

**2019 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 2019, 14 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 experimental diagnostic development, computer modeling of implosion physics, cryogenic target characterization, experimental design, irradiation uniformity, physical chemistry, and optical materials characterization. The students, their high schools, their LLE supervisors, and their project titles are listed in Table I. 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, fission, pulsed power, holography, and LLE's cryogenic target program. 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 28 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 23rd annual William D. Ryan Inspirational Teacher Award. The recipient this year was Mrs. Rebecca Berardino, a mathematics teacher at Barker Road Middle School in Pittsford. 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. Berardino was nominated by Margaret Rudnick, a participant in the 2018 Summer Program.

A total of 391 high school students have participated in the program from its inception in 1989 through 2019. The students in 2019 were selected from just over 40 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 Simon Narang as one of the 300 Regeneron Scholars chosen from nearly 2000 applicants nationwide. In addition, four participants in the 2019 program (Ji-Mi Jang, Simon Narang, Henry Berger, and Hanna Wiandt) were selected as finalists in the InspoScience Research and Innovation Competition (2020 Virtual Edition), which attracted over 400 entrants from the U.S., Canada, and Mexico.

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.

Table I: High School Students and Projects—Summer 2019.

Name	High School	Supervisor	Project Title
Henry Berger	Brighton	C. J. Forrest	Design of a Single-Hit Neutron Spectrometer for D–D Fusion
Adelyn Carney	Webster Schroeder	H. G. Rinderknecht	Optimization of X-Ray Prepulse Geometry for Imprint Mitigation in Directly Driven Implosions
Ji-Mi Jang	Pittsford Mendon	T. Z. Kosc	Micro-Raman Spectroscopy of Silica and Hafnia Laser Damage Sites
Christopher “Jude” Kukla	Pittsford Mendon	F. J. Marshall and S. T. Ivancic	Evaluation of Fresnel Zone Plate X-Ray Imagers for Inertial Confinement Fusion Applications
Michele Lin	Attica	M. McCluskey and R. Boni	A Comparative Study of the Effects of Methanol and Ethanol Solutions on the Bulk Etch Rate of CR-39
Anthony Mazzacane	Pittsford Mendon	P. B. Radha, O. M. Mannion, and S. Miller	Using <i>IRIS3D</i> to Simulate the Effects of Smoothing by Spectral Dispersion on Cryogenic Implosions
George Morcos	Rush Henrietta	K. L. Marshall	Glassy Liquid Crystals Based on Natural Products for High-Peak-Power Laser Optics
Adam Mroueh	Pittsford Sutherland	D. Broege	Schlieren Diagnostic for the Imaging of Thermal Turbulence
Ka-Hyun Nam	Brighton	C. Fagan and W. T. Shmayda	Comparative Analysis of Oxygen Uptake in Nickel and Copper-Zinc Beds
Simon Narang	Pittsford Sutherland	M. D. Wittman and D. Bredesen	Modeling for Direct-Drive Fusion Implosions: Cryogenic Target Filling at Arbitrary Viewing Angles and Yield Prediction
Max Neiderbach	Geneseo	M. A. Sharpe, V. Anand, and R. Peck	Enhancements to the Calorimetric Measurement System on the OMEGA Laser
Stephen Rosa	Eastridge	W. T. Shmayda and M. D. Sharpe	Investigations of the Hydrogen-Palladium and Deuterium-Palladium Systems
William Wang	Pittsford Sutherland	R. S. Craxton	Development of a Beam Configuration for the SG4 Laser to Support both Direct and Indirect Drive
Hanna Wiandt	Pittsford Mendon	R. S. Craxton	Optimization of the Uniformity of 12-Quad Direct-Drive Targets for the National Ignition Facility

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