CPS Plasma Page

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Two projects – four students – share CPS First Award at Intel ISEF

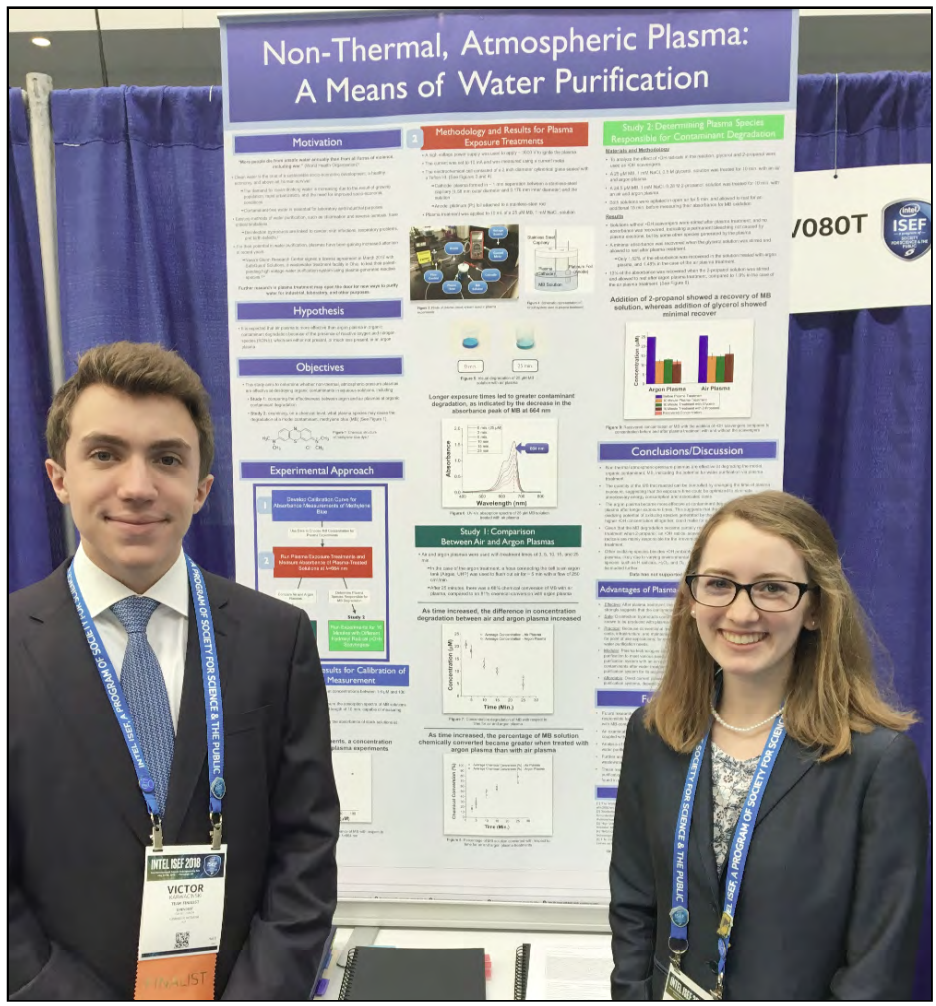
Pittsburgh, PA – Sometimes it is impossible to single out just one project for excellence. For the second year in a row, the Coalition for Plasma Science (CPS) has awarded its prize ($5000) at the Intel International Science and Engineering Fair (ISEF) to two projects that demonstrate the breadth of plasma research – from fusion to environmental remediation.

Victor Karwacinski and Mary Sgroi of Trinity School at Greenlawn (South Bend, IN) shared half of the award for their project **"Nonthermal, Atmospheric Plasma: A Means of Water Purification."** The team explored how nonthermal plasmas degrade organic contaminants – like methylene blue (MB) - in water. Observing the effects on MB of both air and Argon plasmas, they discovered that at exposures of over 10 minutes argon was more effective. Further experiments indicated that hydroxyl radicals are partially responsible for the MB degradation.

Karwacinski revealed that his inspiration for the project came while visiting his aunt, a rheumatologist in his home country of Poland, when she spoke to him about a current epidemic. The new antibiotic developed to mitigate the illness was causing people to become ill.

"The problem came down to the contaminated water in the production of the antibiotic," he explains. "Thereafter, my aunt and I started discussing different methods of water purification and she introduced me to plasma."

When he shared this story with his colleague, Mary Sgroi, they felt compelled to investigate further as a team. "We felt an obligation to address the deficiencies of current means of water purification and explore the promising potential in plasma technologies."



Victor Karwacinski and Mary Sgroi decided to explore how plasmas can be used to purify water after learning that contaminated water used in an antibiotic was making patients ill . Photo / Paul Miller

Karwacinski has now coauthored a paper with his project mentors from Notre Dame University, Dr. David Go and graduate student Hernan Delgado, which will be submitted for publication in November 2018. He looks forward to further exploring plasma research during his senior year.

The second winning project, entitled **"Langmuir Plasma Research,"** was presented by another two-person team – Daniel Christensen and Michaela Fennel of Northwest Nuclear Laboratories (NWNL), an organization that uses a research-grade ion collider – a Farnsworth Fusor – to teach high school students nuclear engineering principles.

The team set out to create and develop a probe that could help them map the densi-

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ty of plasma inside the Inertial Electrostatic Confinement (IEC) D-D fusor, compelled by noticing for years a diamond shaped pattern left on the interior of the reactor chamber.

"The anode on our fusor has a unique architecture which generates a single beam of plasma that leaves a diamond shaped discoloration on whatever surface is in line with the beam during operation," explains Christensen. "We wanted to generate quantitative information about the density of the plasma, which we believe to be correlated with the discoloration caused by the beam."

Fennel is enthusiastic about the NWNL. "It is a pretty special place," she says. "It is a nonprofit, owned and operated by Microsoft IT Manager Carl Greninger. Every Friday evening, he opens up his home to around 20 high school students from all over Puget Sound. I am confident there is no other program like this one in the world. It is not associated with any traditional high school, and anyone with a curiosity and passion is welcome to join." Her teammate is equally enthusiastic. Christensen observed that winning the award "provided a sense of validation that we do new and relevant research at NWNL."

"These two projects had contrasting strengths," according to Paul Miller, who judged on behalf of CPS. "The environmental work of Karwacinski and Sgroi was a carefully designed study in which a model pollutant was treated with plasma, and represented a promising first step in addressing a specific kind of contamination problem. The work of Christensen and Fennel demonstrated student-driven achievement in plasma diagnostic control and data interpretation in a laboratory setting."

Of the four remaining finalist plasma projects, two received awards.

Observations of the Chiral Magnetic Effect in the Quark-Gluon Plasma Produced in Au+Au Collisions at the Relativistic Heavy Ion Collider: Cindy Wang, William A. Shine Great Neck South High School, Great Neck, NY
Received Physics and Astronomy Third Award ($1000).

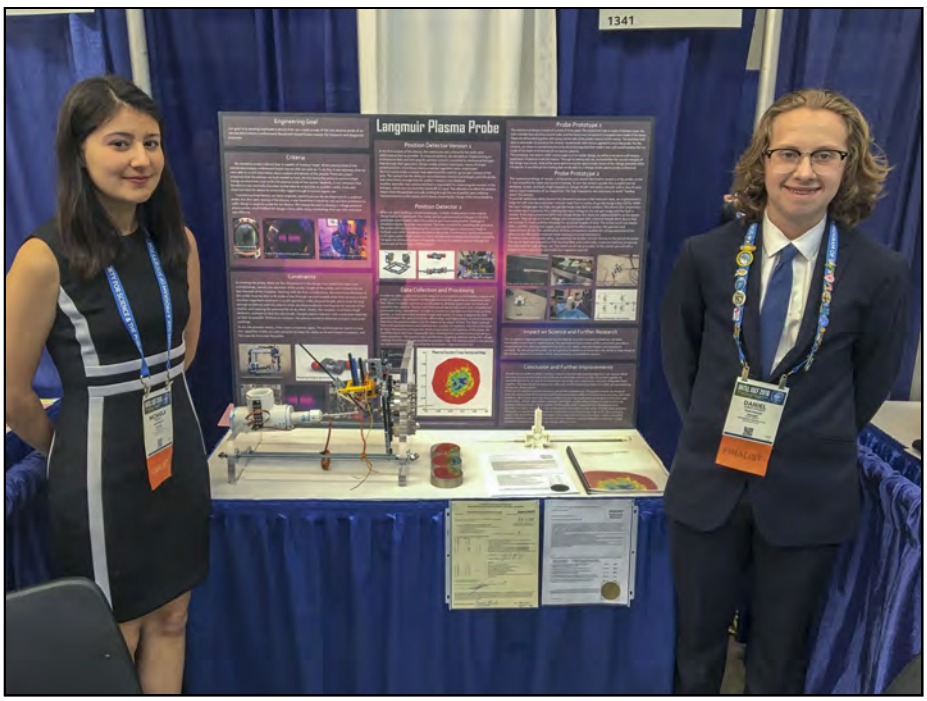
Fusion Reactions in Low Wattage Inertial Electrostatic Confinement Devices: Daniel Klasing, Stuart W. Cramer High School, Belmont, NC
Received Energy (Physical) Third Award ($1000)

Investigating the Effects of Propellant Mass Flow Rate and a Swirl Ring on the Efficiency of a Magnetoplasmadynamic Thruster: Avery Clowes and William Menkers, Phillips Exeter Academy, Exeter, NH

Aneutronic IEC Fusion Concept: Ben Kolar, Fergus High School, Lewistown, MT

The Intel ISEF, a program of the Society for Science and the Public, is the world's largest international pre-college competition. In 2018 approximately 1800 young scientists, entrepreneurs and makers, convened in Pittsburgh, PA for the final competition. These finalists were selected from 420 fairs in 81 countries, regions and territories.

The CPS Excellence in Plasma Physics Award is supported in part by contributions from the American Physical Society Division of Plasma Physics and the Institute of Electrical and Electronic Engineers, Nuclear and Plasma Science Society.



Michaela Fennel (left) and Daniel Christensen created a probe to help them explore the plasma density inside an IEC D-D fusor. Photo / Paul Miller

CPS has a new website

It has the old web address, but a new look. The Coalition for Plasma Science has upgraded its website to be current and easier to use.

Artistic web designer Xixi, who has generously updated and added content to the site since its inception, redesigned the pages to be more visually appealing and better organized.

We hope you will explore the new site, and continue to use it to learn more about plasmas around the universe and plasma applications around the world. You will find links there to our publications, as well as the familiar educational resources, including A Teachers Guide to Plasma Science Resources.

https://www.plasmacoalition.org/