

# Educational Opportunities in Bioenergy

Office of the Biomass Program Webinar

April 23, 2012



# Agenda

- **Overview of programs – Tim Theiss**
  - Laboratory Relationship Manager, Biomass Program
  - Oak Ridge National Laboratory
- **Mentor perspective – Erin Webb, Ph.D., P.E**
  - Research Engineer, Renewable Systems Group
  - Oak Ridge National Laboratory
- **Post-graduate perspective – Scott Curran**
  - Research Engineer, Fuels & Engines Group
  - Oak Ridge National Laboratory
- **Student perspective – Kevin Caffrey**
  - Ph.D student, Biological and Agricultural Engineering,
  - North Carolina State University

# ORNL's mission

**Deliver scientific discoveries and technical breakthroughs that will accelerate the development and deployment of solutions in clean energy and global security, and in doing so create economic opportunity for the nation**



# ORNL is DOE's largest science and energy laboratory

History in the Manhattan Project

\$1.6B budget

4800 employees

3000 guests annually

\$500M modernization in progress

33,000 acre reservation

Nuclear legacy continues with isotope supply for medicine and industry

World's most intense pulsed neutron source and a world-class research reactor

World's richest unclassified scientific computing facility

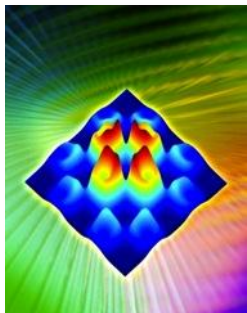
Nation's Largest concentration of open source materials research

One of three science-based bioenergy initiatives

Broad R&D transportation program



# Science strategy for the future: Major initiatives



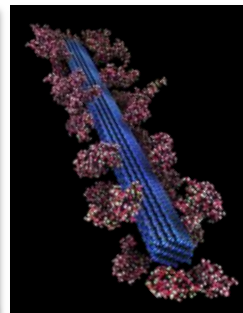
Deliver  
forefront  
science  
using  
neutrons



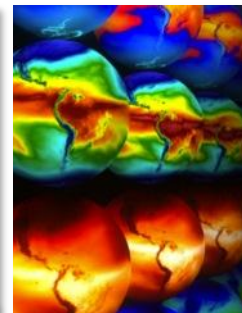
Develop and  
demonstrate  
advanced  
materials  
for energy  
applications



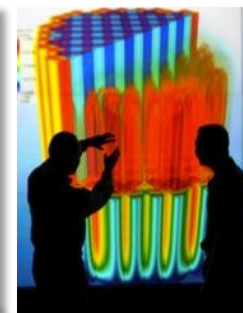
Enable  
discovery  
and innovation  
with computing,  
data infra-  
structure,  
and analytics



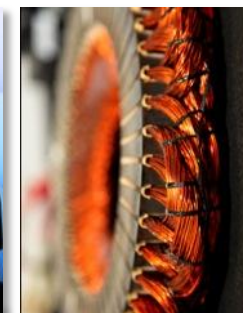
Accelerate  
biomass  
production  
and  
conversion  
for energy  
and materials



Advance  
understanding  
of climate  
change  
impacts



Develop,  
virtualize,  
and validate  
advanced  
nuclear  
energy  
systems



Deliver  
sustainable  
transportation  
solutions

# Education Program Partners

- ORNL and Oak Ridge Institute of Science & Education (ORISE) partners since late 1940's
- FY2011 ORAU administered approximately 35 different programs, program components, and events
- New programs/components are created to meet emerging needs



# Various types of programs are available

- For undergrad and grad students
  - Research participation (summer, academic year, or longer)
  - Summer practica for holders of fellowships and scholarships
  - Academic credit
- For faculty
  - Summer
  - Sabbatical
  - Intermittent
  - Teams
- For pre-college
- For postgraduates



# Overview of Science Education Programs

Undergraduate	Graduate	Postgraduate	Faculty
<ul style="list-style-type: none"> <li>• HERE@ORNL</li> <li>• Laboratory Technology Program</li> <li>• Nuclear Engineering Science Laboratory Synthesis Internship</li> <li>• DOE Science Undergraduate Laboratory Internship</li> <li>• DOE Community College Institute</li> <li>• Volkswagen Distinguished Scholars Program</li> </ul>	<ul style="list-style-type: none"> <li>• HERE@ORNL</li> <li>• Nuclear Engineering Science Laboratory Synthesis Internship</li> <li>• Advanced Short-Term Research Opportunity</li> </ul>	<ul style="list-style-type: none"> <li>• Postdoctoral Research Associates</li> <li>• Post-Master's Research Participation</li> <li>• Post-Bachelor's Research Participation</li> <li>• Advanced Short-Term Research Opportunity</li> <li>• HERE@ORNL</li> <li>• Nuclear Engineering Science Laboratory Synthesis Internship</li> </ul>	<ul style="list-style-type: none"> <li>• HERE@ORNL</li> <li>• HBCU/MEI Summer Faculty Program</li> <li>• DOE Visiting Faculty Program</li> </ul>

<http://www.ornl.gov/education>



# Science Education Participation FY11

1,315 students, faculty, and recent graduates participated in ORNL Research Programs in FY2011

238 U.S. Colleges and Universities Represented

44 states, District of Columbia, Puerto Rico, & many foreign countries

25 HBCUs and MEIs Represented

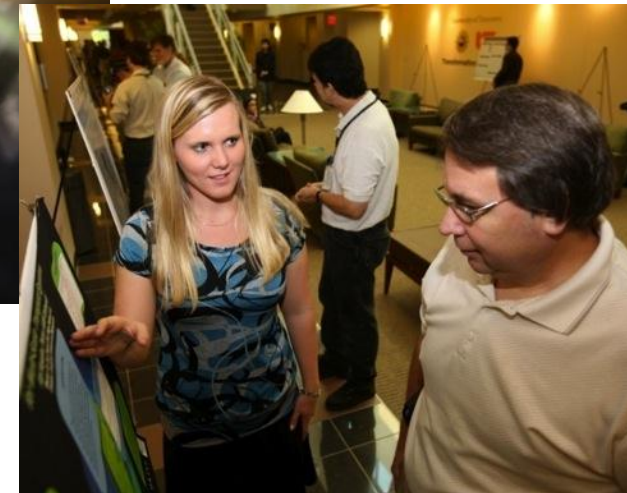
26% Female

# Numbers of research participants in FY10

<b>Academic Status</b>	<b>FY 2010</b>
<b>Undergraduates</b>	<b>462</b>
<b>Graduate Students</b>	<b>259</b>
<b>Recent AAS/BS/MS Graduates</b>	<b>184</b>
<b>Postdoctoral Associates</b>	<b>360</b>
<b>University Faculty</b>	<b>55</b>
<b>Pre-College Students</b>	<b>254</b>
<b>Pre-College Teachers</b>	<b>68</b>
<b>Other Scientists</b>	<b>3</b>
<b>TOTAL</b>	<b>1645</b>

# We provide a quality experience for undergraduates

- Primarily summer students
- Orientation
- Seminar series
- Brown Bag Lunches
- Instruction on abstracts/posters
- Poster session
- Graduate Fair
- Inclusion of students in other programs



# Post-Graduate Research Experiences

- **ORNL specific programs:**
  - **Post-Doc and Post-Masters Opportunities**
    - Across all areas of ORNL
    - Posting Specific
    - 1 year appointments, renewable for up to 3 additional years
    - No Citizenship Requirement
  - **Post-Bachelor's Opportunities**
    - Across all areas of ORNL
    - Posting Specific
    - 1 year appointments, renewable for up to 1 additional year
    - US Citizens or LPRs
  - Must fill specific need (job posting)
  - Often used as recruiting tool

# Additional thoughts

- Always looking for talent ...
- Have to match your educational needs with organizational needs (we have a job to do)
- It is not always exciting but it is instructive
- Too late for summer 2012
- For more information:
  - Marisa Moazen
    - [Marisa.Moazen@ornl.gov](mailto:Marisa.Moazen@ornl.gov)
    - (865) 241-6958
  - Cheryl Terry
    - [Cheryl.Terry@ornl.gov](mailto:Cheryl.Terry@ornl.gov)
    - (865) 576-3427
  - [www.ornl.gov/ornl](http://www.ornl.gov/ornl)

Science Education Programs at Oak Ridge National Laboratory

World Class Science. Big Ideas.  
All we need is **You!**

Internships • Collaborations • Research Experiences

Undergraduates • Grad Students • Postdocs • Postgrads • Faculty • Teachers

Join our diverse team of educational participants from 49 countries working side-by-side with ORNL scientists on cutting-edge research at the U.S. Department of Energy's largest science and energy laboratory.

Interested in learning more?  
[www.ornl.gov/ornl](http://www.ornl.gov/ornl)

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OAK RIDGE  
National Laboratory

ORAU ORISE

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# Purposes of an internship

- **For the student....**
  - **Broaden your horizons**
    - **Networking!** It really is about who you know
    - **Take advantage of all the opportunities that you can** (seminars, tours, professional meetings, etc)
  - **Real world experience**
    - **Your success AND failures** (if you take advantage of them) are invaluable to you and your future employers
- **For the mentor.....**
  - **Paying back for what others did for us**
    - **Have you ever heard about the turtle on the fence post?** It didn't get there by itself!
  - **Get some work done!**
    - **We're busy and we need some help.** Some of this (actually, a lot) of this work isn't glamorous. But, that doesn't mean it isn't important

# Characteristics of a good intern

- **Self-starter**
  - Be curious and eager. It makes you more fun to work with.
  - This is your experience. What you gain from it depends mostly on you.
- **Be confident but not arrogant, take direction well**
- **Good communication skills**
  - This is a job. Your communication (including emails) should reflect this.
- **Some basic research skills you should bring to the table:**
  - Data analysis (e.g., plot data, regression analysis, etc.)
  - Literature reviews – you should be able to find and review relevant literature (beyond Google)



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# Post-graduate perspective



- **ORAU Post-Masters Fellowship program**
  - **Fuels, Engines and Emissions Research Center at ORNL**
    - 2 full year appointments
    - Transitioned to ORNL staff during third year
    - Very similar to ORNL staff – mentored by ORNL staff
      - Unparalleled opportunity to work at national lab straight out of graduate school
- **Background coming into fellowship (M.S. MechEng)**
  - **Biodiesel production, alternative fuel use, sustainability, engines and hybrid powertrains.**
    - DOE AVTC participant at the University of Tennessee
      - Advanced vehicle technical competition (EERE OVT)
    - DOE GATE Fellow



# Post-graduate perspective

- **Research Activities During Post-Master's**
  - Working exact area of interest with biomass – biofuel use in internal combustion engines (vehicle)
    - Research into biofuels performance and emissions
    - Biofuels in advanced combustion engine operation
- **Opportunities for working across the lab**
  - Center for Bioenergy Sustainability (CBES)
    - Background with vehicles offers beneficial perspective to researchers focused more on feedstock's, or conversion processes
    - Collaborations have resulted in co-writing proposals
- **Be part of larger research community outside of ORNL**



# Post-graduate perspective

- **ORAU gateway to bioenergy research of interest at ORNL**
  - Knew what area I wanted to work in
  - Knew ORNL was where the best fit of research
  - ORAU post-grad program allowed path to long-term career
  - Also, gave ORNL ability to evaluate how I fit in the lab



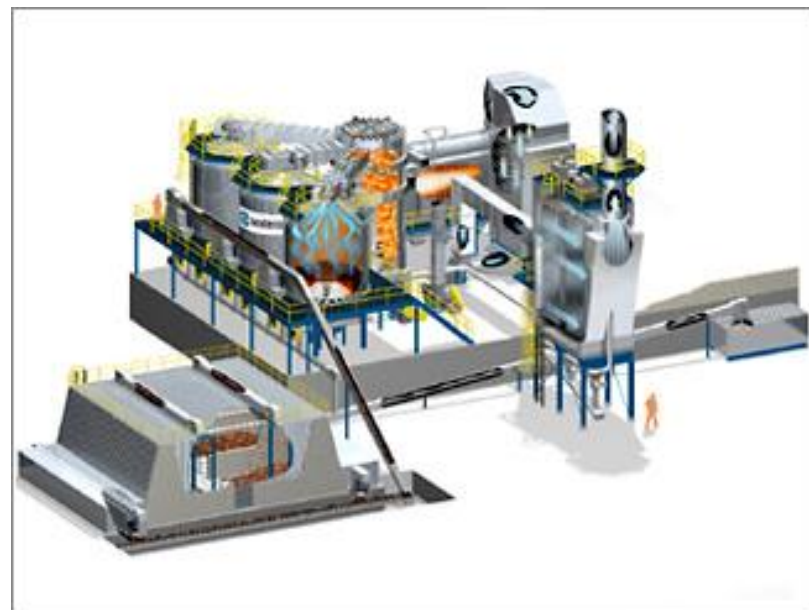
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# Student Perspective

- Worked on two projects - both related to ORNL Biomass Steam Plant
  - Value Chain Analysis, summer 2010
  - ORNL Biomass Farm, summer 2011
- Project components
  - Field work - site visits, timber cruise, sample analysis
  - Computer modeling - life cycle analysis, techno-economic analysis
  - Data acquisition and literature reviews
  - Assisted with harvest demonstration
- Interaction with a multi-disciplinary team
- Presentations at scientific conferences



# Student Perspective - advise

- **What I gained from my experiences:**
  - **Connections - personal and professional**
  - **Research skills - modeling, data acquisition, field work, etc.**
  - **Communication skills- presentations, interpersonal, and interviewing**
  - **Perspective - Bioenergy roots and its future**
- **What I could have done differently:**
  - **So much to do at ORNL (and UT)**
  - **More connection with researchers at ORNL and other DOE labs**
  - **More tours/visits**
  - **There is always more research that could be done**



# Questions?

- **Thanks for your time and attention ...**