

**2018 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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During the summer of 2018, 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 computer modeling of implosion physics, experimental diagnostic modeling, cryogenic target characterization, physical chemistry, computational chemistry, laser beam modeling, laser flash-lamp diagnostics, web-based data analysis, and the adaption of a technique developed to visualize laser damage to high-school life-science education. 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, the National Ignition Facility, scientific measurement techniques, 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 29 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 22nd annual William D. Ryan Inspirational

Teacher Award. The recipient this year was Mrs. Jennifer Vibber, a mathematics 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. Vibber was nominated by Claire Guo, a participant in the 2017 Summer Program.

A total of 377 high school students have participated in the program from its inception in 1989 through 2018. The students in 2018 were selected from approximately 50 applicants. Each applicant submitted an essay describing his or her interests in science and technology, a copy of his or her 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 scholars (formerly known as “semifinalists”) and finalists in the prestigious Regeneron (formerly Intel) Science Talent Search. This tradition of success continued this year with the selection of Maia Raynor and Anirudh Sharma as two of the 300 Regeneron Scholars chosen from nearly 2000 applicants nationwide.

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 web site in January with an application deadline near the middle of March. For more information about the program, please contact Dr. R. Stephen Craxton at LLE.

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Table I: High School Students and Projects—Summer 2018.

| Name                | High School          | Supervisor                     | Project Title   |
|---------------------|----------------------|--------------------------------|---|
| Aditya Bhargava     | Victor               | M. J. Guardalben               | Measurement Accuracy of the Harmonic Energy Diagnostic on OMEGA EP  |
| Steven Booth        | Brighton             | W. A. Bittle and V. Anand      | Analysis Tools for Current Characteristics of Pulse-Forming Networks Driving High-Energy Flash Lamps                      |
| Carwyn Collinsworth | Brighton             | M. D. Wittman and D. H. Edgell | Real-Time X-Ray Analysis of Liquid-DT Fill Level in Full-Tube Capsules to Control Solid-Layer Thickness                   |
| Matthew Cufari      | Pittsford Sutherland | P. B. Radha and O. M. Mannion  | Modeling Charged-Particle Spectra to Diagnose Asymmetries in OMEGA Implosions   |
| Audrey DeVault      | Penfield             | C. J. Forrest                  | Spectral Moment Analysis of the Deuterium–Deuterium Neutron Energy Distribution from Inertial Confinement Fusion on OMEGA |
| Katherine Glance    | Pittsford Sutherland | W. T. Shmayda and M. Sharpe    | Measuring Isotherms of the Hydrogen-Palladium System  |
| Katherine Kopp      | Victor               | S. G. Demos                    | Microscopy with Ultraviolet Surface Excitation in Life Science Education  |
| Hannah Lang         | Rush Henrietta       | K. L. Marshall                 | Computational Chemistry Modeling of Photoswitchable Liquid Crystal Alignment Materials                                    |
| Maia Raynor         | Brighton             | W. T. Shmayda and C. Fagan     | Oxidation of Copper Zinc Alloy  |
| Margaret Rudnick    | Pittsford Mendon     | K. L. Marshall                 | Protective Polymer Coatings for Laser Optics  |
| Aidan Sciortino     | Wilson Magnet        | R. W. Kidder                   | A Containerized Approach for Data Analysis on Omega   |
| Anirudh Sharma      | Webster Schroeder    | R. S. Craxton                  | Optimization of Cone-in-Shell Targets for an X-Ray Backlighter on the National Ignition Facility                          |
| Alan Tu             | Pittsford Sutherland | A. B. Sefkow                   | Complex Ray Tracing and Cross-Beam Energy Transfer for Laser-Plasma Simulations   |