U.S. DEPARTMENT OF ENERGY | Office of Science

Programs in the Office of Science / Office of Workforce Development for Teachers and Scientists (WDTS) / DOE

Opportunities for Undergraduates and Faculty at DOE Laboratories

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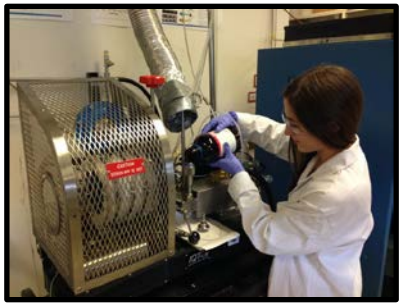
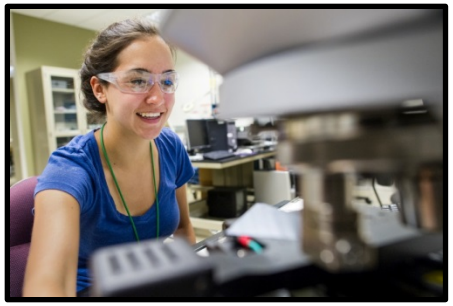
Workforce Development for Teachers and Scientists at a Glance

Ensuring a pipeline of STEM workers to support the DOE mission

- At DOE labs and facilities, WDTS supports ~1,000 students and faculty annually
  - 725 Science Undergraduate Laboratory Interns (SULI) placed at one of 17 DOE labs or facilities
  - 80 Community College Interns (CCI)
  - ~100 graduate students engaged in Ph.D. thesis research for 3-12 months at a DOE laboratory
  - 60 faculty and 25 students in the Visiting Faculty Program (VFP)
- Support for the National Science Bowl
  - More than 20,000 students, coaches, and volunteers participate in the regional and final competitions.
  - In FY 2015, there are 118 regional events, involving 14,000 students from all fifty states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. WDTS brings the regional winners, the top 4% of the teams, to Washington, D.C. for the final competitions.
- Support for ~6 Albert Einstein Distinguished Educator Fellows
- Support for on-line business systems modernization
  - This activity modernizes on-line systems used to manage applications and review, data collection, and evaluation for all WDTS programs.
- Support for program evaluation and assessment
  - This activity assess whether programs meet established goals using collection and analysis of data and other materials, such as pre- and post-participation questionnaires, participant deliverables, notable outcomes, and longitudinal participant tracking.





The Office of Science (SC)

http://www.science.energy.gov

First, some very brief background on SC mission, programs, and facilities….because this is at the center of these experience based learning opportunities.

The DOE Office of Science (~$5B/year)

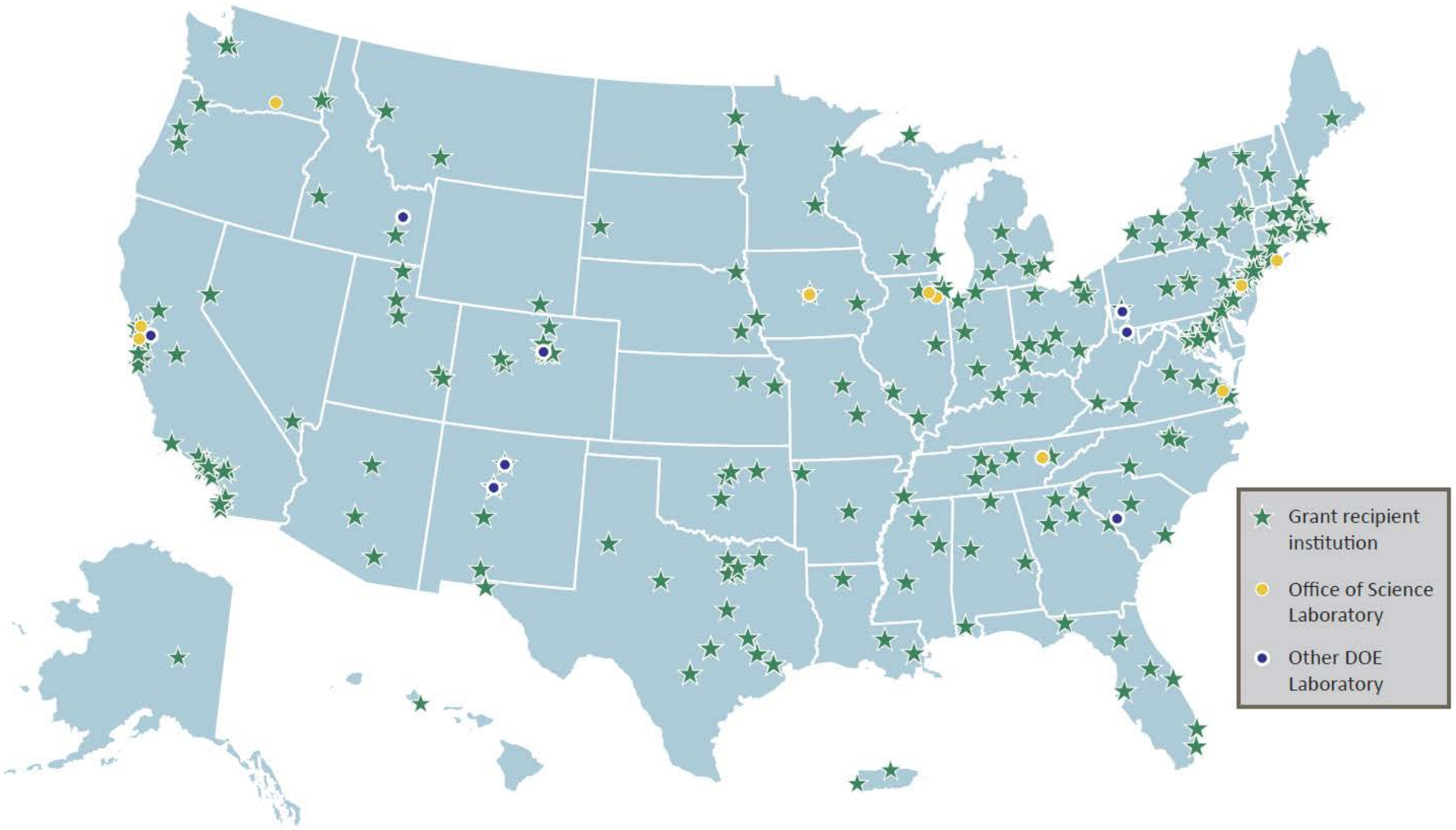
The undulator hall at SLAC's Linac Coherent Light Source (LCLS).

- The Office of Science (SC) is the single largest supporter of basic research in the physical sciences in the United States.
- Funds 25,000 Ph.D. scientists, graduate students, undergraduates, engineers, and technical staff supported at more than 300 institutions in all 50 States and DC through competitive awards
- 31 national user facilities serving more than 29,000 users each year
- 100 Nobel Prizes during the past 6 decades—more than 20 in the past 10 years

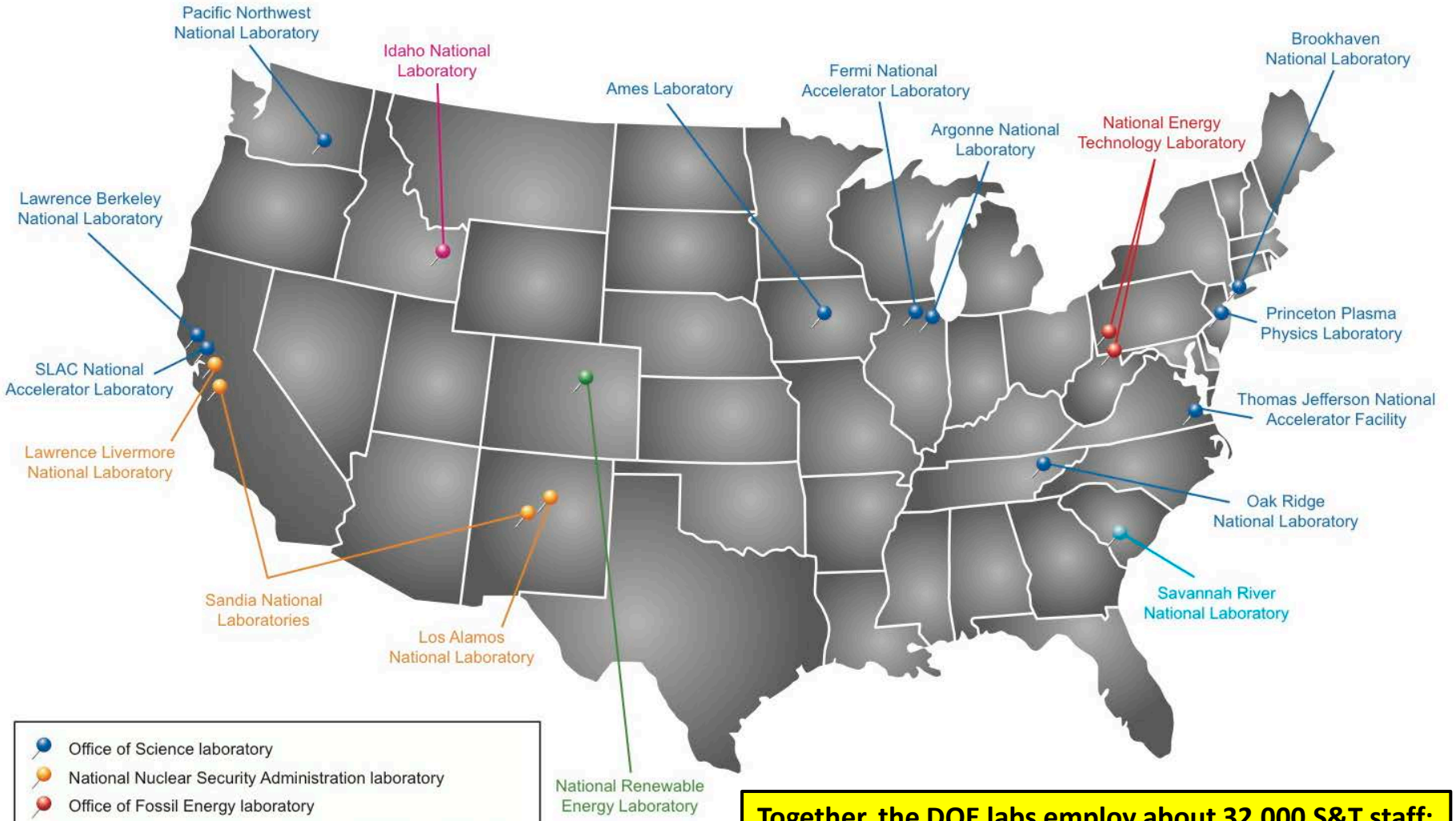
The Office of Science Research Portfolio

Advanced Scientific Computing Research	• **Delivering world leading computational and networking capabilities to extend the frontiers of science and technology**
Basic Energy Sciences	• **Understanding, predicting, and ultimately controlling matter and energy flow at the electronic, atomic, and molecular levels**
Biological and Environmental Research	• **Understanding complex biological, climatic, and environmental systems**
Fusion Energy Sciences	• **Building the scientific foundations for a fusion energy source**
High Energy Physics	• **Understanding how the universe works at its most fundamental level**
Nuclear Physics	• **Discovering, exploring, and understanding all forms of nuclear matter**

FY 2011 Funding Recipient Institutions



DOE Labs Employ >30,000 Scientists and Engineers



Together, the DOE labs employ about 32,000 S&T staff; SC labs employ about 14,000 S&T staff; many at the Ph.D. level.

User Facilities at DOE Laboratories

★ SC is the steward of these ten DOE laboratories

Why Office of Science (SC) sponsored internships?

In a word… **WORKFORCE***

The Workforce Development for Teachers and Scientists (WDTS) program mission is to ensure that DOE has a sustained pipeline of science, technology, engineering, and mathematics (STEM) workers. This is accomplished, in part, through support of undergraduate internships and visiting faculty programs at the DOE laboratories, administered by WDTS for DOE; and Nation-wide, middle- and high-school science competitions that annually culminate in the National Science Bowl® in Washington D.C. These investments help develop the next generation of scientists and engineers to support the DOE mission, administer its programs, and conduct its research.

WDTS activities rely significantly on DOE's 17 laboratories, which employ more than 30,000 workers with STEM backgrounds. The DOE laboratory system provides access to leading scientists; world-class scientific user facilities and instrumentation; and large-scale, multidisciplinary research programs unavailable in universities or industry. WDTS leverages these assets to develop and train post-secondary students and educators to enhance the DOE mission.

SC sponsors and operates these programs to help sustain the DOE's scientific and technical workforce pipeline.

**As a mission agency ,"education" programs cannot be supported. As a result, WDTS does not solicit or provide direct awards to campuses, and instead, offer experience based learning opportunities directly to students and faculty.*

The Office of Workforce Development for Teachers and Scientists (WDTS) manages these programs

Mission: WDTS program mission is to ensure that DOE has a sustained pipeline of highly skilled and diverse science, technology, engineering, and mathematics (STEM) workers.

- WDTS undergraduate student intern programs (one for 2/4-yr institutions and one for community colleges) and a visiting faculty program at the DOE laboratories:
  - *Science Undergraduate Laboratory Internship (SULI) - ~725/year*
  - *Community College Internship (CCI) - ~80/year*
  - *Visiting Faculty Program (VFP) - ~(60/25)/year*
- WDTS funds these programs, provides oversight, manages their national application systems, and ensures that a common set of core program elements are delivered.
- Host labs and facilities operate these programs locally; *e.g.* - identifying mentors and projects according to their mission overlap, reviewing & selecting candidates, and executing professional development activities per common programmatic baselines.

Science Undergraduate Laboratory Internship (SULI)

The SULI program places undergraduate students(from 2 or 4 year institutions) in paid internships in science and engineering research activities at 16/17 DOE Laboratories, and one National User Facility. Students work with laboratory staff scientists or engineers on projects related to ongoing research programs. This, or its predecessor programs, have been in operation since the early '90s.

- Appointments are for:
  - 10 weeks during the Summer Term (May through August) or 16 weeks during the Fall Term (August through December) and Spring Term (January through May).
  - Application process for the 2015 Summer Term is closed – The 2015 Fall Term application will open in mid-April 2015.
- All interns have defined research projects that must be within the DOE mission space.
- All interns have required deliverables: A research report, an oral or poster presentation, a peer review, a general audience abstract, and pre- and post- participation surveys.
- Interns receive a $500 weekly stipend, travel to and from the laboratory, and possibility for a housing allowance.
- Laboratories also provide an array of seminars and professional development opportunities.
- Undergraduates from 2 or 4 year colleges, in their sophomore through senior year, or recent graduates, are eligible to apply.
- Must be at least 18 years old at the time of application; and a U.S. citizen or PRA.
- Must have a minimum cumulative GPA of 3.0.
- May participate as an intern a maximum of two times; May apply a maximum of three times.
- WDTS sponsors ~700 participants per year, majority (~535) in the Summer Term.

Please visit http://science.energy.gov/wdts/suli/ for full details and how to apply.

2014 SULI participant at the Ames Laboratory awarded prestigious scholarship

Mr. Lindemann preparing samples (above) and discussing his research at a lab-wide poster session (below).

- William Lindemann participantedi n the 2013 summer and 2104 spring semester term SULI program at Ames Laboratory. Lindemann participated in hands-on x-ray reflectivity and fluorescence research, and is co-author on a research paper published in the *Journal of Organic Electronics*.
- William has been awarded a Barry M. Goldwater Scholarship, one of the nation's premier undergraduate scholarship in mathematics, natural sciences, and engineering. Out of over 1,100 students who applied for the scholarship, which is based on academic merit, 283 were selected and awarded a scholarship that will cover the cost of tuition fees, books, and room and board up to a maximum of $7,500 per year.
- Lindemann will apply the award to his senior year at Iowa State, where he is an undergraduate in materials science and engineering. He plans to pursue a Ph.D. in materials science and conduct research in advanced ceramics.
- "*My success in receiving this award is due in large part to the SULI research experience I've had at the Ames Laboratory and to my mentor David Vaknin*," said Lindemann. "*SULI is a remarkable program for introducing undergraduates to real-life research experiences in science laboratories*."

2014 SULI participant working in high performance computing project inspired to pursue graduate studies

Under the supervision of mentor Dr. Bert Debusschere, Kathryn Dahlgren developed visualization tools and conducted performance analysis for fault-tolerant PDE solvers.

- This Science Undergraduate Laboratory Internship (SULI) project involved the development of novel solvers for partial differential equations (PDEs). The goal was to develop PDE solvers that are resilient to hard and soft faults in extreme-scale computing architectures, an emerging problem in the move towards exascale computing.
- Kathryn Dahlgren, a computer science student at California State University, Stanislaus, CA said, "*I worked on visualization tools that offer users different formats and methods for mapping the data generated by the PDE solvers*."
- Kathryn especially appreciated learning about techniques for organizing the development of large software and methods for conducting detailed software performance analyses, focusing on key areas for parallel-processing bottlenecks.
- Kathryn believes that her internship experience in efficient algorithm design and software implementation considerations "*will prove extremely helpful as she works on upper-division class projects*." She also said that "*the internship inspired a keen interest in pursuing graduate-level education and research related to parallel computing*."

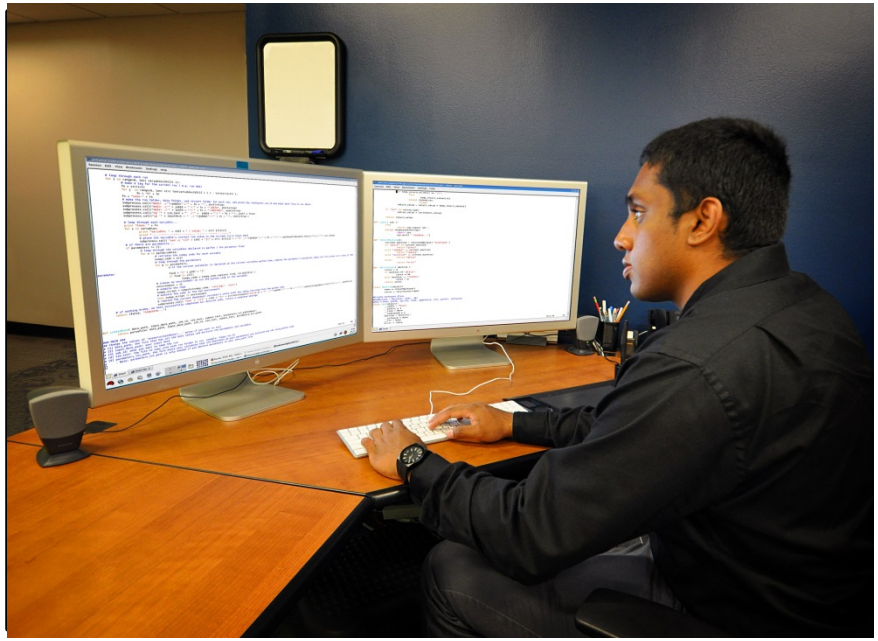
Community College Internship (CCI)

The Community College Internship (CCI) places students from community colleges in paid internships in technology based projects supporting laboratory work under the supervision of a laboratory technician or researcher. This, or its predecessor program, have been in operation since 1999.

- Operates primarily during a 10-week Summer Term (May through August), but a semester term opportunity pilot is planned, probably for the 2016 Spring Term.
  - Application process for the 2015 Summer Term is closed – Stay tuned for a new semester term opportunity.
- All interns have defined technical projects that are within the DOE mission space.
- All interns have required deliverables: A research report, an oral or poster presentation, and pre- and post- participation surveys.
- Interns are compensated as follows: $500 weekly stipend, travel to and from the laboratory, and a housing allowance.
- Laboratories also provide an array of seminars and professional development opportunities.
- Must be at least 18 years old; and a U.S. citizen or PRA.
- May participate as an intern a maximum of two times; May apply a maximum of three times.
- Must have a minimum cumulative GPA of 3.0.
- WDTS supports ~70 participants each Summer Term.

Please visit http://science.energy.gov/wdts/cci/ for full details and how to apply.

2014 CCI participant working in high performance computing project pursues computer science and engineering degree



CCI intern Raj Kumar worked on uncertainty quantification in large eddy simulations with mentor Dr. Jeremy Templeton.

- This Community College Internship (CCI) project involved developing an infrastructure to run uncertainty quantification studies of large eddy simulations (LESs) - a mathematical model for turbulence used in computational fluid dynamics - on Sandia's high-performance computer systems. The work will help determine the viability of LES as an engineering tool for improving combustion efficiency.

- Raj Kumar, a 20-year-old computer science and engineering major at Las Positas Community College , Livermore, CA plans to transfer to one of the University of California campuses, preferably Berkeley or Davis, next fall. "*I especially enjoyed the opportunity to work with Sandia's high-performance computers*," Raj said. "*As a result of the internship, I've grown much more interested in computer architecture and, in particular, highly parallel systems*."

- Through his work, Raj gained experience with various advanced programming languages and techniques. Raj also attended a two-day uncertainty quantification workshop that was taught by Sandia employees.

- "*My mentors have made my time at Sandia an invaluable learning experience, far more than any experience inside the classroom has been or could be*," Raj said.

Visiting Faculty Program (VFP)

Opportunities for faculty from academic institutions that are typically underrepresented in the DOE research community to engage in a jointly developed research project at a DOE laboratory during the Summer Term. The scope of the projects should be robustly connected to ongoing host lab research project activities. This, or its predecessor program, have been in operation since 2003.

- Faculty may optionally invite up to two students to participate, one of whom may be a graduate student. VFP- Students must meet SULI requirements, apply separately, and only if invited.
  - Students must have a minimum cumulative GPA of 3.0.
  - Student interns have required deliverables matching those for SULI: A research report, an oral or poster presentation, a peer review, general audience abstract, and pre- and post- participation surveys.
- Operates during a 10-week Summer Term (May through August) - Application process for the 2015 Summer Term is closed; reopens for 2016 in early October 2015.
- Faculty receive stipend of $13,000 for 10 week term, undergraduates receive stipend of $500/week; all participants are provided travel to and from the laboratory, and possibility for a housing allowance.

Please visit http://science.energy.gov/wdts/vfp/ for full details and how to apply.

Visiting Faculty Program (VFP), *cont.*

- Must be a full-time faculty member at an accredited U.S. degree granting, postsecondary, institution of higher education historically underrepresented in the U.S. research community, in an area of physics, chemistry, biology (non-medical), mathematics, engineering, environmental sciences, materials sciences, or computer / computational sciences (link to list of ineligible institutions from VFP webpages).
- Must be a U.S. citizen or PRA. Faculty may participate up to three terms.
- Faculty must, through their own efforts, establish a collaboration with a laboratory scientist to co-develop a 6-page research project proposal prior to applying to the program.
  - Faculty can contact host labs by using the POCs listed at: http://science.energy.gov/wdts/vfp/how-to-apply/selecting-a-host-doe-laboratory/
  - Proposal requirements are posted at: http://science.energy.gov/wdts/vfp/how-to-apply/submitting-a-proposal-to-doe/
- Students may only apply after receiving an invitation through the online system
  - Faculty, in their application, must list student(s) to receive system-generated invitation(s)
  - If a student had already applied to CCI or SULI, they must first "un-submit" this application
- WDTS supports ~ 50 faculty and ~25 students each Summer Term (this ratio is not prescribed).

Please visit http://science.energy.gov/wdts/vfp/ for full details and how to apply.

VFP faculty participant experience helps enable new STEM programs and opportunities at Alabama A&M University

Dr. Egarievwe at BNL with his VFP student, Ariel Dowdy

- Professor Stephen Egarievwe, faculty member at Alabama A&M University (an HBCU), is a three-term VFP participant at Brookhaven National Lab, where he explored the development of room temperature semiconductor nuclear detectors. Dr. Egarievwe and several VFP undergraduate students have co-authored VFP project related papers published in peer-reviewed journals.

- Based on his VFP research experience opportunity, Dr. Egarievwe established a Nuclear Engineering and Radiological Science (NERS) Center at Alabama A&M University to support students and faculty research. Several graduate students have since completed M.S. and Ph.D. research projects at NERS.

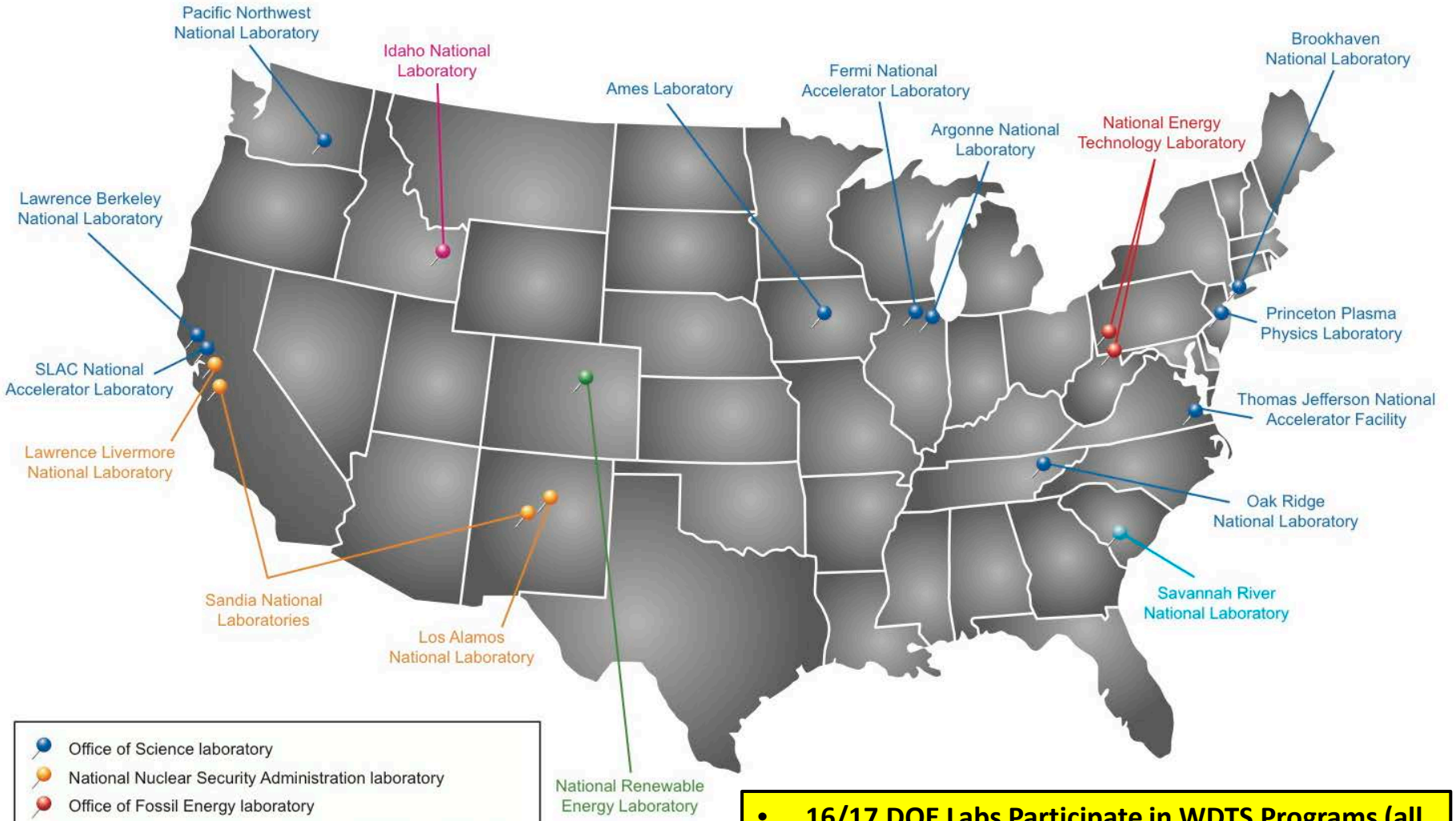
- The VFP program and collaboration with BNL helped the Electrical Engineering Technology and Mechanical Engineering Technology programs at Alabama A&M achieve full ABET accreditation. These efforts also led to the development and establishment of "Nuclear Systems" as a new concentration in Electrical Engineering and Mechanical Engineering programs at Alabama A&M.

- Based on his VFP experience, Dr. Egarievwe developed a number of successful research proposals, including a 5-year, $2 million grant from the Applied Research Initiative Program at the Department of Homeland Security's Domestic Nuclear Detection Office.

Navigating the Online Application System

- Applications, and all required materials, must be submitted using the WDTS online application system:
  - Account creation is required for access (links are on WDTS website program pages)
  - When completing (student, not faculty applicants) an application, have available pdf copies of your most recent transcripts (and from all other institutions attended)
  - Have available names and email addresses for at least 2, but no more than 3, individuals able to complete a recommendation form on your behalf (the first two received recommendations by the online system fulfill this requirement)
    - The system sends a recommendation request email to your recommender proving them a link to its form
- The application, in addition to general information, includes:
  - Numerous elements that tie directly to the eligibility requirements
  - A cumulative GPA calculator
  - Inquires about your areas of STEM studies, specialization, and interests
  - Inquires about your skills and experience
  - Four short essay questions
- **Applicants** select a 1st and 2nd choice host DOE lab
  - Only these labs will view your application
  - Host labs do not all offer the same STEM specialization areas
  - Information on specific project opportunities may be available from host labs
  - Host labs do all offer similar professional development activities

DOE Laboratories (16/17 are WDTS Host Labs)



- **16/17 DOE Labs Participate in WDTS Programs (all except NETL)**
- **Project areas vary by stewardship and mission**

SULI, CCI, and VFP Information Resources

- Review the WDTS program web pages, including the FAQs:
  - The left-hand navigation items provide links to information related to eligibility, compensation, obligation, applying, selecting a host lab, recommendations, key dates, notification, and FAQs

    Science Undergraduate Laboratory Internships (SULI)
    http://science.energy.gov/wdts/suli/

    Community College Internships (CCI)
    http://science.energy.gov/wdts/cci/

    Visiting Faculty Program (VFP)
    http://science.energy.gov/wdts/vfp/

- Visit the WDTS Outreach page for additional presentations and recorded webinars:

  http://science.energy.gov/wdts/outreach/

WDTS Points-of-Contact

Jim Glownia – james.glownia@science.doe.gov; (301) 903 2411

http://www.science.energy.gov/wdts

- SULI, CCI, & VFP:
  - **Cindy White** - Program Manager: cindy.white@science.doe.gov

    - http://science.energy.gov/wdts/suli/contact/
    - http://science.energy.gov/wdts/cci/contact/
    - http://science.energy.gov/wdts/vfp/contact/
    - sc.suli@science.doe.gov
    - sc.cci@science.doe.gov
    - sc.vfp@science.doe.gov

Closing Words and Tips for Applicants

Application deadlines and requirements are firm, including receipt of recommendations (**no exceptions!**)

- Don’t wait until the last minute, especially for requesting recommendations
- Host labs offer additional information resources regarding their programs and opportunities - visit their websites listed on our program pages or ask us for their contact information
- Ask us any questions using the provided resources
- Technical support for the online system is available during regular business hours
- One application per program, per term (see eligibility information for other limitations)
- When determining the SULI one-year completion requirement, we only count credits earned *while enrolled as a matriculating student*
- Only complete, compliant, and eligible applications are released to host labs
- One offer per term only, independent of acceptance or declination