2016 SUMMER RESEARCH PROGRAM FOR HIGH SCHOOL JUNIORS

AT THE

UNIVERSITY OF ROCHESTER'S

LABORATORY FOR LASER ENERGETICS

STUDENT RESEARCH REPORTS

PROGRAM DIRECTOR

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University of Rochester
250 East River Road
Rochester, NY 14623-1299

During the summer of 2016, 13 students from Rochester-area high schools participated in the Laboratory for Laser Energetics' Summer High School Research Program. The goal of this program is to excite a group of high school students about careers in the areas of science and technology by exposing them to research in a state-of-the-art environment. Too often, students are exposed to "research" only through classroom laboratories, which have prescribed procedures and predictable results. In LLE's summer program, the students experience many of the trials, tribulations, and rewards of scientific research. By participating in research in a real

environment, the students often become more excited about careers in science and technology. In addition, LLE gains from the contributions of the many highly talented students who are attracted to the program.

The students spent most of their time working on their individual research projects with members of LLE's scientific staff. The projects were related to current research activities at LLE and covered a broad range of areas of interest including laser physics, computational modeling of implosion physics, experimental diagnostic development, experimental modeling and data analysis, physical chemistry, optical design, tritium capture and storage, cryogenic target characterization, and scientific web page development. The students, their high schools, their LLE supervisors, and their project titles are listed in the table. Their written reports are collected in this volume. By working through several iterations of their project reports, incorporating feedback from their supervisors and the Program Director, the students experience most of the steps involved in preparing a scientific paper for publication.

The students attended weekly seminars on technical topics associated with LLE's research. Topics this year included laser physics, fusion, holography, nonlinear optics, atomic force microscopy, optical instruments, and pulsed power. The students also received safety training, learned how to give scientific presentations, and were introduced to LLE's resources, especially the computational facilities.

The program culminated on 24 August with the "High School Student Summer Research Symposium," at which the students presented the results of their research to an audience including parents, teachers, and LLE staff. Each student spoke for approximately ten minutes and answered questions. At the symposium LLE presented its 20th annual William D. Ryan Inspirational Teacher Award. The recipient this year was Mrs. Shayne Watterson, a chemistry

teacher at Penfield High School. This award honors a teacher, nominated by alumni of the LLE program, who has inspired outstanding students in the areas of science, mathematics, and technology. Mrs. Watterson was nominated by Emma Garcia and Felix Weilacher, participants in the 2014 Summer Program.

A total of 353 high school students have participated in the program since it began in 1989. The students this year were selected from approximately 60 applicants. Each applicant submitted an essay describing their interests in science and technology, a copy of their transcript, and a letter of recommendation from a science or math teacher.

In the past, several participants of this program have gone on to become semifinalists (now designated as "scholars") and finalists in the prestigious Regeneron (formerly Intel) Science Talent Search. This tradition of success continued this year with the selection of Webster Kehoe and Nathan Morse as two of the 300 Regeneron Scholars chosen from over 1700 applicants nationwide. In addition, Grayson Lenhard qualified to attend the Intel International Science and Engineering Fair on the basis of his LLE project.

LLE plans to continue this program in future years. The program is strictly for students from Rochester-area high schools who have just completed their junior year. Application information is mailed to schools and placed on the LLE website in early February with an application deadline near the middle of March. For more information about the program, please contact Dr. R. Stephen Craxton at LLE.

This program was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement No. DE-NA0001944.

Table I: High School Students and Projects—Summer 2016.

Name	High School	Supervisor	Project Title
Kyle Bensink	Victor	D. W. Jacobs-Perkins	Post-Shot Data Analysis Tools for Cryogenic Target Shots
Lindsay Browning	Penfield	R. S. Craxton	Development of a Standardized Saturn Ring for Proton Backlighting on the National Ignition Facility
James Hu	Brighton	R. W. Kidder	Using Social Media Technologies for Online Scientific Analysis and Collaboration
Webster Kehoe	Wilson Magnet	R. S. Craxton	Beam Pointing Optimizations for Omega Implosions
Grayson Lenhard	Prattsburgh	W. T. Shmayda	Characterizing a Cu/Mn Alloy for Extracting Oxygen from Inert Gas Streams
Joseph Mastrandrea	Webster Thomas	W. T. Shmayda	Measuring Hydrogen Pressure over a Palladium Bed
Nathan Morse	Allendale Columbia	M. J. Guardalben	Frequency Conversion Crystal Designs for Improved Ultraviolet Power Balance on the 60-Beam OMEGA Laser
Sapna Ramesh	Pittsford Mendon	K. L. Marshall	Characterization of the Electrical Properties of Contaminated Dielectric Oils for Pulsed Power Research
Archana Sharma	Webster Schroeder	A. Kalb	Design and Optimization of a Portable Wavefront Measurement System for Short-Coherent-Length Laser Beams
Jonah Simpson	Brighton	C. Stoeckl	Validating the Ion Slowing Model in the *Geant4* Toolkit
Matthew Wang	Pittsford Sutherland	C. Stoeckl	Impulse Response Calibration of a Neutron Temporal Diagnostic Using the Multi-Terawatt Laser
Leah Xiao	Webster Schroeder	R. S. Craxton	Simulations of Laser-Driven Magnetized-Liner Inertial Fusion
Joy Zhang	Penfield	R. T. Janezic	Development of a Digital Microscope for the Characterization of Defects in Cryogenic DT-Filled Targets