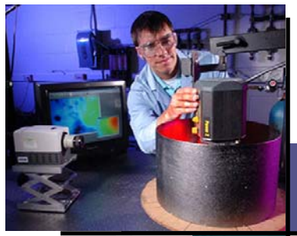
Argonne NATIONAL LABORATORY | Nuclear Engineering Division

Student Opportunities
in Nuclear Energy R&D



Argonne's roots lie in nuclear energy R&D. Argonne-led research supports every main nuclear power system throughout the world. One of our most notable successes has been the development and transfer of the technologies in today's commercial nuclear reactors.

Today, we continue our work in support of current-generation reactor technology while conducting research and development aimed at closing the nuclear fuel cycle and enabling the production of the clean sustainable energy that will be needed for the future.

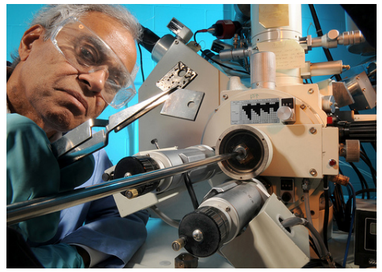
Argonne's scientific and technical diversity provides the full range of capabilities needed to meet this challenge. Working in diverse, multidisciplinary teams, we are using cutting-edge research and modeling/simulation tools to translate fundamental scientific understanding into innovative technologies.

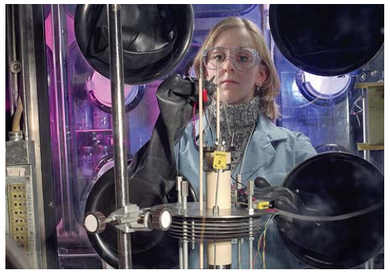
http://students.ne.anl.gov

Argonne National Laboratory

is a leading R&D center near Chicago, Illinois, that is working on technologies to provide the clean, sustainable and affordable energy that will be needed for U.S. energy security and related economic competitiveness.

We bring together the best minds in science, engineering, modeling, and simulation. We form teams to tackle complex scientific challenges, translating basic science into engineering solutions.





The Nuclear Engineering Division

and its precursors have contributed to the development of civilian nuclear power systems for over 50 years, ever since the dawn of the nuclear age. Over the years, we have significantly expanded our competencies and applied them to problems outside of the civilian nuclear arena.

The mission of the Nuclear Engineering (NE) Division is to advance the design and operation of nuclear energy systems and to apply our nuclear energy-related expertise to current and emerging programs related to advanced reactor systems and national security and non-proliferation. Currently, we are involved in several programs of national and international importance, including

- Next-generation nuclear systems analysis, including development of advanced fast reactor systems for actinide management,
- Advanced fuel cycle and repository performance modeling,
- Reduced Enrichment for Research and Test Reactors (RERTR) design and safety analyses,
- National security and non-proliferation programs to support materials safeguards and export controls in Russia, the Newly Independent States (NIS), and elsewhere throughout the world.

Division personnel additionally contribute to improving the operation of existing nuclear energy systems and to resolving issues related to their performance and safety. We have a key role in advancing major Laboratory initiatives in such diverse areas as transportation, hydrogen generation and computational science. Finally, we contribute engineering expertise to the design, operation and decommissioning of major facilities at Argonne and elsewhere.

- ***Current Generation Nuclear Power Systems***
- ***Next-Generation Nuclear Power Systems***
- ***National Security and Nonproliferation***
- ***Advanced Nuclear Fuel Cycles***
- ***Advanced Simulation Methods***

Examples of 2011 NE Student Projects

- Support activities in the area of system dynamics scenario studies that include both the U.S. and the global nuclear fuel cycle developments.
- Theoretical simulation of images of targets scenes as "seen" by a passive millimeter wave (MMW) camera.
- Participate in studies involving various aspects of liquid metal technology, primarily involving stripper films and targets for the FRIB.
- Development and qualification for advanced alloys for nuclear reactor systems.
- Assist with a variety of tasks related to nuclear energy safety worldwide. Perform literature search in the area of spent nuclear fuel dry storage internationally.
- Active and passive electromagnetic remote sensing techniques. Use the available lab equipment and data acquisition software to collect and examine data.
- Participate in experimental activities focused on sodium technology for fast reactor R&D, and development of measurement techniques and data acquisition.
- System analysis and system dynamics simulation of the nuclear fuel cycle, and deployment scenario studies using Argonne integrated fuel cycle system analysis codes.
- Develop working familiarity with the computational fluid dynamics software package STAR-CCM+. Apply skills to thermal fluid simulation tasks, such as computational mesh development and solution verification analyses, to support the development of Reactor Cavity Cooling System experiment in the Natural Shutdown Test Facility.
- Work with TREAT database to develop significant understanding of these technically complex experiments and the science and engineering that led to their success and usefulness.
- Implement a visual-tactile display for applications in surgical robot system and nuclear reactor simulator.
- Assist the Argonne Vulnerability Assessment Team with vulnerability assessments, modeling, and R&D on physical security and nuclear safeguards devices, systems, and programs.
- Participate in the development and population of a nuclear forensics database containing information on radioactive sources.

The Nuclear Engineering Student Experience

Rice University Senior, Spring 2011
"I will be a senior next year at Rice University in Houston, TX. I am a Chemical and Biomolecular Engineering major. However at Argonne, I applied for an internship in the Nuclear Engineering field. There are so many fields of study and only a minimal amount of background experience is needed, so the doors are open to explore any related field to your major, or so I found.

I learned about Argonne's summer programs from my uncle, who has worked at Argonne for fifteen years. He has always told me how wonderful it is to work here, and highly suggested I come and take a tour and look around. I fell in love with the atmosphere and environment, as well as with the opportunity Argonne had to offer. I was a little nervous before beginning my internship because I had not had any real research experience, or any interaction with the scientific or professional world prior to this internship. I was relieved to find out on my first day when my supervisor informed me that this would not be a problem and they would teach me everything I needed to know!

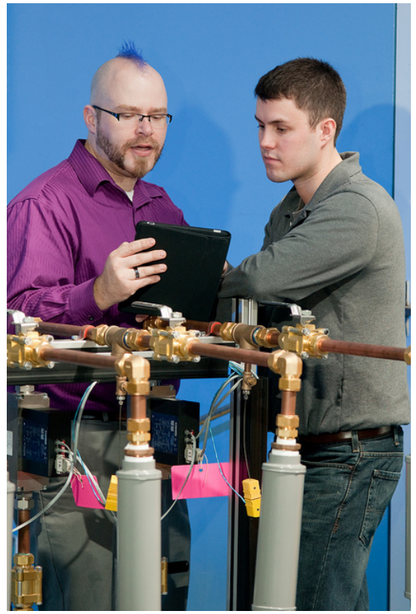
The major advantage of an internship at Argonne is that you are put right in the middle of breaking ground research. Nothing learned in a classroom can be substituted for a real hands-on experience. Argonne gives you the opportunity to learn what it would be like to be a scientist and to have a one of kind internship.

My future plans include graduation in the spring from Rice, and then attending graduate school. One day I would love to return to Argonne and pursue a lifelong career here. My internship at Argonne has helped me to realize that I want to pursue a career in research, and there is no better place to do so than at Argonne National Laboratory."

Iowa State University Sophomore, Fall 2008
"I was told about Argonne's summer research aide appointment program by a gentleman who works at Argonne. I applied to the program because it seemed like a fantastic opportunity in which to grow in my understanding of science as well as to expand my knowledge base. The biggest advantages I found to this program are being able to get involved in actual scientific research work, as well as being able to jump right into the program. There really are no disadvantages, other than that I don't receive any university credit for being a research aide. This was my first opportunity to interact with scientific researchers in a laboratory environment.

My plans for the future include graduation from ISU, then going directly to work for a company that will let me work on my master's degree while working for them. I hope then to continue on to my PhD. I believe that working at Argonne has given me the confidence, as well as the knowledge, to achieve these goals."

Argonne Graduate and Undergraduate Student Programs



- **Laboratory-Graduate Research Appointments** are available for qualified U.S. university graduate students who wish to carry out their thesis research at Argonne National Laboratory under the co-sponsorship of an Argonne staff member and a faculty member at the student's home institution.
- **Guest Graduate Appointments** are available for qualified graduate students who indicate that access to Argonne National Laboratory will be beneficial to their thesis research and to Argonne programs.
- **Thesis-Parts Appointments** support qualified graduate students who wish to visit Argonne for periods from a few days to a few months, so that they may utilize special Laboratory facilities.
- **Science Undergraduate Laboratory Internships (SULI)** provide special training and research experiences to college and university undergraduate students at the DOE National Laboratories.
- **Community College Student Internships** provide special training and research experiences to community college students at the DOE National Laboratories. The CCI Program enables students to pursue technical careers by giving them direct exposure to major scientific research facilities and also to the laboratory's scientific and technical staff.
- **Pre-Service Teacher (PST) Program** provides the opportunity for pre-service teachers to learn about the applied world of science, mathematics, and technology and to creatively transfer this knowledge to the classroom.
- **Research Aide Appointments**, primarily summer appointments, are designed to provide the Argonne scientific and engineering staff with technical assistance.
- **Cooperative Education** appointments made primarily during the academic year are available to undergraduate and graduate students.
- **Faculty and Student Team (FAST) Fellowships**
  Faculty from colleges and universities with limited research facilities and those institutions serving populations, women, and minorities underrepresented in the fields of science, engineering, and technology are encouraged to apply for the FaST program.

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