

## High-School Projects at the Laboratory for Laser Energetics (2008)

**Jay Amin** (Rush-Henrietta) built a diagnostic known as a “spectral shearing interferometer” to measure the duration and shape of ultrashort optical pulses, and demonstrated it by measuring a pulse just one trillionth of a second long. He was named a semifinalist in the 2009 Intel Science Talent Search based on this project.

**Christopher Baldwin** (Honeoye Falls-Lima) continued work started by two previous summer-program students on developing an improved database for the OMEGA EP laser system. He focused on an application that interrogates the database to calculate the changes in the timings of all diagnostic instruments that result from different beam paths being selected.

**Husain Bawany** (Brighton) created a new Web-based database system related to the cryogenic capsules filled with deuterium or deuterium-tritium fuel that are imploded on the OMEGA laser. The system, now routinely used by LLE researchers, ties together previously unconnected databases and allows the characteristics of cryogenic capsules to be correlated with implosion results.

**Krysta Boccuzzi** (Mercy) investigated the damage that occurs to solid-state imagers in digital cameras used on the OMEGA and OMEGA EP laser systems. She tracked the degradation over time and found that the number of dead pixels increased significantly after shots that produced high neutron yields.

**David Brummond** (Honeoye Falls-Lima) worked on PC-based acquisition systems as an alternative to oscilloscopes. He adapted a preexisting Java program written for oscilloscopes to monitor and save data from a PC-based system.

**Nicholas Hensel** (Fairport) made measurements of the vibrations of cryogenic fuel capsules, using a Fast Fourier Transform technique to identify resonant frequencies of the capsule support structure. The understanding and minimization of vibrations is important as the capsule must be located very close to the target chamber center if it is to implode symmetrically.

**Rachel Kurchin** (Harley) performed computer calculations of the distortions that occur when a spherical fusion fuel capsule is viewed through a transparent cylinder. She then made measurements using microscopy that verified her predictions. She was named a semifinalist in the 2009 Intel Science Talent Search based on this project.

**Alexis Kurmis** (Greece Arcadia) worked on a new counting system for high-energy neutrons produced from fusion reactions in implosion experiments on OMEGA. This involves the simultaneous detection of two gamma rays.

**Mangala Patil** (Pittsford Mendon) investigated a method of protecting sol-gel antireflective optical coatings for high-power laser systems such as OMEGA and OMEGA EP from trace contaminants. The coating is treated by exposure to vapor rather than by dipping in a solution. She tested the vapor-treated coatings by measuring their contamination resistance to vacuum pump oil vapor.

**Angela Ryck** (Fairport) performed two-dimensional hydrodynamic simulations of an alternate fusion geometry in which a fuel capsule is first imploded with long-pulse beams such as the 60 OMEGA beams and then irradiated with a short-pulse beam such as OMEGA EP through a cone embedded in the shell of the capsule. She varied the beam pointings to optimize the fuel density.

**Collin Sowinski** (Penfield) worked on methods of removing tritium contamination from surfaces. He investigated the use of a plasma for this purpose and studied the effects of varying the plasma pressure.

**Jack Stokes** (Fairport) investigated sensorless commutation of brushless DC motors for use on the OMEGA and OMEGA EP target chambers to conveniently remove mechanical equipment in the event of sensor failure. He built and successfully tested a fixture to demonstrate that this technique is viable.

**James Tsay** (Phillips Academy) looked at the optimization of x-ray backlighting diagnostics, used in many experiments, in which plasma x-ray line emission projects the shadow of a target onto a photographic film. He used an atomic physics computer code to find the optimal temperature for the production of the line emission.

**Brian Wang** (Webster Thomas) wrote a computer program to model the movement of a pulse of electrons through streak cameras. The program works out the broadening of the pulse due to Coulomb forces between the electrons and will be used to aid in the design of streak cameras that will measure ultrashort short pulses such as are produced on OMEGA EP.

**Bradley Wideman** (Fairport) measured the reflectivity of a potassium acid phthalate crystal used for x-ray diffraction in the X-Ray Laboratory at LLE. He programmed stepper-motor controllers to automate the measurement process.