



Teacher Professional Development Programs in Science and Technology

The world's largest laser, fastest supercomputers and most productive carbon dating facility—these are just some of the phenomenal scientific resources at Lawrence Livermore National Laboratory (LLNL), a premier research facility located in Livermore, California. As a Department of Energy (DOE) national lab, LLNL helps enhance science and technology education with college-accredited professional development programs for middle- and high-school science teachers.

Programs are conducted in partnership with the University of California (UC) and California State University (CSU) and are aligned with the Science Content Standards for California Public Schools and the California Standards for the Teaching Profession. They leverage LLNL's world-class research staff and facilities to give teachers an up-close look at the significant science and exceptional engineering conducted at a renowned national laboratory. A team of LLNL scientists, UC and CSU science educators and master science teachers collaborate to create quality programs and comprehensive instructional materials.

The Laboratory's professional development programs for science teachers are described below. Some are designed for credentialed teachers, and others are for pre-service and emerging teachers and offered solely to CSU students. U.S. citizenship and advance registration are required unless otherwise noted.

Credentialed Teachers

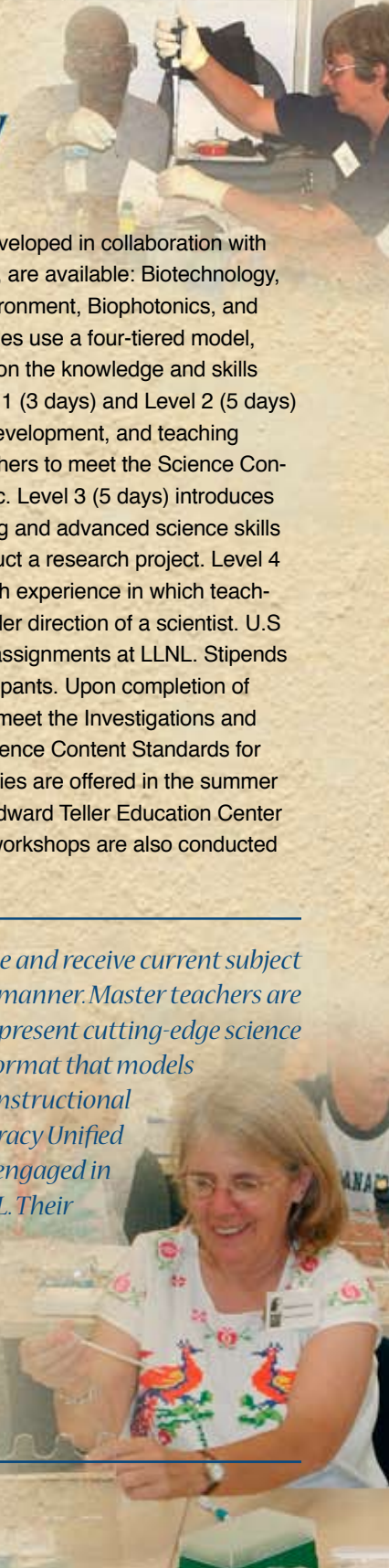
Science on Saturday (SOS) is a series of 90-minute science presentations geared to middle- and high-school teachers and students. The lectures are presented by LLNL scientists partnered with master science teachers. Each presentation has two components: fundamental science, followed by an example of related cutting-edge research conducted at the Laboratory. Teachers attending SOS receive a CD ROM containing the presentation for use in the classroom. A SOS Web site provides additional teaching resources, including lessons related to the talk and reference materials. Science on Saturday presentations are held at various locations, including Livermore and Tracy. To encourage participation, many teachers provide extra credit for students who attend SOS presentations. Registration is not required. Admission is free and open to the public. (<http://education.llnl.gov/sos/>)

The **Teacher Research Academy** offers middle- and high-school science teachers a unique experience in professional

development. Four academies, developed in collaboration with the UC Davis School of Education, are available: Biotechnology, Energy Technologies and the Environment, Biophotonics, and Fusion/Astrophysics. The academies use a four-tiered model, with succeeding levels building upon the knowledge and skills gained in the previous level. Level 1 (3 days) and Level 2 (5 days) provide content knowledge, skill development, and teaching strategies sufficient to enable teachers to meet the Science Content Standards for the chosen topic. Level 3 (5 days) introduces research methods, technical writing and advanced science skills for teaching students how to conduct a research project. Level 4 (6-8 weeks) is a mentored research experience in which teachers conduct scientific research under direction of a scientist. U.S. citizenship is required for Level 4 assignments at LLNL. Stipends may be provided for Level 4 participants. Upon completion of Level 4, teachers are prepared to meet the Investigations and Experimentation Standards for Science Content Standards for California Public Schools. Academies are offered in the summer and conducted by the UC Davis Edward Teller Education Center (ETEC) located at LLNL. Level 1 workshops are also conducted

"ETEC attracts teachers to come and receive current subject specific content in a unique manner. Master teachers are partnered with scientists to present cutting-edge science content in a hands-on format that models up-to-date pedagogy and instructional methods. Teachers from Tracy Unified School District are actively engaged in the programs offered at LLNL. Their experiences have improved their teaching skills and motivated their students."

*—Kirk Brown,
Science Department Chair,
Tracy High School*





at ETEC-affiliated partner locations in the Central Valley. Participants may earn extension credit from CSU Chico or graduate credit from CSU East Bay applied toward a Masters of Science in Education, curriculum option. (<http://etec.ucdavis.edu/academies/>)

LLNL hosts teachers in the DOE **Academies Creating Teacher Scientists (ACTS) program**. ACTS aims to create a cadre of outstanding science and math teachers with the content knowledge and scientific research experience needed to serve as leaders in their local and regional teaching communities. This three-year program uses the mentoring talent at LLNL and other DOE national laboratories to guide and enrich teachers' understanding of the scientific and technological world. ACTS teachers at LLNL participate in the Lab's Teacher Research Academy for their selected field of research. They also establish long-term relationships with their mentor scientists and teaching colleagues, who continue to support the educational efforts of the ACTS teachers when they have returned to their classrooms. Stipends and other funding support for the teachers are provided by DOE. (<http://education.llnl.gov/doeacts/>)

"The DOE ACTS experience is truly rewarding. Going through the Biotechnology Teacher Research Academies 1, 2 and 3 opened my eyes to an opportunity that many in my profession and home state only dream about. As a result of this experience, I will be designing and teaching the first-ever biotechnology course at Waipahu High School."

*—Mike Sana,
Science Teacher, Waipahu High School, Hawaii*

Pre-Service and Emerging Teachers

The **Edward Teller Science and Technology Education Symposium** is a one-day event for CSU science students planning to enter the CSU teacher credential program. Students participate in science lectures and hands-on activities conducted by LLNL researchers and master teachers to develop their understanding of how science at a national laboratory is applied to solve problems. Students also tour LLNL research facilities. The symposium links to the CSU Science Teacher and Research Program, where students can apply to participate in a research internship at a California DOE national laboratory, including LLNL. (<http://education.llnl.gov/etsymposium/>)

The **Science Teacher and Research (STAR) program** is open to CSU undergraduate science majors entering their senior year in the fall who have declared an interest in pursuing a single-subject teaching credential and graduate students entering or in a CSU teacher credential program. STAR is offered in partnership with CSU, LLNL and DOE. STAR participants engage in an 8-week mentored research project at LLNL. The program also includes science and teaching symposia and opportunities to interview and network with master teachers. A stipend is provided by CSU. (<http://cesame.calpoly.edu/STAR.htm>)

Further Information

For additional information about LLNL professional development programs for science teachers, including online registration, go to the Lab's Education Web page (<http://www.llnl.gov/llnl/education/>) or contact Richard Farnsworth, Science Education Program, at (925) 422-5059 or farnsworth1@llnl.gov.

