

Employees Keep Up with the Times

THE times keep changing, requiring employees to keep up with their own rapidly evolving fields—whether it's mechanical engineering, computer science, biomedical informatics, or organizational management. At Lawrence Livermore, the Education Assistance Program helps promote a workforce that has the necessary skills and knowledge to address mission-critical activities. Kathy Zobel, program leader for the Education Assistance Program, says, "The Laboratory has always had to compete with private employers for workers with advanced skills, but even more significant is the need for constant skills growth and development. In particular, in scientific and engineering communities, where the bar can be raised overnight, ongoing opportunities to learn are a necessary strategy for survival."

Livermore's senior management agrees. Dona Crawford, associate director for Computation, says, "Employee development is advantageous to all areas of the Lab, but it is of paramount importance in computing, where the technologies are constantly evolving. Our vitality depends on a vibrant, skilled, productive, dynamic workforce."

Forging Links with Universities

Since the early days of its existence, the Laboratory has supported further education for its employees. In the 1960s, Laboratory cofounder Edward Teller worked with the University of California (UC) at Davis to create the Department of Applied Science. That connection, along with another forged later with Stanford University, has endured and strengthened. In the 1970s, Livermore, UC Davis, and Stanford created a microwave link to offer graduate classes on site to Livermore engineers and computer scientists.

Over the past decade, 355 employees have participated in B.S., M.S., M.B.A., and Ph.D. programs, 61 in A.A. and A.S. programs, and 180 in certificate programs. Nearly 210 employees have obtained degrees, with many others now in progress. Employees also have opportunities to enroll in occasional work-related classes to enhance their skills without entering degree or certificate programs.

Zobel notes that advanced degrees, in particular, lead employees to provide ever-more sophisticated technical contributions—a requirement for a premier research and development organization such as Livermore. Since 2003, 70 percent of those receiving advanced degrees through the Education Assistance Program have been



*“The foundation of every state
is the education of its youth.”*

—Diogenes Laërtius

promoted or had other major career advancements. Monya Lane, associate director for Engineering, notes, “When these employees become involved in further education, they not only improve their own skills but also raise the technical level of the Engineering Directorate overall.” She adds that some individuals who have continued their education at the Laboratory began their careers as engineering technicians and eventually became senior managers.

For example, Donald Boyd, principal associate director for Operations and Business, joined Engineering in 1977 with an M.S. in engineering from Massachusetts Institute of Technology. He went on to obtain a Ph.D. in materials science from UC Davis, using resources provided by the continuing education program. This commitment helped him rise through the ranks within Engineering and later at the Pacific Northwest National Laboratory. From his current position as a senior Livermore manager, Boyd encourages interested staff to simultaneously continue their education and their careers. “The Education Assistance Program is a great resource for career development that I heartily support,” he says.

The Laboratory also provides tuition assistance for qualified employees. To apply, employees turn in education plans to the Student Policy Committee for review and approval. Course work and degrees can be obtained from regionally accredited institutions, from UC Berkeley to the University of Alabama. Degrees can be completed concurrently with full-time employment at the Laboratory. Employees may also request tuition assistance to take two job-related classes a year in a wide range of fields.

But it’s best to let those who have “been there, done that” speak to the experience.

Get a Job, a Ph.D., or Both?

When Tim Dunn interviewed at Livermore in 1998, he had just received his master’s in aeronautical and astronautical engineering from the University of Illinois. He was undecided whether to get a job or continue his education, but as it turned out, he didn’t have

to choose. Through the Education Assistance Program, he earned a Ph.D. in mechanical and aeronautical engineering from UC Davis, graduating in 2011.

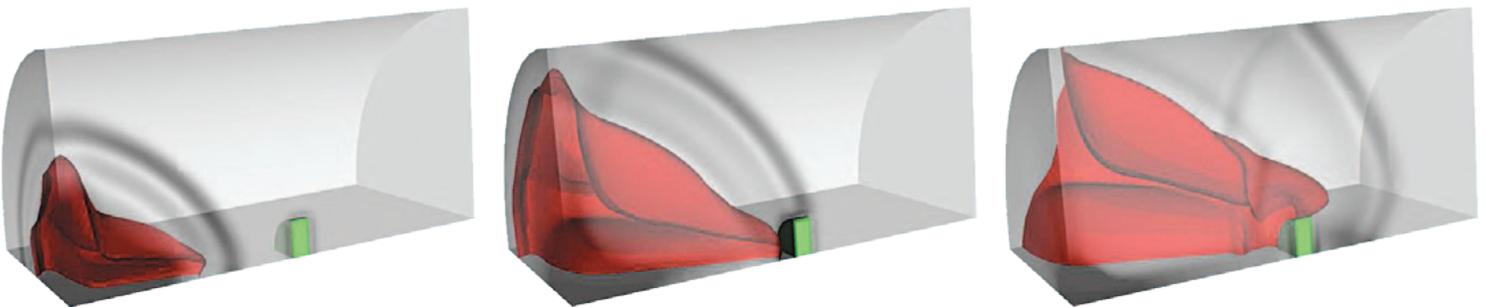
Earning a doctorate degree is a challenging process, and even more so when the student works full-time. However, in Dunn’s case, the process was made easier with the Laboratory’s assistance. Dunn explains, “Before I enrolled in the Ph.D. program, I took a couple of Davis classes to see if learning through the TV link would work for me. Those classes, combined with the ones I’d completed for my master’s, transferred over, which shortened the process.”

In his Ph.D. work, Dunn turned to a project he already supported: the ALE3D code. ALE3D is a two- and three-dimensional multiphysics numerical simulation tool for examining hydrodynamics and structures. Scientists use ALE3D to model detonation, deflagration, and convective burn processes of high explosives, propellants, and more. The code includes a multiphase portion for modeling mixtures of solids, liquids, and gases. For his dissertation, Dunn created new algorithms to model multiphase flows, extending ALE3D’s capabilities. He says, “Modeling explosives is one application of this research that is of interest to the Lab. An explosive consists of a granular solid, infiltrated with gas. An explosive reaction can result in complex interactions between the gas and solid phases. Researchers want to understand this phenomenon in more detail.”

While obtaining a Ph.D., Dunn depended on the Laboratory’s Education Office for assistance. “I would bring the staff my completed course work assignments, and they would time stamp and fax in my work,” he says. “The staff also proctored my exams and helped with paperwork. It was a great program from which I benefited.”

Exploring New Fields

Biomedical engineer Haiyin Chen came to Livermore from Johns Hopkins University as a postdoctoral researcher in 2009. What drew her to Livermore, and what helps keep her here, is the



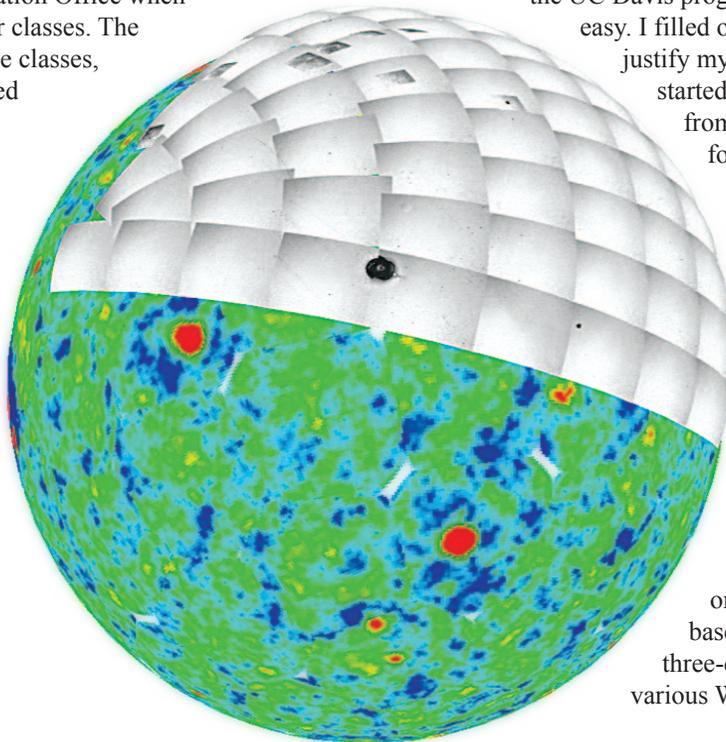
Tim Dunn created a multiphase flow capability for the hydrodynamics code ALE3D. In the simulation shown here, a high-pressure gas mixed with inert particles sends a shock into a steel plate (green). The dark shadows indicate the shock front, and the red contour is the particle front.

range of research conducted and the opportunities to participate. “The Lab is a wonderful place to work—one can continue to grow and add to one’s original skill set,” says Chen. “The Education Assistance Program is an important benefit offered by the Lab to its employees. I can apply new skills learned in the classroom to my present job, enhancing my contribution.”

Before coming to the Laboratory, Chen’s research focused on neural control of movements, a field that blends neuroscience, control theory, and computation. Thanks to the Education Assistance Program, she has added bioinformatics to the knowledge base she brings to her projects. She explains, “One of my first projects at the Lab involved examining the accumulation of starch in algae cells in a microfluidics device. Working on that project, I realized a revolution was happening in genome science as a result of breakthroughs in high-throughput sequencing technologies. I already had a keen interest in bioinformatics, particularly in mining genomic sequencing data, and I wanted to learn more and apply bioinformatics to my work in biology.”

With her group leader’s encouragement, she researched educational programs and discovered that Stanford offered a graduate certificate in biomedical informatics. The short course of study focuses on understanding techniques for analyzing biological data from recent genomic research. This past June, Chen completed the course requirements, working at her own pace and viewing the Web-based lectures on evenings and weekends. “My upper management was very supportive, as was Kathy,” says Chen. “I contacted the Education Office when I needed to sign up for classes. The Laboratory paid for the classes, and Kathy administered exams here on site.”

Dan Potter’s Target Viewer maps images of a National Ignition Facility BB-sized target in a three-dimensional sphere, allowing users to zoom around the target in a Web-based application similar to Google Earth.



While working on her certificate, Chen applied her new skills to a project that examines how viruses evolve and mutate both in natural hosts and in laboratory cell lines. Her work includes searching for markers that enable viruses to transmit from one host to another. Chen believes it’s important to learn new skills by taking on varied projects and working with others doing cutting-edge research. “The Education Assistance Program prepared me to enter a new area of research and gave me the opportunity to learn from professors renowned in their fields,” she says. “It’s a privilege to have this program available.”

Master’s Project on Target at NIF

Computer scientist Dan Potter came to Livermore as an undergraduate summer student, while completing his computer science degree and applying to graduate schools. “Coming here really opened my eyes, and working at NIF [the National Ignition Facility], the world’s largest and most energetic laser, has been an amazing experience,” he says. Potter continued working at NIF through his winter-term graduation, intending to start graduate school at UC Davis the following fall. But things changed. “NIF’s contributions to energy research made me realize I wanted to continue my efforts at NIF,” says Potter. “My decision to stay was met with enthusiasm, but I also was strongly encouraged to pursue an advanced degree. Luckily, I could do both.”

Potter applied for a full-time position at NIF and deferred enrollment at UC Davis. He says, “When the time came to begin the UC Davis program and blend it with my job, Kathy made it easy. I filled out the paperwork, met with my managers to justify my education plan, and enrolled.” Soon after he started his course work, Education Assistance moved from the TV system to Web-based learning. Potter found the new system convenient: He could view lectures on his computer on his own time, versus scheduling classes to attend at noon onsite or taking VHS tapes home for later viewing.

For his master’s project, Potter created a Web-based application for visualizing NIF target data. He says, “Just as Google Earth allows one to rotate and zoom in and out over Earth’s surface, my application, Target Viewer, allows NIF scientists to interactively explore target surfaces.” Previously, NIF scientists had to examine hundreds of target surface images, either in small static groups or one at a time. Target Viewer replaced this onerous process. Potter used WebGL—a Web-based graphics library that enables real-time three-dimensional rendering capabilities to run within various Web browsers. In addition to zooming and



(left) Landruff Trent of Mechanical Engineering assists employees taking a microwave-transmitted TV course in the 1970s. (below) Today, employees can watch a Web-based streaming lecture on a computer from their home or office (shown here Haiyin Chen).

moving about a target's surface, Target Viewer users can simultaneously compare two target surfaces or examine one target from multiple perspectives. The NIF target group began using Target Viewer instantly. "It was a worthwhile experience," says Potter. "I was doing grad work and supporting the project as well as getting immediate feedback from users."

As is often true, the experience had extended benefits. Not only did Potter obtain his master's degree, he also developed a useful tool that was applied. Furthermore, he gained visibility at the Laboratory, writing a paper and presenting a poster at last year's International Atomic Energy Association's meeting. "The project resulted in long-term benefits I had not foreseen," he says.

Potter, who gives full marks to the Education Assistance Program, says, "I don't know if I would have tackled grad school while working if the UC Davis relationship didn't exist. The program allowed me to remain part of the NIF community while earning an advanced degree, benefiting me and the Lab."

Benefits Accrue to All

Although the technology for offering courses has changed over the years, with microwave-transmitted TV giving way to Web-based streaming, the opportunity to learn and earn degrees while on the job continues to play a significant role in recruiting and retention. Monika Witte, deputy division leader of Laser Systems Engineering and Operations and chair of the Laboratory's Student Policy Committee, believes that the benefit of this education to Lawrence Livermore is tremendous.



"These individuals bring forward both Lab experience and new mission-oriented technical or organizational skills," she says. "Employees who participate are fortunate to advance their careers with both the skills gained from work experience and from continued education. I believe employees should seriously consider taking advantage of this Laboratory-sponsored education program."

—Ann Parker

Key Words: Education Assistance Program, continuing education, distance learning.

For further information contact Kathy Zobel (925) 422-9335 (zobel2@llnl.gov).