

Science Education in the National Interest

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Lawrence Livermore National Laboratory's commitment to science education finds its roots in the close relationship between Livermore Laboratory and the University of California, and in the realization that the leading edge research conducted at the Lab requires the development of skills that are not always readily available from academia. One of my goals when I became Director of the Science & Technology Education Program in May 1998 was to expand our education activities to help ensure a highly skilled, diverse laboratory workforce. This goal is being accomplished in part by engaging students as research interns in the Lab's mission-based, science programs with access to our state-of-the-art facilities.

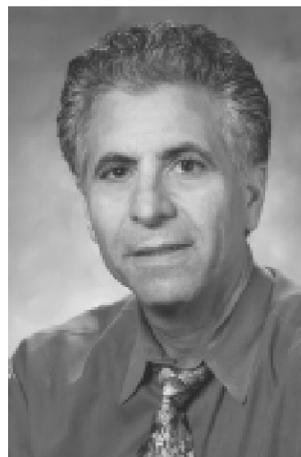
It has also become apparent that the decline in students enrolling in undergraduate majors of interest to Livermore Lab, such as physics, requires additional components be added to our education activities. As reported by American Institute of Physics (AIP Enrollments and Degrees Report, January 1998), with respect to U.S. students, the number B.S. degrees in physics has declined for the past seven years, leading to a 17% reduction. The negative slope in the number of degrees is not anticipated to change over the next few years.

Thus a decision was made to increase career counseling by researchers in our existing internships. A new education-research-counseling theme (see figure 1) was developed for our science education projects involving pre-college, undergraduate, and graduate students, with an emphasis on undergraduates attending four-year colleges and universities. The 'road-map' of figure 1 attempts to help students answer the question "what is the path that must be chosen to enter a challenging and rewarding career within science, mathematics, engineering, and technology disciplines?" Certainly the skills and training a research intern acquires are common factors to success in undergraduate curricula, graduate school, and technical careers.

Our experience at Livermore Lab mirrors that of our education and research colleagues at other institutions—career counseling combined with internships effectively increases the number of students entering scientific careers. Being involved in world-class research provides interns with a set of experiences that support their education and career goals. At the same time, it is a proven method for attracting students to the lab's mission-based science and technology. We

offer numerous internships to undergraduate and graduate students that provide opportunities to become part of a professional team.

The Undergraduate Research Semester (URS) is one of our programs with all of the above education-research-counseling components. The URS is available at each of the three Department of Energy, Defense Programs National Laboratories: Lawrence Livermore, Los Alamos, and Sandia. Interns work with mentors or scientific teams engaged in long-range, multi-discipline investigations. Appointments are usually for one semester or 17 weeks during the academic year. Students participate in seminars, workshops, and coursework designed to supplement the research experience and to help them address their questions about technical careers. Selection is based on academic references and merit, career goals, and availability. Research opportunities are available in such mission-based topics as electro-optics, large-scale computing and environmental protection. Figure 2 shows three former Livermore Lab URS interns, from top to bottom: Thomas Hall, Edgar Harding, and Anabel Miranda.



Dr. Don Correll

Hall worked in the operations engineering group of the National Ignition Facility laser construction project at Livermore Lab. He presently is working as an employee in the optics assembly areas of that facility. He will attend graduate school in fall 1999 working on a M.S. in robotics/controls. Harding did research on earthquakes and the San Francisco Bay Bridge. He recently earned a B.S. in civil engineering at Mississippi State University. His internship at Livermore Lab connected him with a UC Berkeley professor who offered an opportunity for graduate research. Miranda worked on the effects of bacteria to the overall corrosion rates of waste packages that could potentially be deposited for long-term storage at Yucca Mountain, Nevada.

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She has accepted another internship at the Lab while waiting to start graduate school in fall 1999 for doctoral studies in immunology and genetics.

These students are a recent representative sample of the 132 URS interns that spent a semester of their undergraduate education at Livermore Lab, 1995 through 1998. Of these interns, 30% pursued graduate school, 50% returned as summer employees, and more than 5% became career lab employees.

The banner for Livermore Lab's web home page (www.llnl.gov) reads "Science in the National Interest," which succinctly describes how the Lab's research is focused on issues of national importance. The Science & Technology Education Program's activities are described on our home page (education.llnl.gov) under a parallel banner "Science Education in the National Interest." If students can be part of the Lab's scientific inquiry, then they will have direct experience in "science in the national interest."

I invite CAMP participants to visit our web sites and consider whether a research internship might support your ultimate educational and career goals.

Figure 1. A common theme of Livermore Lab's science education projects is the integration of education, research, and career counseling for students, especially undergraduates attending all types of two- and four-year colleges and universities.

EDUCATION	RESEARCH	CAREERS
Graduate	Scientific Research	Professional Science & Engineering
Undergraduate	Research Training	Senior Technical & Engineering
Pre-College & Community College	Research Exposure & Skills	Technical

Figure 2. Undergraduate Research Semester interns, above, have the opportunity to become involved in Department of Energy research, working with mentors or scientific teams engaged in long-range investigations and using advanced facilities and equipment. CAMP participants are encouraged to visit the URS website.

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Don Correll earned a B.S. in physics at Cal State Long Beach and a Ph.D. in plasma physics at UCI. He joined LLNL in 1976, and has taught plasma physics at UC Davis. His career has evolved from research scientist to science management to science education.

