

**2022 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 2022, 16 students from Rochester-area high schools participated in the Laboratory for Laser Energetics' Summer High School Research Program (Fig.1). This was the 33rd year of the program, which started in 1989. The 2020 program was unfortunately canceled because of the COVID-19 pandemic. In 2021, LLE held a fully virtual program for students who had applied and been interviewed for the 2020 program, and in 2022 LLE was able to return to a normal, in-person program.

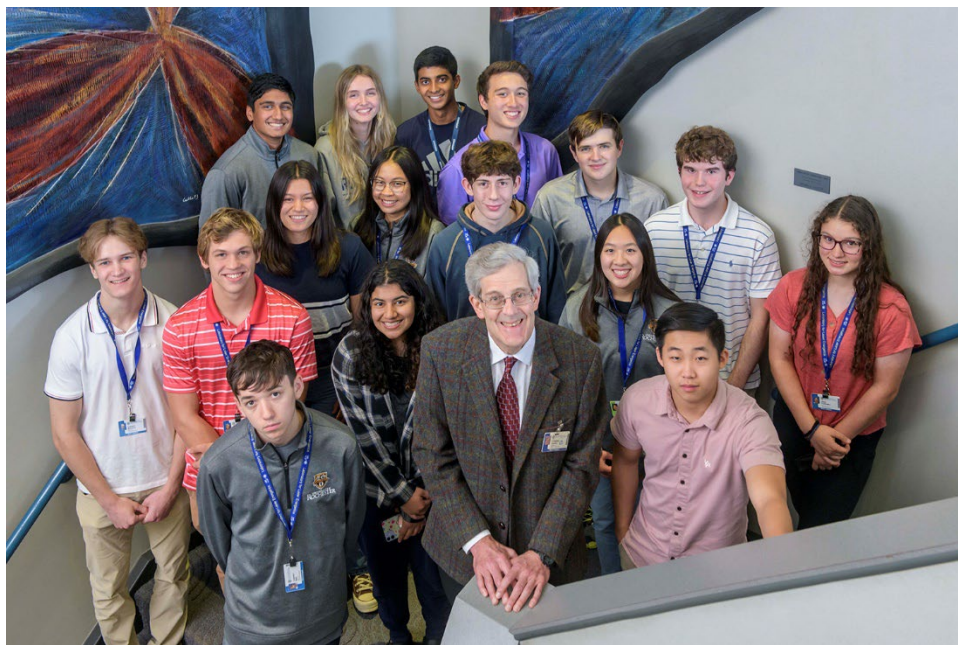


Figure 1.

Participants in LLE's 2022 Summer High School Research Program. Front Row: Cameron Ryan, Alisha Upal, Dr. Stephen Craxton, Grace Wu, Rick Zhou; Middle Row: Jackson McCarten, John Geiss, Elizabeth Norris, Jenny Zhao, Samuel Gray, David Villani, Jayden Roberts, Olivia Fietkiewicz; Back Row: Arjun Patel, Sara Davies, Vinay Pendri, and Micah Kim.

The goal of LLE's 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, physical and computational chemistry, laser physics,

optical engineering, terahertz radiation, future laser system design, and scientific data management. 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, nonlinear optics, fission energy, pulsed power, fiber optics, and LLE's cryogenic target program. The students also received safety training, learned how to give scientific presentations, were given guidance on writing scientific reports, and were introduced to LLE's computational resources.

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 eight minutes and answered questions. At the symposium LLE presented its 24th annual William D. Ryan Inspirational Teacher Award. The recipient this year was Mrs. Dawn Knapp, a mathematics teacher at Victor 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. Knapp was nominated by Semma Alfatlawi, a participant in the 2021 Summer Program.

A total of 415 high school students have participated in the program from its inception through 2022. The students in 2022 were selected from just under 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.

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.

### **Acknowledgment**

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Table I: High School Students and Projects—Summer 2022.

Name	High School	Supervisor	Project Title
Sara Davies	Pittsford Sutherland	R. S. Craxton	Direct-Drive Uniformity Calculations for a Future High-Gain Laser Facility
Olivia Fietkiewicz	Mercy	S. Bucht	Measuring the Mode Field Diameter of Single-Mode Fibers Using the Knife-Edge Technique
John Giess	McQuaid	V. N. Goncharov and K. M. Woo	Mitigating Rayleigh–Taylor Instabilities in the Deceleration Phase of Inertial Confinement Fusion
Samuel Gray	Brighton	W. T. Shmayda and E. Dombrowski	Characterizing a Cryosorption Pump for Collecting Tokamak Exhausts
Micah Kim	Home School	D. W. Jacobs-Perkins	Design, Fabrication, and Testing of a 3-D–Printed Optomechanical Assembly for MIFEDS Coil Characterization
Jackson McCarten	Webster Schroeder	B. N. Hoffman and K. R. P. Kafka	Viability Testing of Polymer Coating for Optical Cleaning Applications
Elizabeth Norris	Brighton	M. D. Wittman	Determining the Absorption Efficiency of a Flow-Through Pd-Bed as a Function of Initial $^4\text{He:D}_2$ Ratio and Flow Rate
Arjun Patel	Brighton	D. Chakraborty and R. Sobolewski	Terahertz Time-Domain Characterization of Biological Tissues Modeled Using COMSOL Multiphysics
Vinay Pendri	Pittsford Mendon	K. L. Marshall	Computational Modeling of Liquid Crystals and Related Materials Using Time-Dependent Density Functional Theory
Jayden Roberts	Brockport	S. T. Ivancic	Investigation of Microwave-Induced Chemical Etching in CR39
Cameron Ryan	McQuaid	R. W. Kidder	Containerized Application Management for Cloud-Based Scientific Analysis
Alisha Upal	Pittsford Sutherland	R. S. Craxton	Development of a National Ignition Facility Laser Configuration with X-Ray Backlighting for Direct Drive of a Foam Ball Target
David Villani	Harley School	M. J. Guardalben	Energy Prediction on the OMEGA EP Laser System Using Neural Networks
Grace Wu	Pittsford Mendon	I. A. Begishev	Measurement of the Refractive Indices of KDP and ADP at Low Temperatures
Jenny Zhao	Pittsford Mendon	K. L. Marshall and N. D. Urban	Chiroptical Properties and Mesophase Stability of Saturated Chiral Dopants for High-Peak-Power Liquid Crystal Device Applications
Rick Zhou	Brighton	W. T. Shmayda and M. Sharpe	Measuring the Performance of Molecular Sieve Driers