CPS Plasma Page

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Two Projects Share CPS First Award at Intel ISEF

Los Angeles, CA - Sometimes presenting a single award seems less than fair. At the 2017 Intel International Science and Engineering Fair (ISEF) the Coalition for Plasma Science (CPS) decided to recognize two projects for excellence in plasma physics research, one examining the use of plasmas for healing wounds, the other focusing on plasma generated within a pickle. These first-place projects were selected from seven finalists by judges Lee Berry, Chair of CPS, and Seth Dorfman, a lecturer and plasma scientist at UCLA.

Nathan Kinsey (left) joins the team of Sonja Gabriel and Hannes Hipp at the ISEF podium to accept the CPS First Award. Photo / Intel ISEF

Berry notes, "While the number of projects focused on plasma applications or science declined from previous years, the seven finalists were complemented by a wide variety of projects that used plasma in a supporting role. The absence of projects with fusion neutrons was notable."

This is the second year in a row CPS has chosen to recognize Nathan Kinsey, currently a senior at Eugene Ashley High School in Wilmington, North Carolina. Kinsey's "The Effects of Electrical Discharge Plasma Treatment on Cellular Growth and Wound Healing" builds on his 2016 award-winning project, which hypothesized that applying plasma to muscle cells would enhance cell growth and wound recovery.

Kinsey explains, "Previously I found that low doses of plasma led to larger muscle cell size in vitro and may enhance wound healing. The present study examined the effects of plasma on artificial wound healing in vitro using myoblast cells (found in muscle tissue), and also wound healing in vivo using planarian flatworms."

When myoblasts grown on culture plates received a 1 cm artificial wound, both low and high doses of plasma led to higher rates of healing (wound closure) than was seen on the control plates. Similarly, planarian worms, which can regenerate when bisected, grew longer head and tail segments when their halves were exposed to low or high doses of plasma. The rate of wound closure was also greater in the group treated with plasma.

In a separate experiment, he learned that his plasma generating device increased reactive oxygen species (ROS) in the medium, which are recognized for their antibacterial properties. He concluded that, "Given plasma's antibacterial properties and potential for wound healing, plasma activation therapy could be used in medical applications such as treatment of burns, ulcers and sores, to closure of wounds."

CPS was not the only institution impressed with Kinsey's work this year. He also received a Drexel University Award – a full tuition scholarship worth $194,000.

Kinsey shared the CPS First Award with Hannes Hipp and Sonja Gabriel, who attend Studienkolleg St. Johann Blonried in Aulendorf Baden-Würtemberg, Germany. Each project received half of the $5000 prize. CPS more than tripled the value of its prize this year, allowing the judges the flexibility to award the sum to one project, or to several.

Hipp and Gabriel's "Big Bang Pickle" project took off from the well-known experiment in which a salty pickle receives voltage from electrodes attached at each end, generating a plasma within it. This experiment is discussed on numerous web sites with a 'don't try this at home' qualifier. They knew that a pickle connected to DC voltage would light up the negatively charged electrode, and surmised that AC current, "because of the permanently changing flow direction of the current" would light up both sides. So they were surprised when the glow started on a seemingly random end and then persisted on this end.

They hypothesized that the pickle needed

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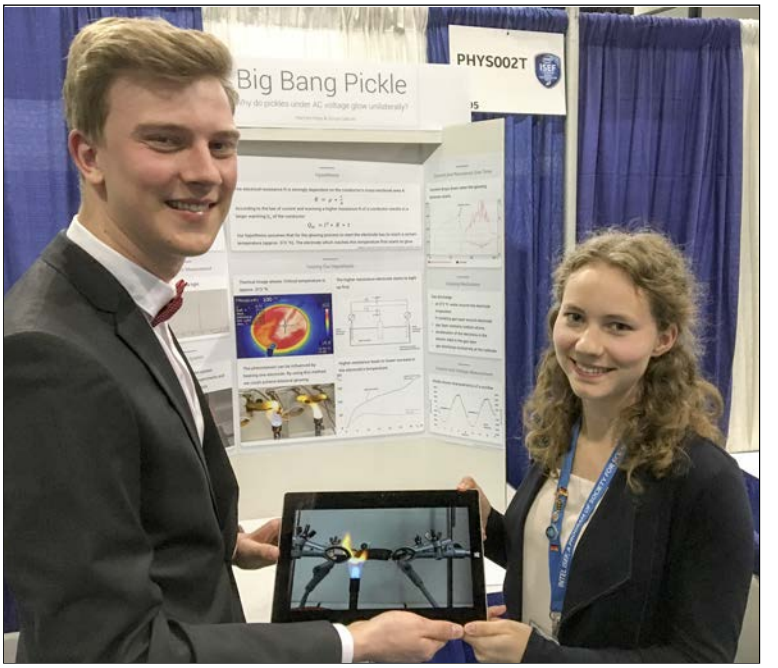
to reach a certain temperature (approximately 110 degrees C, when steam is produced) to initiate the glow. They then measured the voltage drop at each end. "In conformity with the law of current and warming, the higher-resistance electrode warms up faster and thus starts to glow first. Our data suggest that as soon as the glowing process starts, the current decreases wherewith the less-resistance electrode is not able to reach the critical temperature."

Lee Berry was impressed with the young scientists. "What caught our attention was that the team found science in this gee whiz, over the top experiment. The question they asked was 'Which electrode was going to produce light? Why, even with AC, was the light-emitting end the same?' Both students really got into the question and settled on good explanations. It was also interesting to me because of work that is going on to use discharges in water as a means of purification."

Of the five remaining plasma finalist projects, two received awards at the event.

Optimization of Temperature Conditions for Pristine Graphene Synthesis: Govind Krishna, DuPont Manual High School, Louisville, KY.
Received Chemistry Fourth Award ($500); and American Chemical Society Honorable Mention



CPS First Award winners Sonja Gabriel and Hannes Hipp illustrate their plasma pickle experiment with photos on an iPad. Judge Lee Berry was impressed that "the team found science in this gee whiz, over the top experiment." Photo / Lee Berry

An Electric Spark Scalpel: Valeriia Lebedeva, Gymnasium #5, Korolyov Moscow Region, Russian Federation.
Received China Association for Science and Technology (CAST) First Award ($1200).

Plasma Actuator, "Not a Drag," Year II: Robert Kollman, Shallowater High School T-STEM Academy, Shallowater, TX.

Fabrication of a Multilayer Graphene Based Single Electron Transistor with Chemically Transferred Graphene: Parker Coye, Lake Highland Preparatory School, Orlando, FL

3D Printed Micro Patterned Gas Electron Multiplier: Adam Syndergaard, Maple Mountain High School, Spanish Fork, UT

CPS judge Seth Dorfman remembers Nathan Kinsey from ISEF 2016. This is Kinsey's second consecutive award from CPS for his biomedical plasma research. Photo / Lee Berry

The Intel International Science and Engineering Fair (Intel ISEF), a program of Society for Science & the Public (the Society), is the world's largest international pre-college science competition. Each year, approximately 1,800 high school students from more than 75 countries, regions, and territories are awarded the opportunity to showcase their independent research and compete for on average $4 million in prizes.

Millions of students worldwide compete each year in local and school-sponsored science fairs; the winners of these events go on to participate in Society-affiliated regional and state fairs from which the best win the opportunity to attend Intel ISEF.

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