

# Students and Researchers Partner for Summer Projects

**A**N immigrant from China and the first college-bound member of his family, Zhi Liao puzzled over choosing a career. Career preference tests indicated he would make an ideal air traffic controller, so he headed to college with that suggestion in mind. However, it took a junior-year summer internship at Lawrence Livermore in laser optics for Liao to find an enduring vocational passion. “Until my internship, I didn’t know what it is laser scientists do,” says Liao. “As a summer intern, I was inspired to learn more, and I wanted to come back.” He came back to do research at Livermore twice more while working toward his Ph.D. in optics, and the third time to stay, as a staff scientist at the National Ignition Facility.

Each year, the Laboratory welcomes several hundred students who spend their summer assisting Livermore scientists with research. Internship opportunities during the academic year are expanding but still less common. According to Barry Goldman, manager of many student internship programs and member of Livermore’s Strategic Human Resources Management organization, the summer internship experience is most often a confirmation that students have chosen a career path and course of study that suit them. But for some, such as Liao, direct exposure to the Laboratory’s robust and diverse research programs is a revelation, leading students in a direction they had never before

NIF scientist and former intern Zhi Liao (second from left) works with his summer interns. Like many Lawrence Livermore researchers, Liao sees mentoring students as a way to give back to the community and help train future scientists.



imagined. Goldman says, “One never knows what might spark or focus a student’s interest.”

### **Aspiring Auditors Choose Livermore, Too**

Livermore paid and unpaid internships are primarily available in science, engineering, and technology, the Laboratory’s well-known strengths. But opportunities have also broadened in recent years to include other essential disciplines that help keep a highly respected national laboratory running smoothly. Internships in areas such as law, finance, and project management introduce a broader cross section of students to the Laboratory and what it has to offer. College junior Matt Spaur recently completed his second summer in Livermore’s Independent Audit and Oversight Department, reviewing expense reports, conducting interviews, and verifying payroll, among other auditing tasks. Before Spaur began his internship search, he had never heard of Lawrence Livermore nor had he any experience in auditing. Now, after two summers of intensive and rewarding on-the-job experience, the business administration major intends to pursue a career as an auditor. “To get hands-on experience in a career I am interested in is priceless,” says Spaur.

Summer opportunities at the Laboratory are available for mature students at all stages of career exploration and study, from the occasional exceptional high school student to eager undergraduate students and graduate students who have finely honed their research passion. Most students are hired for the summer as paid interns through the Scholar Employment Program. This summer, just 240 students were accepted to the program, out of several thousand applicants.

A smaller but growing number of students—158 this summer—are brought in through the Academic Cooperation Program, the Laboratory’s unpaid internship program. In this program, a student may receive course credit or may be sponsored by an external agency such as the Department of Homeland Security or the Department of Energy’s (DOE’s) National Nuclear Security Administration. These two paths to coveted Laboratory internships attract motivated students from across the nation with strong academic credentials.

### **Real Work, Not Busywork**

Internships at Livermore offer students much more than an impressive resume entry—they give students the time and resources needed to expand or develop career-related skills and the opportunity to receive specialized training and experience from professionals in their field. Opportunities originate with researchers or staff members, who need student assistance on a project and either post the project on the Laboratory’s jobs Web site ([careers.llnl.gov](http://careers.llnl.gov)) or indicate their interest and availability to the manager of a particular internship program. Once a student and researcher are paired by the program manager, the student assists the researcher during the summer academic break—whether in the laboratory or at a computer, working one-on-one or with

team members—in accordance with project goals and criteria determined between them.

Liao now hosts his own summer students and also manages the Student Internship Program for the National Ignition Facility. As he helps match students with projects, Liao works to ensure that internships are formulated to benefit both parties. “We need to make sure that the projects are appropriate for both the mentor and student,” says Liao. “A balance is required to keep the students interested and productive.”

Attention to the learning component of internships makes summers at the Laboratory a far cry from the coffee making and paper shuffling of a stereotypical internship. Here, interns make real contributions to research projects. Klint Rose, engineer and winner of a DOE 2009 Outstanding Mentor Award, says, “I put my students right on the critical path. They do real projects with real impacts, and the result is that they appreciate making a contribution.” Rose’s interns have made essential presentations and conducted demonstrations for high-profile audiences. As a former Livermore intern himself, he understands what students are hoping for from an internship. “My student experience helps me know what is reasonable as a summer project, what will help a student grow and not just be busywork,” says Rose.

### **Learning Experience for Mentors and Students Alike**

John Knezovich, also a former summer student, is director of Strategic University Relations, the Laboratory’s point of contact for all DOE summer programs. According to Knezovich, what catches students by surprise is how researchers dispense with titles and hierarchy and treat them as team members and colleagues. “Students and researchers get their hands dirty together, solving problems,” says Knezovich. “Students appreciate and see the value of interdisciplinary teams, which is the hallmark of what we do.” Not only is the interdisciplinary, egalitarian work environment a refreshing contrast for many students familiar with the more rigid disciplines and traditional hierarchies of a university setting, but it also introduces students to founder Ernest O. Lawrence’s vision of team science—solving seemingly intractable problems using all available tools and resources.

Solid career experience, real responsibilities, and treatment as a peer are what students value most about a Livermore experience, according to exit surveys conducted by Goldman. These features attract and retain stellar students. A full quarter of this summer’s interns are students who have returned to the Laboratory to continue their research or explore a new topic. All undergraduate interns are encouraged to submit abstracts and papers to DOE’s *Journal of Undergraduate Research* at the end of the summer—for many, their first opportunity to publish research. Sometimes, discoveries during summer internships have even led to unique opportunities for students to coauthor papers or copresent posters at a science conference. Physicist Don Correll of the Physical and Life Sciences Directorate has been involved with student programs

in various capacities for many years. He notes, “A summer at the Lab raises the level of scientific knowledge for students. They experience the highest caliber of research. Individual mentors are the people who make all of this possible.”

For mentors, the experience has its own rewards. Many mentors are former summer students themselves who view mentoring as a way to give others the same opportunity. Both Rose and Liao mentor several students each year. Interns naturally bring extra help to short-handed projects, but they also provide a fresh perspective, someone who may question a process and cause researchers to rethink their assumptions or methods. Working with students also gives mentors a chance to exercise their teaching and managerial skills. According to Goldman, “Mentoring helps Livermore researchers retain their connection to academia, to see what is being taught and which technologies are being used for research.” Select mentors gain broader recognition for their efforts through the student-nominated Outstanding Mentor Award Program administered by DOE’s Office of Science.

### Long-Term Connections Start with Internships

Hosting outstanding student interns is a win–win situation. Goldman sees summer programs as an opportunity to build a long-term relationship with students and establish Livermore in their minds as a leading scientific laboratory. One Academic Cooperation Program that he manages, the Military Academic Research Associate (MARA) Program, brings midshipmen, cadets, and faculty in U.S. military branches to the Laboratory for a month—only one-third the length of most internships—to experience Livermore’s research offerings. MARA is a model program for the National Nuclear Security Administration, which is looking to expand its national laboratory–military collaborations. The program enables academy instructors to expand and build on their teaching curriculum. In addition, it gives future military officers familiarity with and respect for the Laboratory and how its research contributes to the Department of Defense.

According to Goldman, the summer programs also function as a “pipeline” to attract promising students to a career at Livermore. Many Laboratory researchers and administrators are former summer students, including Director Emeritus Bruce Tarter. While not all of the students will return to work at Livermore after graduating, other long-term benefits are seen in bringing in summer students. Says Goldman, “If students go on to work in industry, the opportunity may arise for further collaboration. If they

Livermore summer interns from the Military Academic Research Associate Program, ROTC, and other student programs pose at Pony Tracks, a collection of tanks, in nearby Portola Valley, California. Occasional student field trips to relevant science, engineering, and national security destinations supplement their daily internship tasks.

go on to academia, they may send students to Livermore as well as have a desire to collaborate.” Past internships have led to fruitful professional partnerships between former students and Laboratory researchers.

### Events Spur Friendship and Networking

Goldman has been managing various Livermore internship programs for 12 years. One of his most enduring contributions is the creation of the Institutional Education Committee (IEC), which includes representatives from departments across the Laboratory. The committee plans a broad range of summer activities to engage students of various ages and interests. Events this summer included tours of the Joint Genome Institute in Walnut Creek, California, and Livermore’s High Explosives Applications Facility; social activities such as barbecues and an ever-popular rafting excursion; research talks and panel discussions by scientists; and seminars on the practice of science, including understanding patents and how to write an abstract. These events are optional and open to all Laboratory students.

Rose chose to spend his summer internships working mostly at his desk or in the lab, with limited social interaction, he admits with a laugh. He has come to value the student activities and now encourages his students to take full advantage of the offerings. Not only are the activities an opportunity to meet students and researchers with whom they may later interact, but the events also expose students to the breadth of research performed at the Laboratory. Students can be surprised to discover that some





A student discusses her summer research results with Livermore physicist Don Correll at a student poster symposium. Held each August, the event is modeled on professional scientific poster sessions and offers students presentation experience and networking opportunities.



long-time employees have had multiple careers while at the Laboratory because of the diversity of research offerings.

A summer highlight is the student poster symposium, held every August and attended by many Livermore researchers. This event is modeled after the poster sessions at a professional scientific meeting, and all summer students are invited to participate. Correll, one of the creators of the student poster session, is pleased with the results. He says, “When Lab scientists come, they see what they’d find at a professional session. The students produce an excellent set of posters.” Many mentors encourage students to start thinking about their posters as soon as they arrive. According to Correll, the poster work forces students to consider not only how to present technical content but also how to create a pleasing and instructive visual presentation—useful professional skills in most any field. The poster session offers a satisfying conclusion to a summer of career immersion and hands-on experience.

The Laboratory’s enduring relationship with the University of California has imbued its staff with strong support and respect for education and career preparation opportunities. Fewer high schools offer career counseling services, and yet many more students attend college, many of whom are the first in their family to do so. The nation has a strong need for institutions to provide opportunities that guide students toward a good career match and encourage outstanding students to consider graduate-level education. The Laboratory’s internships are a valuable resource for inspiring students and help them steer a confident course toward their future career.

Laboratory management strongly supports and values the summer student programs and what they offer both the Laboratory and the student community. “Summer students give as much or more to the Laboratory as they receive from us,” says Laboratory Director George Miller. “They bring a special curiosity and enthusiasm for learning. They often energize project teams and rekindle our thirst for knowledge, reminding us of the reasons we chose careers at a national laboratory.” Whether summer students continue on to graduate school or enter the working world, exposure to the Laboratory’s innovative, multidisciplinary approach to tackling tough projects provides practical experience that they can draw on time and again.

—Rose Hansen

**Key Words:** Academic Cooperation Program, Institutional Education Committee, Military Academic Research Associate (MARA) Program, Outstanding Mentor Award, Scholar Employment Program, Student Internship Program.

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