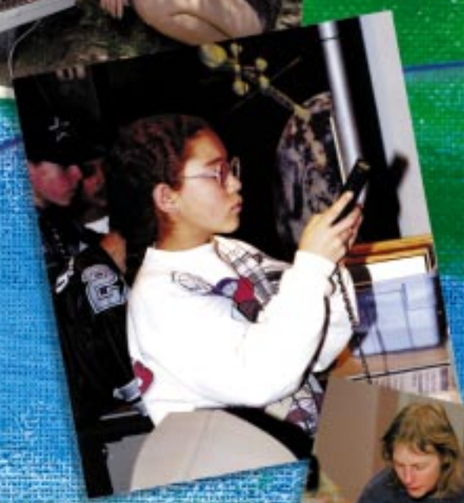

Science Education at Los Alamos National Laboratory

Los Alamos
NATIONAL LABORATORY
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Science Education at Los Alamos National Laboratory

Los Alamos
NATIONAL LABORATORY

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The Education Program Office extends a sincere thank you to the Science Education Program Coordinators for a job well done throughout the years. Their vision, hard work, and dedication have made our education programs a success. Students, teachers, school districts, and Los Alamos National Laboratory staff have all benefited.

Teacher Opportunities to Promote Science
Becky Parker
Los Alamos Space Science Outreach
Rick Alexander
New Mexico Supercomputing Challenge
David Kratzer
Critical Issues Forum
Rick Alexander, Bill Robertson
American Indian Community and Science Education Partnership
Becky Parker
Robotics Workshop
Paul Argo
Educational Pipeline for Student Initiatives Linked on the Network
Joseph Vigil
Summer of Applied Geophysical Experience
Scott Baldridge
Los Alamos Physics Summer School
Lee Collins
Volcanology
Grant Heiken
Explorations in Energetic Materials
Judith Snow
Fulfilling the Educational Needs of the Nuclear Future: Actinide Chemistry
John Watkin, Web Keogh, David Clark
Two-Year College Initiative
Abad Sandoval
Undergraduate Research Semester
David Alexander
Underrepresented Minority and Female Program
Abad Sandoval
Historically Black Colleges and Universities Program
Pamela Bivens
Mentored Collaborative Research Project
Pamela Bivens
National Consortium for Graduate Degrees for Minorities in Engineering and Science
Pamela Bivens
Oak Ridge Institute of Science and Education
Sandra Landry
Service Academy Research Associates
Ken McKenna
Postdoctoral Program
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National Physical Science Consortium
Sandra Landry
High School Student Work Programs
Melissa Velarde
Undergraduate Student Work and Research Programs
Melissa Velarde
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Educational Networking Support Program
Pat Eker, Kenny Brown
Equipment for Education
Dolores Jacobs
Bradbury Science Museum
John Rhoades, Garry Franklin
LANSCE Educational Tours
Dolores Jacobs
Web of Learning
Bill Robertson
AIMS Fluid Instabilities Curriculum Development
Bob Benjamin
Science at Home
Dolores Jacobs

Contents

Introduction 1

Teacher Programs 2

Student Programs 6

Internships and Postdoctoral Appointments 16

Educational Technology 28

Public Understanding of Science 32

Curriculum and Resources 36

Photo Information 40

Web Site Information 42

Introduction

At Los Alamos National Laboratory (the Laboratory), we are pleased to support our schools by offering teachers and students access to our unique resources. Our aim is to enrich and motivate today's science educators and tomorrow's science leaders. Support from the U.S. Department of Energy allows us to provide a wide variety of educational programs specifically designed to benefit teachers, administrators, parents, and students (K–12, undergraduate, and graduate). These programs are conducted by many different organizations within the Laboratory and are designed as dynamic hands-on experiences in science, mathematics, engineering, and technology.

Our educational programs are firmly based in the disciplines that compose our core competencies and ongoing technical programs, so our technical staff members serve as content experts and mentors for educational participants. Collaborations outside of Los Alamos bring added strength. We work with other national laboratories and government agencies, the New Mexico Department of Education, and the National Science Teachers Association. Many of our programs are conducted jointly with universities and two-year colleges.

We provide educational opportunities that fall into six categories: Teacher Programs, Student Programs, Internships and Postdoctoral Appointments, Educational Technology, Public Understanding of Science, and Curriculum and Resources. A significant number of activities are directed toward strengthening educational methods themselves. For example, our teacher enhancement programs focus on pedagogy and emphasize new ways of teaching science and math. Our educational technology workshops are focused on computer networking and use of the World Wide Web to enhance classroom learning.

We offer more than 20 programs each year, including the following:

- Research internships and fellowships
- Programs that expose students to Los Alamos science, math, engineering, and technology or help teachers develop curricula in those areas of study
- Programs that help students acquire critical-thinking and problem-solving skills
- Programs that teach effective methods of communicating science and math to the public (including educational activities at the Bradbury Science Museum in Los Alamos)
- Workshops centering on new teaching methods for science and math and ways of applying computer technology to science education
- Programs that help teachers and administrators develop and implement computer networks and Internet connections in their schools
- Programs that help two-year colleges increase job opportunities for their graduates by developing courses in the skill areas in demand at Los Alamos
- Diversity programs that increase the number of minorities and women entering careers in science, math, and engineering

Diversity is of great importance in all our programs. In many cases, we reach out specifically to minorities and women, who have been historically underrepresented in science, math, and engineering. We strive for the broadest possible representation and recruit extensively to reach that goal.

For more information, call **(505) 667-8680**, send e-mail to **dgill@lanl.gov**, or access the Education Program Office home page:

http://education.lanl.gov/

This Web site provides access to information about all our programs. The addresses for additional Web sites, if available, accompany the catalog's program write-ups.

Join us at Los Alamos for educational enrichment. We offer dynamic, hands-on experiences in science, math, engineering, and technology.

Science Education at Los Alamos National Laboratory

Teacher Programs

Teachers from grade schools, middle schools, and high schools take part in programs that enhance science- and math-teaching skills.

Teacher Opportunities to Promote Science

Eligibility: New Mexico teachers of elementary, middle, and high school math, science, and technology

Duration: Three years

"The student-parent component of TOPS is a huge success. Parents now look forward to our family nights."

Teacher,
Las Vegas, NM

The Teacher Opportunities to Promote Science (TOPS) program recruits teacher teams to attend academic-year workshops and summer institutes. These institutes enhance science-teaching skills, promote curriculum alignment between grade levels, provide mathematics enrichment, establish communication through electronic networking, and develop computer skills. The TOPS curriculum is revised as it develops in participants' classrooms.

Participating teams develop appropriate inquiry-driven curricula and projects that model sound teaching practices and tie directly to ongoing programs at Los Alamos National Laboratory. Laboratory scientists serve as content experts and mentors. The teacher-developed projects are designed to promote involvement and communication among teachers, students, and community members.

The TOPS program has been successful in increasing teachers' technology skills and in creating a network that helps teachers share information and feel less isolated in their classrooms. Program participants have reported an increase in their confidence as both teachers and problem solvers. Teachers completing this program receive a 24-credit-hour, graduate-level endorsement in science education on their teaching certificate.

Finished TOPS projects can be seen on the TOPS World Wide Web site:
http://set.lanl.gov/programs/tops/

Science Education at Los Alamos National Laboratory

Los Alamos Space Science Outreach

Eligibility: New Mexico elementary, middle, and high school teachers

Duration: One year

The Los Alamos Space Science Outreach (LASSO) program engages teachers in sustained classroom activities associated with ongoing NASA projects. Participating teams of teachers make use of an instructional model that encourages critical thinking, constructivism, research, reflection, cycles of inquiry, and iterative assessment. The teachers increase their knowledge of space science while developing inquiry-driven, student-based units that integrate math, science, and technology. The program provides teachers with an excellent mechanism for encouraging students to pursue careers in space science.

LASSO's current Advanced Composition Explorer (ACE) project focuses participants on the Los Alamos National Laboratory-NASA collaboration on the ACE spacecraft. ACE is currently orbiting the sun to collect data on energetic particles in the solar system.

ACE teaching units can be seen on the ACE Web site:
http:// set.lanl.gov/programs/ace

More information about LASSO is available on the following Web site:
http:// set.lanl.gov

Science Education at Los Alamos National Laboratory

Student Programs

These programs inspire students from kindergarten through college, encouraging them to study science and math.

New Mexico Supercomputing Challenge

Eligibility: New Mexico high school students

Duration: One academic year, with summer courses for teachers

The New Mexico Supercomputing Challenge is an educational experience and competition provided by Los Alamos National Laboratory in collaboration with New Mexico Technet and many other partners. In the Challenge, teams of one to five high school students and their sponsoring teachers work with Laboratory mentors to apply high-performance computing to projects the students choose and define themselves.

"The Challenge has taken a very shy, quiet, uninvolved individual and turned him into a confident, self-assured, involved member of our student body."

High school teacher, Supercomputing Challenge advisor

The Challenge includes student and teacher workshops and instruction in computer programming languages. Each team receives accounts on a Laboratory supercomputer and on New Mexico Technet to access the state network and the Internet. The experience culminates in a spring awards day in Los Alamos.

The goals of the Challenge are to foster creativity in devising computational solutions to scientific problems and to make a positive difference in students' lives, motivating them to prepare for the workforce of the future. The program

- provides students with access to high-performance computers,
- increases student interest in science-related disciplines,
- promotes careers in science and engineering,
- institutes electronic networking between schools, and
- exposes students and teachers to computational experiences.

This experience is open nonselectively to all New Mexico high school students. More information is available on the Challenge Web site:

http://www.challenge.nm.org/

Critical Issues Forum

Eligibility: High school student-teacher teams

Duration: One academic year

The Critical Issues Forum (CIF) is a problem-solving curriculum model in which student-teacher teams study and seek solutions to a science-based, real-world topic assigned by Los Alamos researchers. The selected topic is often related to concerns about nuclear weapons and nuclear materials but may also focus on other issues of global significance, such as the environment. Each team uses the full academic year for collaborative research and, in the spring, reports its findings and recommendations in a position paper and culminating multimedia presentation.

Science Education at Los Alamos National Laboratory

Use of computer technology is extensively integrated into the program. The student-teacher teams interact with electronic mentors through e-mail and the CIF site's question submission area and ongoing dialogue page. Participants learn Web page development, concept mapping, and Internet research in relation to the year's work. The CIF program is designed to

- increase content understanding in a critical issue related to science and/or nuclear weapons, materials, and safeguards;
- model the use of computer technology for research, communication, and information sharing;
- demonstrate how to research a complex critical issue in depth;
- demonstrate a problem-based approach to learning science;
- model the scientific process; and
- promote successful teamwork through cooperative and collaborative learning.

Both the curriculum and the students' work are posted on the CIF Web site:

http://set.lanl.gov/programs/cif/

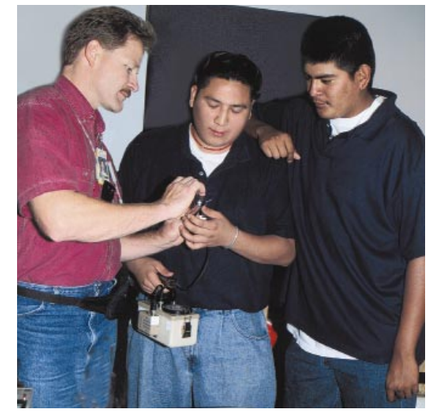
American Indian Community and Science Education Partnership

Eligibility: American Indian high school students

Duration: Summer (six weeks)

The American Indian Community and Science Education Partnership (AICSEP) is a collaboration between Los Alamos National Laboratory and the Santa Fe Indian School (SFIS). The goal of this collaboration is to enhance science teaching and provide learning experiences for American Indian high school students, their teachers, and their communities.

AICSEP works with SFIS's Community-Based Education (CBE) program to recruit teams of students, teachers, and community members from several New Mexico pueblos. The teams receive materials, resources, technical assistance, and training, all of which support science- and/or technology-based work in the students' home communities. Teachers in the program gain invaluable practical applications for their curricula.



"I gained a lot. I learned what my interests are and how to use the tools of a scientist. I learned so much!"

Student, AICSEP participant

During the summer program, AICSEP supports the participating high school students as interns, allowing them to continue the studies they began in CBE. The students work at their respective pueblos three to four days each week and, along with other members of their teams, come to Los Alamos one or two days a week for tours, lectures, or demonstrations about nuclear science and related research. Pueblo community leaders may accompany them. During these visits, AICSEP students and teachers may work with Laboratory scientists on various research projects. The students thus have an opportunity to learn specific scientific skills they can apply to their own projects.

Please check the following Web site:

http://set.lanl.gov/programs/aicsep/

Robotics Workshop

Eligibility: K–12 students, with the main focus on middle school

Duration: Spring (three days)

The Biological Electronics Aesthetic Mechanics (BEAM) Robotics Workshop, sponsored by Los Alamos National Laboratory and Solarbotics of Toronto, Canada, is a workshop and competition held every spring in Los Alamos.

In the first two days, students are assisted in building small robots from kits containing several walkers and simple robotic forms (sollarollers, sollarflappers, photopoppers). The Laboratory provides the kits; additional ones are available for a reasonable fee from Solarbotics.

"I find it quite exceptional to see so many young people totally immersed in their individual projects for two full working days. The creativity, self-esteem, and knowledge that come from such an experience carry great value for each of them individually."

Parent,
Ocate, NM

Science Education at Los Alamos National Laboratory

The third day is devoted to a small-scale competition and demonstration, with entries from the workshop and from external participants who wish to take part.

The Los Alamos Robotics Club works on its own to support Northern New Mexico BEAM participants beyond the time of the workshop. Several schools throughout the area purchase BEAM robotic kits, and Robotics Club members help interested school members plan and run their own smaller robotics workshops. As a result of these activities, a team from Española, New Mexico, entered and won the 1998 World Robotics Championship in Japan.

Please check the following Web site:
http://sst10a.lanl.gov/robot/html/web.html

Educational Pipeline for Student Initiatives Linked on the Network

Eligibility: K–12 students

Duration: One academic year

The Educational Pipeline for Student Initiatives Linked on the Network (EPSILON) is a Web-based program that involves students in a problem-solving scenario that can be addressed from the school room. Computer networking technology is used as the delivery and communication system and provides a common thread throughout the program.

EPSILON begins during the fall semester with a variety of Web-based activities that teach the students to create their own project, develop a proposal for implementing the project, and present and defend their proposal to science and education professionals. The students work in teams that simulate the scientific problem-solving process as it is carried out in a laboratory. Activities are sequenced to build skills.

During the spring semester, a Los Alamos scientist poses a challenging problem to the class and asks for written proposals, sketches, and working models of designs that meet a specific set of requirements. The program culminates with student presentations of their projects. For some of the students, the year's work may be followed by a summer internship (six to seven weeks) working with a particular scientist at Los Alamos National Laboratory.

Please check the following Web site:
http://set.lanl.gov/programs/epsilon/

"The EPSILON program excites the children, and they want to learn more."

Middle school principal,
Santa Fe, NM

Summer of Applied Geophysical Experience

Eligibility: Undergraduates (predominantly upper division) and graduates in geophysics programs or related disciplines; earth science faculty in various fields

Duration: Summer (four weeks)

The Summer of Applied Geophysical Experience (SAGE) has operated in New Mexico's Rio Grande rift since 1983. It is an intensive program of geophysical exploration and research in New Mexico, with instruction provided by active, experienced researchers from participating universities and Los Alamos National Laboratory.

SAGE offers students geophysics experience beyond the classroom-based curriculum and encourages qualified students in related fields to consider careers in geophysics. For earth science faculty, the program provides an opportunity to do field research with highly specialized equipment that might otherwise be unavailable to them.

The program focuses on geological problems of both research and practical interest. Participants combine geophysical data acquired through a variety of techniques with knowledge of the geological setting to derive integrated subsurface interpretations. They process and model geophysical data on personal computers and workstations and make use of the latest software. Various academic institutions and industrial affiliates provide modern field equipment and vehicles.

"Because of SAGE, I know that I want to become a geophysicist."

Student,
SAGE participant

More information is available at the program Web site:

http://geont1.lanl.gov/sage/sage.htm

Los Alamos Physics Summer School

Eligibility: Upper-level undergraduate and first-year graduate students in physics or related disciplines

Duration: Summer (10 weeks)

Conducted with the University of New Mexico, the Physics Summer School is designed to attract students from around the country for a summer of science and math studies at Los Alamos. The students attend morning lecture seminars on such topics as quantum manipulation of atoms, simulations of large-scale systems, quantum computing, and adaptive optics. Laboratory and university staff, together with distinguished visiting lecturers from around the world, organize these studies. In the afternoons, the students work on individual, mentored research projects. At the end of the summer, they write a report on their research and communicate the results to program peers and staff.

The Physics Summer School receives National Science Foundation funding as a Research Experience for Undergraduates site. The goals of the program include

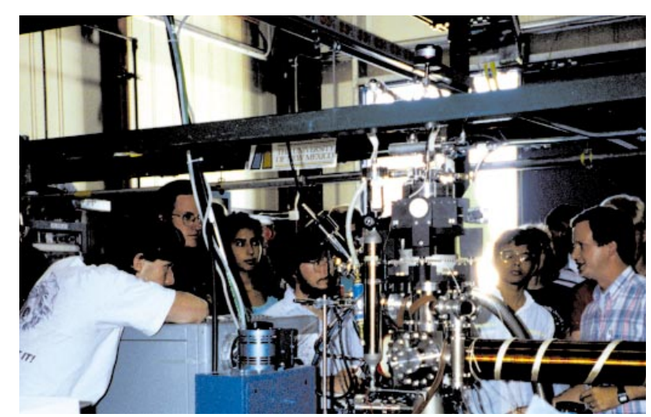
- stimulating a deep interest in science through exposure to the latest, most exciting developments;
- fostering skills in high-performance supercomputing; and
- encouraging students to pursue careers in scientific research.

Please check the following Web site:

http://www.phys.unm.edu/LASS/

"The Los Alamos Physics Summer School made me even more excited about my research and gave me a broader view of the field."

Student,
Los Alamos Physics Summer School participant



Science Education at Los Alamos National Laboratory

Volcanology

Eligibility: Undergraduate and graduate geosciences students; some K–12 teachers

Duration: Four academic-year courses; one summer field study (three weeks)

"My experience with the Volcanology program gave me the chance to work with exceptional researchers in volcanology, geochemistry, and geothermal energy."

Student, Volcanology program

Los Alamos National Laboratory and the University of New Mexico collaborate in offering a comprehensive course of study in volcanology for undergraduate and graduate students. The program consists of four campus courses (two undergraduate and two graduate) and one summer field course for upper-level undergraduates and graduates. The university holds the summer field course primarily in the Jemez Mountains and Valles Caldera of northcentral New Mexico. Participants are based at a university-owned ranch in the area.

The Volcanology program makes use of Los Alamos geosciences staff members as adjunct faculty. Department of Energy projects have given these Laboratory researchers expertise in areas such as the computer modeling of volcanic eruptions and the evaluation of high-grade geothermal systems. They are experienced in the study of the effects of volcanic eruptions on climate and the potential effects of volcanic activity on adjacent energy facilities and population centers. Preparing the next generation of geoscientists to continue such studies is a primary goal of the program.

A secondary goal is to promote basic volcanology as an exciting field that can stimulate student interest in science, especially in the complementary fields of physics and meteorology. (Volcanoes are second only to dinosaurs as a vehicle for introducing science to children.) This secondary goal is met by the inclusion of one or two primary and secondary science teachers in each year's program.

More information is available at the Volcanology program Web site:
http://geont1.lanl.gov/page1/student/volcan/volcan-prog.htm

Science Education at Los Alamos National Laboratory

Explorations in Energetic Materials

Eligibility: New Mexico middle and high school teachers

Duration: One academic year and two summers (eight weeks each summer)

This program allows teachers and their students to gain knowledge about energetic materials—propellants, explosives, and pyrotechnics—and the safety issues associated with their use. Participating teachers and students establish long-term interactions with the High Explosives Science and Technology group at Los Alamos National Laboratory.

The program begins with selected teachers coming to Los Alamos for a summer session with a Laboratory researcher specializing in energetic materials. The summer's work gives the teachers expertise and first-hand laboratory skills useful in the classroom. Los Alamos researchers continue to work with the teachers during the academic year, helping them develop suitable activity modules they can present to their students. One or two Los Alamos staff members and technicians join the teachers in their classrooms for presentations. The teachers return to Los Alamos to wrap up their experience with a second summer of activities. A new group starts work every summer, participating alongside the teachers who are completing their studies.

Students in participating teachers' classrooms visit Los Alamos National Laboratory for tours and technical demonstrations and may participate in a career exploration workshop. After evaluation and modification, activity modules developed by the teachers and their Los Alamos associates will be made available for use in other classrooms and schools and will be published on an interactive Web site.

Fulfilling the Educational Needs of the Nuclear Future: Actinide Chemistry

Eligibility: Undergraduate-graduate University of New Mexico students (university course); four first- or second-year graduate students, nationally selected (research appointment)

Duration: Spring semester course; summer appointment (12 weeks)

Fully accredited by the University of New Mexico and coordinated by the Seaborg Institute for Transactinium Science in Los Alamos, the Actinide Chemistry program features a unique course at the University of New Mexico and summer research appointments at Los Alamos National Laboratory.

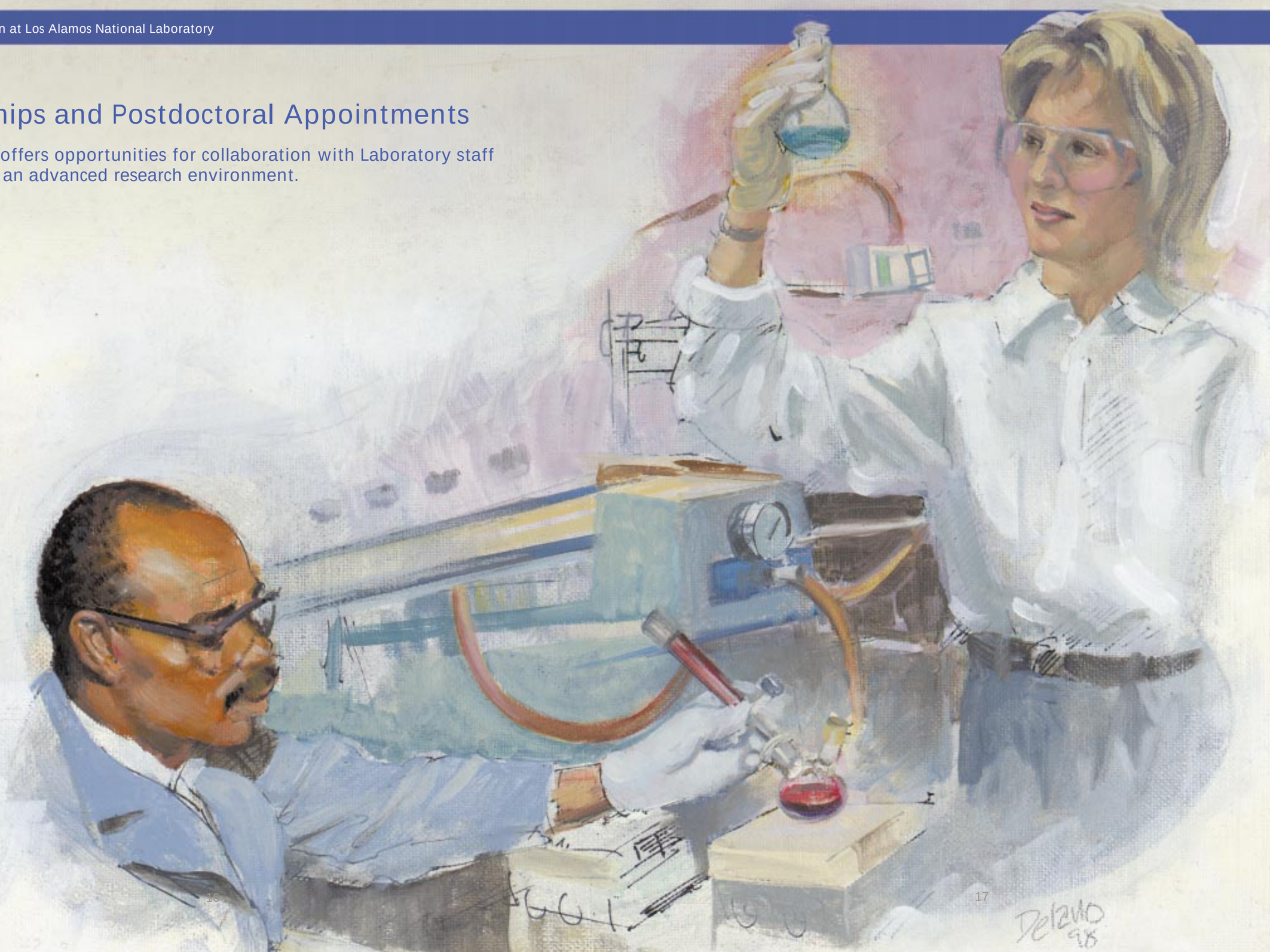
The university course is presented as a lecture series (28 90-minute lectures in all) on the molecular chemistry of actinide elements. Open to both undergraduate and graduate students, the course is offered during the spring semester on the University of New Mexico campus. Four summer research appointments (with stipend) at Los Alamos National Laboratory are also available. Recipients attend a series of lectures, the equivalent of those composing the University of New Mexico course, and perform independent actinide research under the guidance of one or more of the Laboratory's technical staff members. The students' research results may be published in peer-reviewed journals.

"At the conclusion of the actinide course, students will have acquired a greater appreciation of the diverse role of the actinide elements in nuclear energy and inorganic chemistry. They will also understand the importance of these elements for national security."

Actinide Chemistry Program Coordinator

Internships and Postdoctoral Appointments

Los Alamos offers opportunities for collaboration with Laboratory staff members in an advanced research environment.



Two-Year College Initiative

Eligibility: Students and faculty-student teams from two-year regional colleges

Duration: Summer internship

The Two-Year College Initiative (TYCI) was developed to strengthen the academic environment of regional two-year colleges and to increase the number and quality of students pursuing degrees in the emerging technologies of five focus areas: advanced manufacturing, computer technology, electromechanical technology, biotechnology, and environmental restoration and waste management.

Through the internships, students gain an introduction to the latest and most innovative technologies in the competitive career market. Faculty participants learn to strengthen and enhance their institutions' programs. During the academic year, TYCI provides additional faculty workshops in selected technology areas.

Please check the following Web site:
http://stb.lanl.gov/up/programs/rtyci.html

"The faculty workshops allowed me to update skills, tour manufacturing facilities, and look at new ways of presenting materials in my courses. I was inspired to push more of my two-year students into four-year engineering fields."

Two-year college faculty member, TYCI participant

Undergraduate Research Semester

Eligibility: Upper-division undergraduate science, math, computer, or engineering students

Duration: One academic semester

The Undergraduate Research Semester (URS) is a national program sponsored by the Department of Energy and designed to strengthen the quality of national research and education in science, math, and engineering. URS enhances and facilitates the historic interdependence between the university community and Department of Energy laboratories.

URS students receive research appointments at national laboratories (in this case, Los Alamos National Laboratory), where they have access to advanced facilities and equipment not ordinarily available at a university. The URS experience provides hands-on laboratory research in each student's chosen area of study and helps him or her to focus on a particular field.

At Los Alamos, participants conduct innovative research under the guidance of Laboratory mentors. In supplementary educational activities, each student prepares and presents a poster session, gives a technical presentation to his or her sponsoring Laboratory group, and presents URS program coordinators with a short technical research summary. URS encourages participation by women and minorities.

Please check the following Web site:
http://education.lanl.gov/resources/urs/

Science Education at Los Alamos National Laboratory

Underrepresented Minority and Female Program

Eligibility: Undergraduate and graduate minority and female students in science, math, engineering, and technology

Duration: Summer internship

The goal of the Underrepresented Minority and Female (URMF) program is to help minorities and women achieve parity in the fields of science, math, engineering, and technology. Selected participants are awarded research internships that give them direct experience in and exposure to a wide variety of scientific and technological activities at Los Alamos National Laboratory. Recruitment focuses on students from New Mexico, Texas, Colorado, Arizona, and California.

Supplementary educational activities complement the research appointment, allowing students to develop and practice professional skills. At the end of the appointment, each student gives a presentation on his or her research project to program peers and coordinators. The URMF program encourages students to continue their studies at the graduate level.

Please check the following Web site:
http://stb.lanl.gov/up/programs/urmf.html

Historically Black Colleges and Universities Program

Eligibility: Undergraduates, graduates, and faculty members in science, engineering, and technology at participating universities

Duration: Summer internship

The Historically Black Colleges and Universities (HBCU) program is funded by the Department of Energy to expose students and faculty to research opportunities at national laboratories. HBCU positions at Los Alamos National Laboratory are part of this effort.

"The HBCU program has truly provided a necessary link to experience in science and related fields."

Student, HBCU program

Selected students and faculty work with Laboratory mentors to enhance and develop their knowledge base and research experience within their major study area or teaching field. The appointments expose participants to a wide variety of scientific activities and give them access to the most advanced equipment. At the end of the summer, each student reports on his or her research to program peers and coordinators.

Please check the following Web site:
http://stb.lanl.gov/up/programs/hbcu.html

Mentored Collaborative Research Project

Eligibility: Multidisciplinary student-faculty teams from New Mexico and regional universities

Duration: Summer internship

The Mentored Collaborative Research Project (MCRP) gives selected teams the opportunity to work with Los Alamos scientists, who serve as mentors on projects involving topics relevant to Los Alamos National Laboratory's defense missions.

Recent projects have focused on topics such as ceramics, advanced manufacturing techniques, and mechanical and structural properties of polycrystalline and single-crystal erbium oxides. However, to give the students experience in the multidisciplinary research common at Los Alamos, the teams are made up of students and faculty from different science and engineering disciplines. Enrollment is kept low to ensure one-on-one relationships between mentors, students, and faculty.

At the end of the summer internship, the students present their research to their peers and program coordinators and prepare a written paper describing their experience at Los Alamos National Laboratory.

Please check the following Web site:
http://stb.lanl.gov/up/programs/mcrp.html

"Our mentor demonstrated and shared his knowledge, expertise, time, and efforts to ensure that we received quality learning and understanding."

Student, MCRP participant

National Consortium for Graduate Degrees for Minorities in Engineering and Science

Eligibility: First-year engineering graduate students

Duration: One academic year and two summer internships

The National Consortium for Graduate Degrees for Minorities in Engineering and Science (known as GEM) is made up of universities and employers dedicated to increasing the number of underrepresented minority students completing M.S. and Ph.D. degrees in engineering and science. As a member of the consortium, Los Alamos National Laboratory annually provides a year of financial and research support to two new engineering graduate students (M.S. level). Selected students also complete internships at Los Alamos during the summers immediately preceding and following their first year of graduate school.

More information is available at the GEM Web site:
http://stb.lanl.gov/up/programs/gem.html

Science Education at Los Alamos National Laboratory

Oak Ridge Institute of Science and Education

Eligibility: Undergraduate and graduate students and faculty

Duration: Summer research appointment (12 weeks)

The Department of Energy's Oak Ridge Institute of Science and Education (ORISE) provides a variety of educational opportunities, including undergraduate and graduate fellowships in engineering and the sciences. Los Alamos National Laboratory participates in the ORISE program by providing fellowships with 12-week mentored research appointments. These appointments allow ORISE fellowship recipients to gain hands-on experience in such fields as engineering, energy development, environmental management, and personnel safety and safeguards. Limited on-site faculty appointments are available for colleges participating in the Historically Black Colleges and Universities program.

More information about ORISE is available on the Web:
http://stb.lanl.gov/up/programs/orise.html

Service Academy Research Associates

Eligibility: U.S. Military Academy, U.S. Naval Academy, and U.S. Air Force Academy cadets and midshipmen

Duration: Summer (six to eight weeks)

The Service Academy Research Associates (SARA) is a special employment and education program administered by the Department of Defense Programs Office in Los Alamos. SARA appoints selected service academy students to visiting staff positions at Los Alamos National Laboratory, where they engage in hands-on, applied research under the direct mentoring of a technical staff member. They have the opportunity to learn about the Laboratory's various national security, defense, and civilian programs and to develop a lasting interest in science and technology.

The Department of Defense Programs Office issues an annual call to Laboratory technical divisions interested in hosting SARA students. Academy-nominated students are then matched with host organizations based upon student interests and accomplishments.

More information about requirements and procedures is available at the SARA Web site:
http://lanl.gov/programs/DoD/military/sara.html

"The SARA internship was one of the most rewarding experiences I have had to date. It allowed me to apply textbook theory to practical situations. My mentor was extraordinary, as were the others I worked with."

SARA program participant

"What I liked most about my Postdoctoral Fellowship was the close interaction between experienced staff members and postdocs. The quality of the science and commitment to safety really impressed me."

Postdoctoral Fellow

Postdoctoral Program

Los Alamos National Laboratory's Postdoctoral program plays a vital role in keeping the Laboratory at the leading edge of science and technology. Postdoctoral appointees are a valuable stimulus to the research efforts of the Laboratory's staff and provide access to the most recent developments of university science and engineering departments. The appointees also broaden Los Alamos' contact with the external scientific community by providing communication links with industry and universities.

Los Alamos places appointees in an outstanding research and development environment with access to some of the most advanced scientific facilities in the world.

Appointees have significant freedom to perform research, publish the results of their work, participate in scientific and technical conferences, and present their work in seminars. The postdoctoral experience is the perfect opportunity for professional accomplishment and career advancement, as the appointees form one of the primary recruitment pools for Laboratory employment.

Candidates are nominated and sponsored by a Los Alamos technical staff member. Selection is based on review of the Laboratory's Postdoctoral Committee and is determined by the candidate's academic qualifications and research excellence.

Regular Postdoctoral Appointments

Eligibility: Doctoral degree within the last three years or completion of all Ph.D. requirements before the appointment begins

Duration: Two years initially (possible extension to three years)

Postdoctoral Fellowship—Recipients pursue independent research of their own choice. The number of appointments is limited. Candidates are reviewed and selected four times a year by the Laboratory's Postdoctoral Committee.

Postdoctoral Research Associates—Associates pursue research directly connected to Los Alamos National Laboratory's programmatic efforts. The Postdoctoral Committee reviews and recommends candidates for selection throughout the year.

Science Education at Los Alamos National Laboratory

Special Postdoctoral Appointments

Eligibility: Receipt of a doctoral degree within the last five years or completion of all Ph.D. requirements before the appointment begins

Duration: Three years

Candidates for these awards must display extraordinary ability in scientific research and show clear and definite promise of becoming outstanding leaders in the research they pursue.

J. Robert Oppenheimer Postdoctoral Fellowship—Named after the first director of Los Alamos National Laboratory, this fellowship provides the opportunity for recipients to pursue independent research of their own choice. Up to two fellowships are offered annually.

Richard P. Feynman Fellowship—Named after the famed theoretical physicist and winner of the 1965 Nobel Prize in Physics, this fellowship provides the opportunity for recipients to pursue independent research of their own choice in the areas of theory and computing, with emphasis on modeling and simulation. This fellowship is restricted to U.S. citizens and requires the appointee to obtain a Department of Energy Q-level security clearance. Up to two fellowships are offered annually.

"As a postdoc, I was encouraged to publish my work and attend technical conferences. Opportunities to perform both experimental and numerical analyses greatly expanded my experience base. I hope to become a full-time staff member."

Postdoctoral Research Associate

"The fact that the Oppenheimer Fellowship allows you the freedom to perform research at a top scientific organization like Los Alamos ranks it above all other postdoctoral appointments in the country. I also appreciate the significant resources and facilities Los Alamos has to offer."

Oppenheimer Fellow

Frederick Reines Fellowship—Named after the former Los Alamos researcher who won the 1995 Nobel Prize in Physics, this fellowship provides the opportunity for recipients to pursue independent research of their own choice in experimental sciences. The awards go to outstanding experimentalists regardless of their field of study. This fellowship is restricted to U.S. citizens and requires the appointee to obtain a Department of Energy Q-level security clearance. Up to two fellowships are offered annually.

Please check the following Web site:
http://www.hr.lanl.gov/postdoc/

The National Physical Science Consortium

Eligibility: Minority and women graduate students in the physical sciences

Duration: To completion of the Ph.D. (six years maximum)

"I want to help people live better lives. By supporting the start of my research career, the National Physical Science Consortium and Los Alamos have put me on the path to that goal."

NPSC student

Los Alamos is a participating member of the National Physical Science Consortium (NPSC), which is dedicated to increasing the number and diversity of Ph.D. recipients in the physical sciences. The NPSC offers physical science graduate fellowships to talented minority and female students, with the objective of creating a pool of new research scientists and meeting the future needs of academia and industry. Los Alamos National Laboratory normally awards one NPSC student fellowship per year. Interested applicants apply directly to NPSC.

For more information, visit the NPSC Web site:
http://stb.lanl.gov/up/programs/npsc.html

High School Student Work Programs

Los Alamos National Laboratory's high school student programs are designed to complement classroom education and help students make the transition from school to work. Detailed information is available at the following Web site:
http://www.hr.lanl.gov/students/hs.html

High School Co-operative Program

Eligibility: Local area high school seniors, 16 or older

Duration: Summer (90 days) and academic-year employment

The High School Co-operative (HS Co-op) program provides high school seniors with paid work experience in a variety of technical and administrative positions at Los Alamos National Laboratory. Participants may also receive course credit according to criteria established by their high school.

Selection to the program takes interests and aptitudes into account. Selected students work during the summer after completion of their junior year and may continue part-time during their senior academic year.

HS Co-op Postgraduate Category

Eligibility: High school graduates (or equivalent) not yet accepted or enrolled in an undergraduate program

Duration: Up to one year's employment (need not be the first year after graduation)

Science Education at Los Alamos National Laboratory

This category serves as a transition between high school and work or a college career. Participants are encouraged to take classes during this year and may enter the Laboratory's Undergraduate Student program when accepted for undergraduate studies.

Undergraduate Student Work and Research Programs

The undergraduate student programs provide a mechanism for undergraduate students to gain paid work and/or research experience in technical or administrative fields at Los Alamos National Laboratory. Each student has an educational work plan providing guidelines for the work and stating specific educational outcomes. Participants work with mentors who nurture and coach the students and help them adjust to the Los Alamos work environment.

Please check the following Web site:
http://www.hr.lanl.gov/students/ugs.html

Undergraduate Student Program

Eligibility: High school graduates actively enrolled in an undergraduate program

Duration: Summer (90 days) and academic year employment (maximum of six years for pursuit of Bachelor's degree, three years for Associate's degree)

The Undergraduate Student (UGS) program offers opportunities for relevant paid work and/or research for students pursuing an undergraduate degree. The program complements classroom education with experience related to the chosen field of study. Technical and administrative appointments are available.

"This experience has influenced my interest in the national laboratories and in physics. I have become interested in almost all areas of physics. If only I had more time!"

Undergraduate student, UGS program

"The Los Alamos-MIT program really takes care of its students. I worked side-by-side with brilliant people on cutting edge research, which exposed me to topics outside the usual classroom experience."

Student, MIT program

Post-Baccalaureate UGS Category

Eligibility: College graduates holding a Bachelor's degree and not yet accepted or enrolled in a graduate program

Duration: Up to one year's employment (need not be the first year after graduation)

This category serves as a transition between a student's undergraduate and graduate careers. Participants are encouraged to take classes during this year and may move into the Graduate Research Assistant program upon admittance to graduate school.

Massachusetts Institute of Technology (MIT) Engineering Internship Program

Eligibility: Undergraduates at the MIT School of Engineering

Duration: Three work assignments at Los Alamos—two summers (after sophomore and junior years) and one seven-month assignment (summer after senior year through fall semester of graduate school)

Los Alamos National Laboratory has participated in the MIT Engineering Internship program since 1983. Based on the belief that real-world experience is an important aspect of a sound engineering education, this internship combines the traditional on-campus academics with off-campus work at Los Alamos. The Los Alamos-MIT program is principally a joint undergraduate-graduate program leading to the simultaneous award of the B.S./M.S. from a participating engineering department.

Participating students complete a combined B.S./M.S. thesis on a topic related to their work assignment. The thesis topic is normally determined before completion of the second work assignment, and students complete their thesis primarily during the third Los Alamos work assignment. All thesis work is completed under the combined supervision of Laboratory staff members and an MIT faculty member.

Additional or substitute work assignments are possible if agreed to by the Laboratory, the student, and the student's MIT department.

More information is available at the following site:
http://education.lanl.gov/programs/eip.html

Science Education at Los Alamos National Laboratory

Graduate Student Work and Research Programs

The graduate student programs provide paid positions for graduate students who want to pursue their research interests and make significant contributions to Los Alamos National Laboratory groups. Each student has an educational work plan providing guidelines for the work and stating specific educational outcomes. Participating students work with mentors during their time at the Laboratory.

More information is available at the following site:
http://www.hr.lanl.gov/students/gra.html

Graduate Research Assistant Program

Eligibility: Bachelor's degree and active status in a graduate program

Duration: Summer (90 days) or up to one year employment, with optional renewal based on program requirements

The Graduate Research Assistant (GRA) program is a year-round educational program that gives graduate students relevant research experience at Los Alamos National Laboratory. Students may arrange to conduct Master's thesis or Doctoral dissertation research while at Los Alamos. Most appointments are in the technical and scientific disciplines. Optional renewals may extend GRA appointments for up to four years for Master's degree students, seven years for Ph.D. students, and eight years for students pursuing both a Master's and a Ph.D.

Post-Master's GRA Category

Eligibility: College graduates holding a master's degree and not yet accepted or enrolled in a Ph.D. or second Master's program

Duration: Up to one year's employment (need not be the first year after graduation)

This category serves as a transition between receipt of a Master's degree and entrance into a Ph.D. or second Master's program. Participants are encouraged to take classes during this year and may continue as a GRA upon enrollment in a Ph.D. or second Master's program. Participation in the Post-Master's program must not exceed the maximum number of years allowed for participation in the GRA program: four years for Master's degree students, seven years for Ph.D. students, and eight years for students pursuing both a Master's and a Ph.D.

"I always thought I would end up working in a corporate setting, but now I find myself anxiously awaiting my return to Los Alamos—as a student and even more so as a staff member."

Graduate student, GRA program

Science Education at Los Alamos National Laboratory

Educational Technology

The Educational Technology programs develop and apply new technologies to the educational process.

Educational Networking Support Program

Eligibility: Primarily rural Northern New Mexico school districts, but some advisory, technical, and training support for districts in other areas

Duration: Ongoing

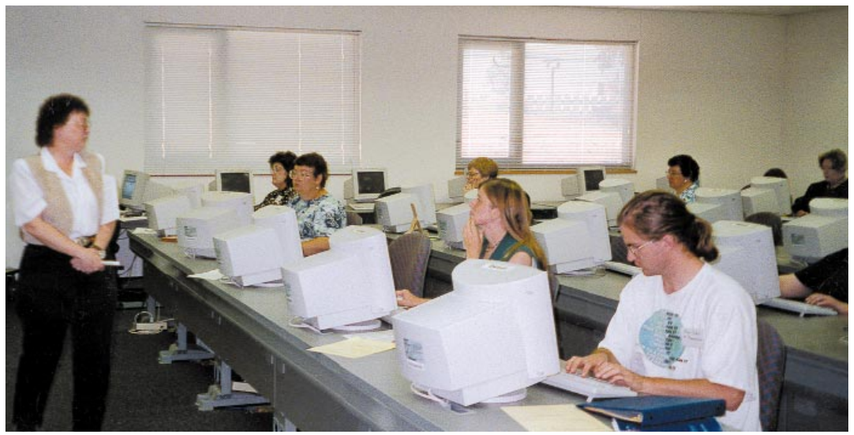
"I have never observed a more meaningful outreach project than the Educational Networking Support program."

Superintendent, Cuba Independent Schools

The Educational Networking Support (EduNets) program was developed in accordance with the national goal of having every school connected to an "information highway" by the year 2000. The program helps school districts establish viable networks and connections to Internet resources and provides teachers, administrators, and technical support teams with the training that allows them to use and maintain these networks and resources. Los Alamos researchers, computer scientists, network managers, and engineers use their technical expertise and experience to help school districts plan and implement the networking infrastructures necessary for achieving success.

EduNets is designed to provide a coordinated consulting resource and on-site support for participating school districts. It also establishes partnerships with community colleges, universities, and governmental departments of education. These partnerships support the establishment of regional training and technical support centers to ensure that each region's educational networking continues into the future.

EduNets personnel are currently working with 44 school districts (30 public and 14 nonpublic), 11 community colleges and universities, the New Mexico Department of Education, departments of education under Native American leadership, and 28 other education support sites.



Science Education at Los Alamos National Laboratory

"Equipment for Education provides teachers with the computers, software, and training they need to fully participate in the Laboratory's science education programs."

Science Education Program Coordinator

Equipment for Education

Eligibility: New Mexico school districts

Duration: Ongoing

The Equipment for Education program is an initiative to help meet the technology needs of specific science education programs sponsored by Los Alamos National Laboratory. Through this program, Los Alamos transfers excess equipment to the schools that have participants in the Laboratory's science and technology education programs, for example, the Teacher Opportunities to Promote Science program, the Supercomputing Challenge, or the Critical Issues Forum. In 1998 the Los Alamos science education programs provided 65 excess items, including computers and other equipment, to 65 teachers in schools in 10 New Mexico school districts.

In addition to providing equipment for its education programs, Los Alamos also uses its Laboratory Gift program to make equipment available to New Mexico schools through a Memorandum of Understanding with the New Mexico Department of Education.

Science Education at Los Alamos National Laboratory

Public Understanding of Science

These programs inform the public about science and math and about research programs at Los Alamos National Laboratory.

"Thank you so much for the cool, funny presentation! I learned a lot about magnets. My friend's mom said she learned more about magnets from that presentation then she had learned in one full school year!"

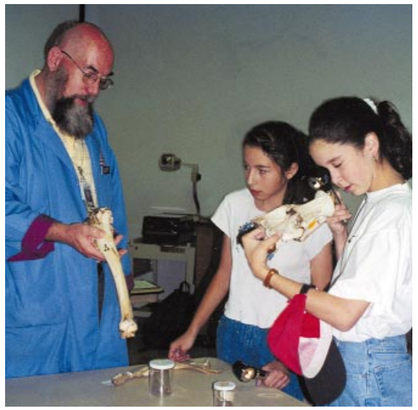
Student visitor, Bradbury Science Museum

Bradbury Science Museum

Eligibility: Public exhibits, discussions, and tours; special student-teacher programs

Duration: Ongoing

The Bradbury Science Museum in Los Alamos uses tours, interactive exhibits, and discussions to inform and educate the public about Los Alamos National Laboratory, its role in World War II, development of the atomic bomb, and current research and development.

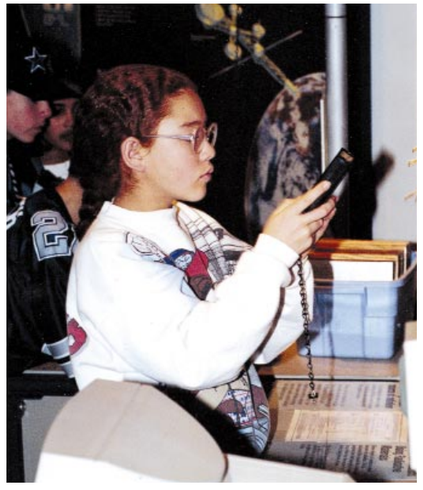


Museum exhibits address topics such as the nation's nuclear stockpile; oil exploration and global warming, along with other energy-related issues; and human genome research and other biotechnologies. Museum visitors also learn about the complex calculations performed by the Laboratory's supercomputers, which Los Alamos researchers use for activities such as modeling nuclear weapon dynamics, studying global climate changes, and maintaining the world data bank on the AIDS virus.

Under the theme "Discovering Science," the Bradbury Science Museum offers special programs for teachers and students of all ages. The museum's science educator works with public and private schools to relate tours and demonstrations to school curricula or to introduce some of the basic components of math and science. Activities are geared to grades K–12, with an emphasis on middle school students. The museum's educational opportunities include the following:

- TechLab, a classroom-like setting where students pursue class or individual studies in geology, chemistry, ecology, and DNA
- DemoStage, where visitors can view science shows and demonstrations that include "Lasers and Light," "Spectrums," "Electromagnetism," "Superconductivity," "Cryogenics," "Hydrology and the Water Cycle," "Thermoacoustics," and "The Human Brain"
- Museum Explainer, a program that gives junior and senior high school students experience in teaching science to the public

Detailed information is available at the museum's Web site:
http://www.lanl.gov/external/museum/



LANSCE Educational Tours

Eligibility: Students K–12

Duration: One-day facility tour

School groups are invited to schedule tours of the Los Alamos Neutron Science Center (LANSCE), where Los Alamos technicians and staff members will acquaint them with the various programs conducted at that facility. LANSCE plays an important role in activities such as accelerator production of tritium, science-based stewardship of the nation's nuclear weapons stockpile, and disposition of plutonium through accelerator transmutation. Tour guides touch on an assortment of technical topics such as subatomic particles, radioisotopes, materials science, particle dynamics, scientific experiment and tool design, circuits, radio frequency generation, and electrical engineering.

Before the tour, teachers receive a classroom information package that includes a video, printed materials, hands-on activities, and a Web site address. Suggested additional activities include hands-on experiments, Web searches, and links back to the Laboratory.

Please check the following Web site:
http://set.lanl.gov/programs/lansce/

"Our classes usually go to the Bradbury Science Museum several times during the school year. We find the learning experience consistently enlightening, professional, and enjoyable."

Española Schools Enrichment program

Science Education at Los Alamos National Laboratory

Science Education at Los Alamos National Laboratory

Curriculum and Resources

The Curriculum and Resources programs develop new science and math curricula for teachers.

Web of Learning

Eligibility: Students and teachers, grades 4–12

Duration: Ongoing

The goal of the Web of Learning project is to establish and constantly upgrade a science and math Web site that will provide a complete set of tutorials, on-line textbooks, problems for students to solve, and currricula that support nationally accepted standards. Still in its beginning phase, the project is concentrating first on math, which is the key to understanding science.

Web of Learning contests allow student-teacher teams to generate the tutorials, curricula, and problems published by the project. Submitters meet challenges to create new materials or upgraded versions of those already available on the site. The best entries appear on the Web, and the contributing teams receive prizes for their schools. In this way, the Web of Learning is constantly improved.

Visit the Web of Leaning site at the following address:

http://set.lanl.gov/programs/learning

"The workshop was terrific! AIMS filled in the gaps in my benchmark curriculum resources."

Teacher, AIMS participant

AIMS Fluid Instabilities Curriculum Development

Los Alamos National Laboratory is collaborating with the Activities Integrating Math and Science (AIMS) Education Foundation to develop classroom lessons that will make fluid instabilities more understandable to students. Fluid instabilities greatly influence weather, ocean currents, and the chemical reactions commonly seen in cooking. The study of fluid instabilities not only produces a better appreciation of these phenomena but also serves as a gateway to enhanced understanding of basic fluid concepts such as pressure, density, and surface tension. The Laboratory is also working with several well-known science museums to develop presentations and exhibits for the public.

The AIMS-Los Alamos lessons consist of inexpensive, hands-on activities that focus on the Rayleigh-Taylor instability (RTI), the phenomenon that causes water to spill from a tilted or inverted glass. Students learn how to identify and control RTI, so they can contain water within an upside-down glass. This process deepens their understanding of fluid pressure, interfaces, and surface tension and shows them that density differences can cause dynamic events.

The activities will become the basis for a resource book (tentative title, *Spills and Ripples*) for grades 5–9. The book also includes engineering applications of RTI, such as the design of bottle openings, and more traditional lessons about the properties of fluids and how to measure them.

More information is available at the AIMS Web site:

http://education.lanl.gov/programs/aims.html

Science at Home

Science at Home is a curriculum module designed to increase public awareness of science by showing students and their parents how to use common household items in science experiments. The Science at Home module, published as an activity book for grades 4–8, is available for purchase through Curriculum Associates, Inc. (ISBN 0-7609-0236-4).

The goals of the Science at Home curriculum module are to

- help parents and children work together to enhance their science process skills,
- give parents the opportunity to model science competence and interest for their children,
- promote parental understanding of how students gain familiarity with physical science concepts,
- help students develop confidence and a positive attitude toward science,
- stress the importance of science in everyday life, and
- encourage parents to involve themselves in educational functions in their communities and in their children's schools.

A sample Science at Home lesson is available on the Web:

http://education.lanl.gov/resources/science.at.home/

"Science At Home continues contributing to physical-science literacy and content, in the classroom and in children's homes."

Science Education Program Coordinator

Science Education at Los Alamos National Laboratory

Photo information

Front cover, top to bottom
John Flower
Gary Warren
Grant Heiken
Gary Warren

Back cover, top to bottom
John Flower
John Flower
Omar Juveland
Gary Warren

Inside document
p. vi Gary Warren
p. 4 Mike Kolb
p. 5 (top and bottom) Rick Alexander
p. 8 RN98128086 Presley Salaz
p. 9 Mick Greenbank
p. 10 (top) RN98114029 John Flower
p. 10 (bottom) RN98114004 John Flower
p. 11 RN98114041 John Flower
p. 12 RN98180010 John Flower
p. 13 (top) RN98180055 John Flower
p. 13. (bottom) Howard Bryant
p. 14 Grant Heiken
p. 18 Mike Kolb
p. 19 Hallie A.V. DeAguero
p. 20 Mike Kolb
p. 21 CN8504263 Tom Velarde
p. 22 RN98120022 John Flower
p. 23 (top) RN98127044 John Flower
p. 23 (bottom) RN98120002 John Flower
p. 24 RN98121006 Gary Warren
p. 25 Hallie A.V. DeAguero
p. 26 RN98343001 Gary Warren
p. 27 Sandra N. Landry
p. 30 Pat Eker
p. 31 Pat Eker
p. 34 (top and bottom) Omar Juveland
p. 35 Omar Juveland
p. 38 RN97284029 Gary Warren
p. 39 Mike Kolb
p. 40 Gary Warren
p. 43 Gary Warren

Access our programs through a central Web site:
http://education.lanl.gov/
You can also visit individual program sites.

Advanced Composition Explorer
http://set.lanl.gov/programs/ace/

AIMS Fluid Instabilities Curriculum Development
http://education.lanl.gov/programs/aims.html

American Indian Community and
Science Education Partnership
http://set.lanl.gov/programs/aicsep/

Bradbury Science Museum
http://www.lanl.gov/external/museum/

Critical Issues Forum
http://set.lanl.gov/programs/cif/

Educational Pipeline for Student Initiatives
Linked on the Network
http://set.lanl.gov/programs/epsilon/

Graduate Student Work and Research Programs
http://www.hr.lanl.gov/students/gra.html

High School Student Work Programs
http://www.hr.lanl.gov/students/hs.html

Historically Black Colleges and Universities Program
http://stb.lanl.gov/up/programs/hbcu.html

LANSCE Educational Tours
http://set.lanl.gov/programs/lansce/

Los Alamos Physics Summer School
http://www.phys.unm.edu/LASS/

Los Alamos Space Science Outreach
http://set.lanl.gov

Massachusetts Institute of Technology Engineering
Internship Program
http://education.lanl.gov/programs/eip.html

Mentored Collaborative Research Project
http://stb.lanl.gov/up/programs/mcrp.html

National Consortium for Graduate Degrees for
Minorities in Engineering and Science
http://stb.lanl.gov/up/programs/gem.html

National Physical Science Consortium
http://stb.lanl.gov/up/programs/npsc.html

New Mexico Supercomputing Challenge
http://www.challenge.nm.org/

Oak Ridge Institute of Science and Education
http://stb.lanl.gov/up/programs/orise.html

Postdoctoral Fellowships
http://www.hr.lanl.gov/postdoc/

Robotics Workshop
http://sst10a.lanl.gov/robot/html/web.html

Service Academy Research Associates
http://lanl.gov/programs/DoD/military/sara.html

Science at Home
http://education.lanl.gov/resources/science.at.home/

Summer of Applied Geophysical Experience
http://geont1.lanl.gov/sage/sage.htm

Teacher Opportunities to Promote Science
http://set.lanl.gov/programs/tops/

Two-Year College Initiative
http://stb.lanl.gov/up/programs/rtyci.html

Undergraduate Research Semester
http://education.lanl.gov/resources/urs/

Undergraduate Student Work and Research Programs
http://www.hr.lanl.gov/students/ugs.html

Underrepresented Minority and Female Program
http://stb.lanl.gov/up/programs/urmf.html

Volcanology
http://geont1.lanl.gov/page1/student/volcan/volcan-prog.htm

Web of Learning
http://set.lanl.gov/programs/learning

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