

LLE's Summer High School Research Program

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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. This was the 31st year of the program, which started in 1989. The goal of the 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 technical 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 (see Table I).

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. The students' written reports will be made available on the LLE Website and bound into a permanent record of their work that can be cited in scientific publications.

Three hundred and ninety-one high school students have now participated in the program. This year's students were selected from just over 40 applicants.

At the symposium LLE presented its 23rd annual William D. Ryan Inspirational Teacher Award to Mrs. Rebecca Berardino, a mathematics teacher at Barker Road Middle School in Pittsford. This award is presented to a teacher who motivated one of the participants in LLE's Summer High School Research Program to study science, mathematics, or technology and includes a \$1000 cash prize. Teachers are nominated by alumni of the summer program. Mrs. Berardino was nominated by Margaret Rudnick, a participant in the 2018 program. Margaret wrote, "Mrs. Berardino is the single most instrumental person that caused me to fall in love with the intricacies of complex problems, ultimately leading me to pursue a STEM-related field in college and probably as a career." When Margaret encountered Mrs. Berardino in seventh grade, she was shocked to find that Mrs. Berardino refused to give her the answers she wanted but told her to work out the problem for herself: "I still vividly remember the panic I felt when Mrs. Berardino said, 'I'm not going to feed you the answer with a silver spoon.'" Margaret had no choice but to persevere. After "an inordinate amount of approaches and thought processes," she came to the answer on her own: "I had never experienced that moment of sincere joy and triumph after mentally crawling to the top of a mountain...This moment changed my life." After

Mrs. Berardino's classes, Margaret was inspired to sign up for the most rigorous science and math classes available and "constantly seek the excitement of advanced learning...I realized that I absolutely do not want to be fed with a silver spoon." Other students in Mrs. Berardino's class were also inspired: "She opened our eyes to the wonder of not just mathematics, but the world, making sure to enrich our theoretical learning with cool examples of math in nature." Margaret concluded by saying, "So much of my love for science is owed to Mrs. Berardino, and looking back, her amazing classes are the part of middle school I remember the best."

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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 Long-Duration Fusion Reactions
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	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	Application for Filling Cryogenic Targets at an Arbitrary Viewing Angle
Max Neiderbach	Geneseo	M. 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 Targets for the National Ignition Facility