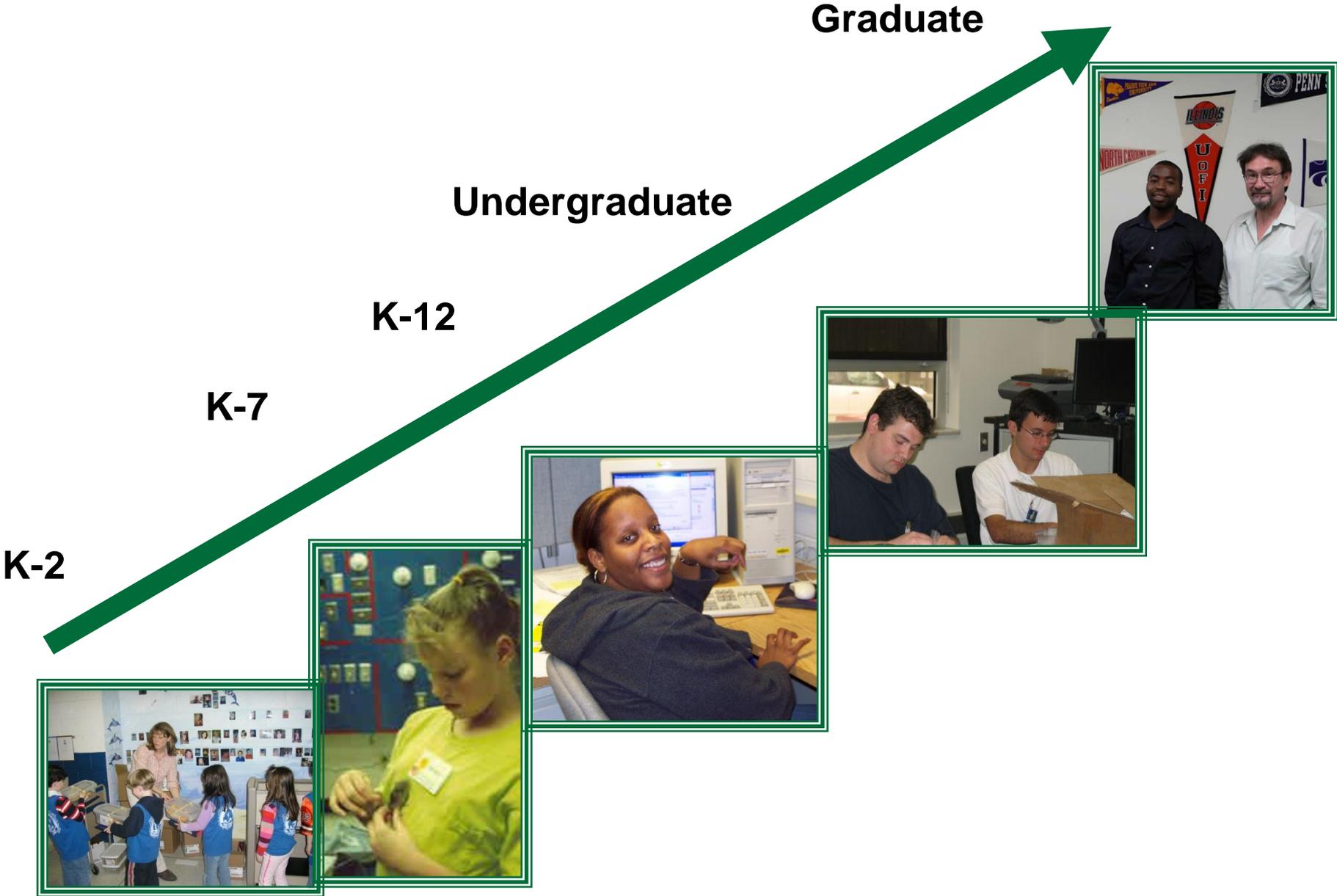
Projected New Builds



* Review Suspended by Applicant

** COL Application Amended by Applicant to ESP on 03/25/2010

Nuclear Education Outreach Targets



An Education Committee is vital to outreach.

**Nuclear Science and Technology
Interaction Program (NSTIP)**

**Nuclear Science
and Energy**
Tina Moore
Anne Holder

**Reactor and Nuclear
Systems**

Kevin Clarno
Peggy Emmett
Nancy Hatmaker
Matt Jessee
Robby Joseph
Barb Snow

**Fuel Cycle and
Isotopes**

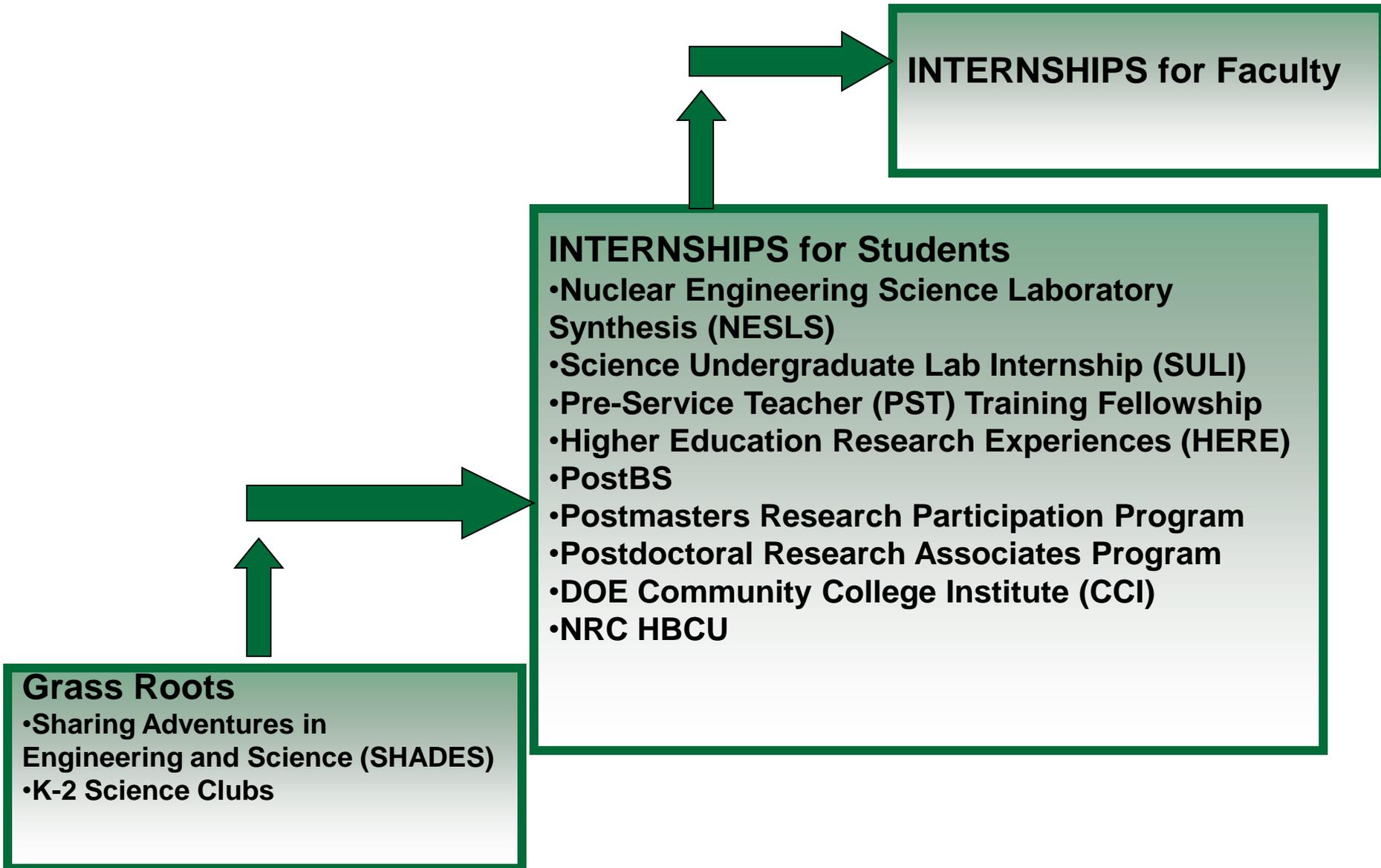
Julie Ezold
Denise Schuh

**Global Nuclear
Security Technology**

Dawn Eipeldauer
Sharon Wagner
Patrick Lynch
Kim Gilligan

Human Resources
Megan Scott

Nuclear Education Outreach Programs



SCIENCE CLUB

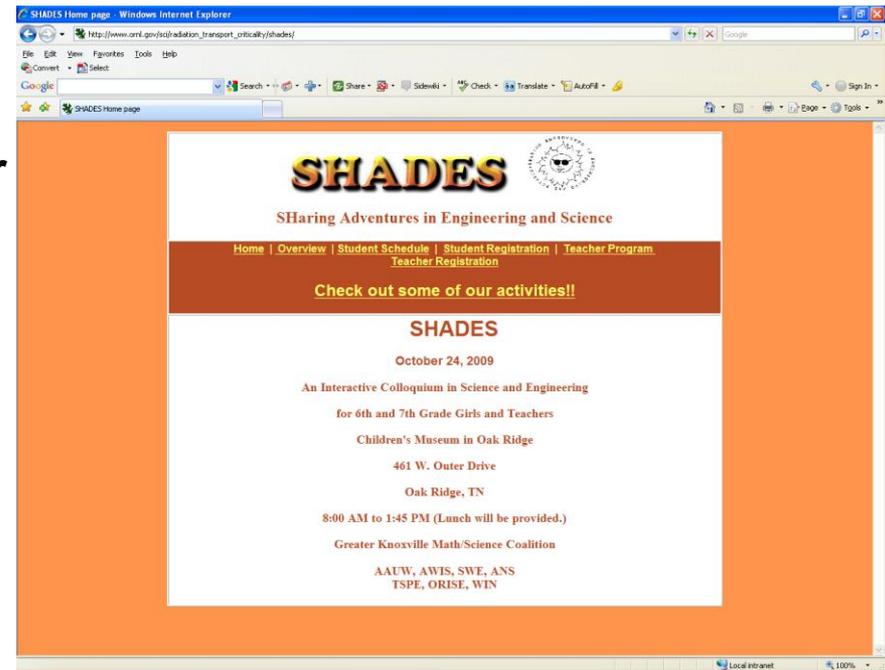
- **Science Club** - a program to encourage kids to explore science in the world around them
- Program is for ages K-2
- Club was started in January 2006 by ORNL staff members
- Kids perform a series of take-home experiments with their families.



Julie Ezold discusses the Science Club with the late Betty Maskewitz, who was very proactive in science Outreach.

SHaring Adventures in Engineering and Science (SHADES)

- ORNL researcher Peggy Emmett started in the 90's
- Half-day program once or twice a year for 6th and 7th females
- over 25 workshops, 1500 students and 150 teachers
- Covers a variety of science topics
- Teachers participate and get in-service credit
- Design Competition



SHADES

Nuclear education is not just about the atom!

Learning about
Pythons



T-shirt
Chromatography



Math of Bouncing Balls



Plant Life



Local School Visits

Meigs County North



Kingston Elementary



Central High School



Meigs County South



Teachers' Workshops



2007-P03518.JPG



2007-P03519.JPG



2007-P03520.JPG



2007-P03521.JPG

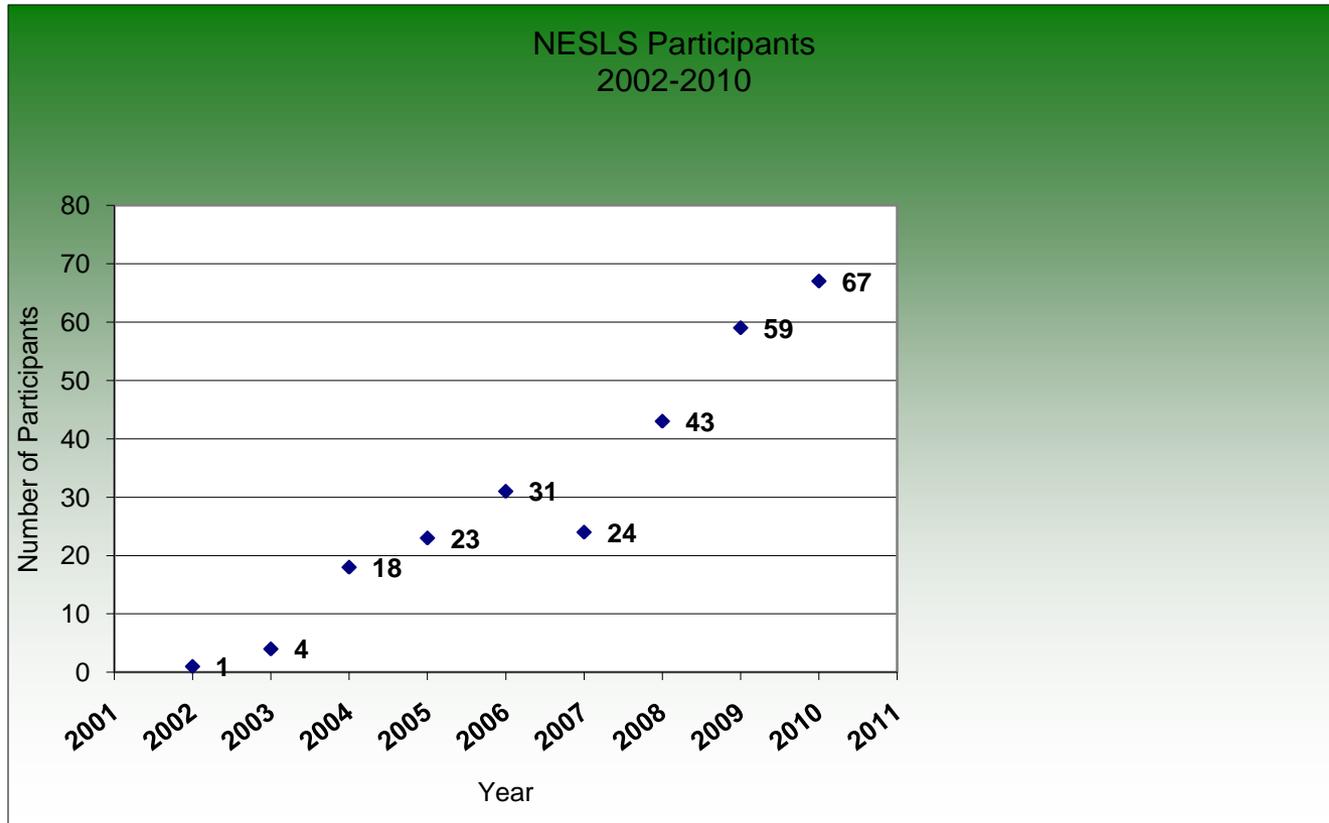


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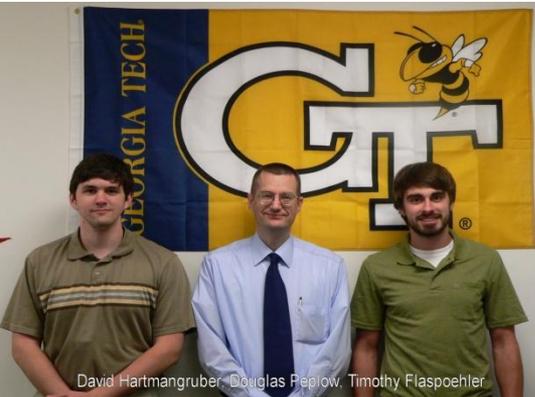


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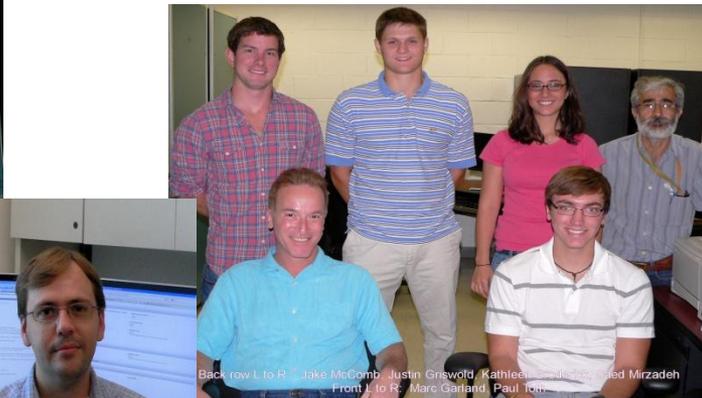
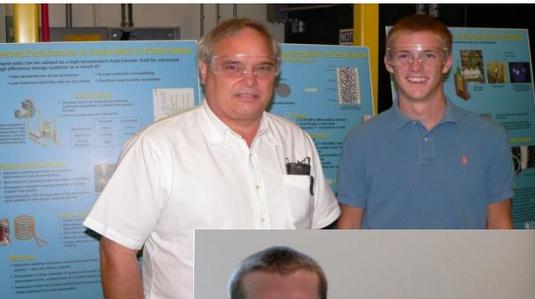
University Outreach - INTERNSHIPS Nuclear Engineering Science Laboratory Synthesis (NESLS)



NESLS Summer Interns and Mentors



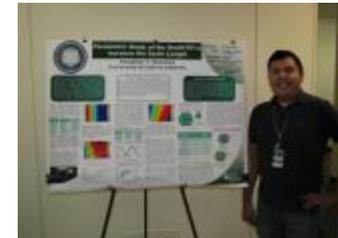
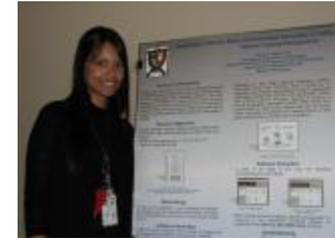
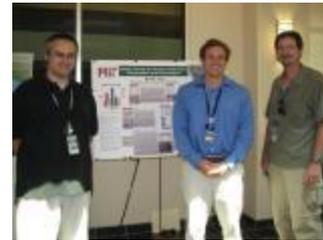
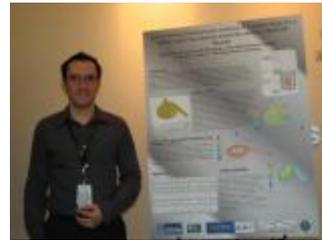
David Hartmangruber, Douglas Peplow, Timothy Flaspoepler



Back row L to R: Jake McComb, Justin Griswold, Kathleen Swickard, Jared Mirzadeh
Front L to R: Marc Garland, Paul Tom



Poster Session



Best Posters



Shaheen Dewji,
Georgia Tech



Trey Krauerz,
University of
Tennessee

Award: Attendance at INMM 2011 Meeting in Palm Springs,
California

Summer **ACTIVITIES** for Students

Tours of ORNL Facilities

- Safeguards Laboratory
- Graphite Reactor
- Holifield
- Oak Ridge Electron Linear Accelerator ([ORELA](#))
- [Supercomputing and EVERST](#)
- Spallation Neutron Source ([SNS](#))
- Remote Systems
- High Flux Isotope Reactor ([HFIR](#))
- Radiochemical Engineering Development Center ([REDC](#))

**ANS Local Section
Picnic at Concord Park**

Tour of TVA Bellefonte Nuclear Plant July 8, 2010

Jesse Cheatham, ORNL postdoc, led a group of summer interns.



Seminar Series for Interns

- lectures in nonproliferation
- general nuclear energy topics



Ambassador Thomas Graham
August 2010



ORNL Staff Ana Raffo-Caiado



ORNL Staff Jeff Binder

Nondestructive Assay (NDA) Summer Institute

NPT and global nuclear nonproliferation regime

International Safeguards and overview of safeguards instrumentation

Basics of NDA

Detection and characterization of nuclear materials

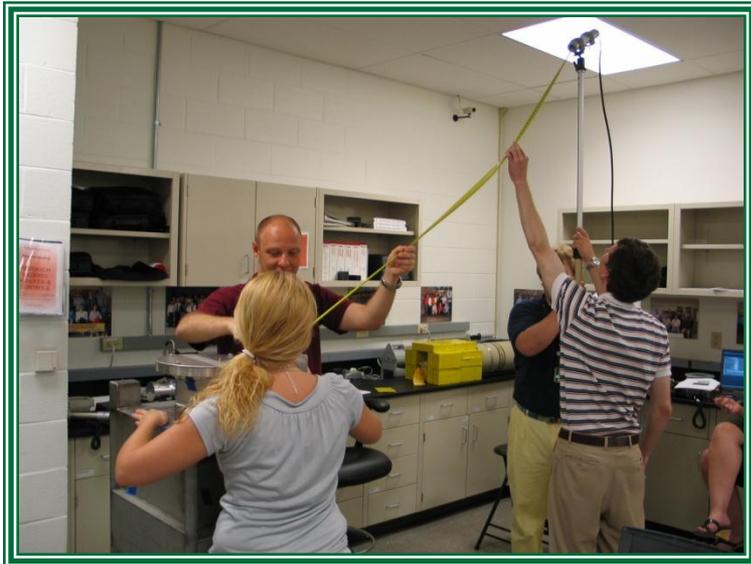
Uranium enrichment measurements

Laboratory exercises

- Handheld gamma-ray detectors

- Uranium enrichment measurements

- Neutron measurements (Active Well Coincidence Counter)



Outreach Activities

- University visits
- Career Fairs
- Conferences

American Nuclear Society

ANS Student Conference

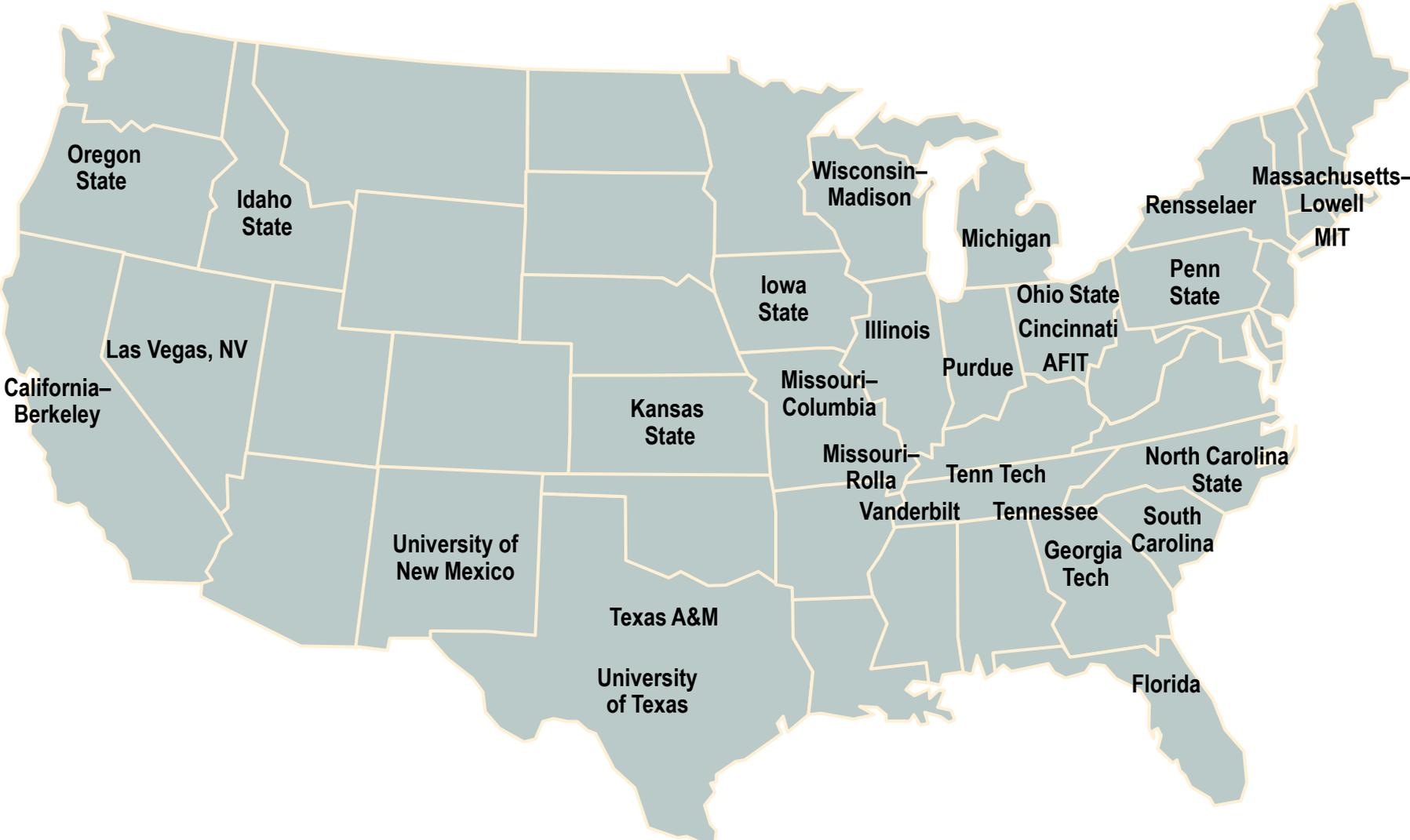
Institute of Nuclear Material Management

Women In Nuclear

ANS CONTE (Conference on Nuclear Training and Education)



University Visits



Southeast Universities Nuclear Reactors Institute for Science and Education (SUNRISE)

**George Flanagan, ORNL
Liaison**

- ORNL signed memorandum of understanding with Southeast University Nuclear Reactor Institute for Science Education (SUNRISE) in September 2007.

- Cooperative efforts between ORNL and SUNRISE in the development of the next-generation nuclear workforce, nuclear technology, and advanced nuclear research.



University Collaboration - Safeguards Curriculum Development

NNSA Office of Nonproliferation and International Security (NA-24) funded ORNL to work with 5 universities.

University of Florida

Georgia Tech

University of Tennessee

North Carolina State

University of Michigan

Safeguards Curriculum Development University of Florida



**University of Florida Nuclear Engineering 4930 Course students at the ORNL
Safeguards Laboratory, June 2010**

Safeguards Curriculum Development Georgia Tech



Georgia Tech Nuclear Engineering Course students at the ORNL Safeguards Laboratory, March 2010

Safeguards Curriculum Development North Carolina State University



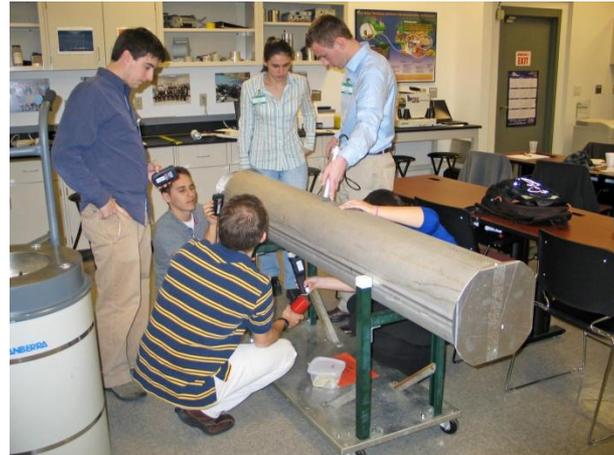
**North Carolina State University Nuclear Engineering Course students at the
ORNL Safeguards Laboratory, March 2010**

Safeguards Curriculum Development University of Tennessee



University of Tennessee Nuclear Engineering Course students at the ORNL Safeguards Laboratory, November 2010

Safeguards Curriculum Development University of Michigan



**University of Michigan Nuclear Engineering Course students at the ORNL
Safeguards Laboratory, November 2010**

Conclusions

- **Nuclear education outreach covers all educational groups.**
- **Government research laboratories should have strong collaborations with universities and have outreach programs.**
- **Internships are a strong component of nuclear education.**
- **Governments should allocate funding for outreach activities.**