CPS Plasma Page

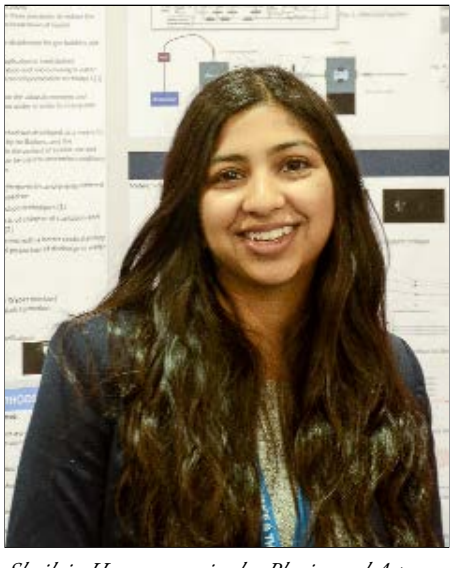
Published by the Coalition for Plasma Science, Vol.18., No.1, July 2016

Biomedical work earns CPS Excellence in Plasma Physics Award at INTEL ISEF

Phoenix, AZ - It seems like only yesterday CPS was sending an inquiry to INTEL International Science and Engineering Fair (ISEF), asking to sponsor a $1000 prize for a student presenting a plasma-related project at the fair. It was 2005. Eleven years later, with the prize increased to $1500, CPS has happily observed the growing interest in plasma-oriented experiments at the INTEL ISEF. This year three judges, including CPS Chair Lee Berry, Princeton Plasma Physics Laboratory Senior Program Leader Arturo Dominguez and UCLA Postdoctoral Scientist Seth Dorfman, evaluated fifteen student projects. In a ceremony on May 13, 2016, they ultimately gave the 11th CPS Excellence in Plasma Physics Award to Nathan Kinsey for "Lightning in a Bottle: Effect of Plasma Activation on Muscle Cells."

Nathan Kinsey (center) discusses his winning project with CPS judges Arturo Dominguez (left) and Seth Dorfman. Photo / Lee Berry

Kinsey hypothesized that applying plasma to muscle cells "would enhance cell growth and wound recovery, and that growth would be proportional to intensity of plasma application." Using a micro-plasma cutter "fabricated from 9V batteries, wire, graphite and aluminum foil," Kinsey applied plasma to muscle cells both directly (to cells in media) and indirectly (to media, which was then applied to cells). He also varied the intensity of the plasma dose.



Shailaja Humane received a Physics and Astronomy Second Prize for her study of "Electrically-Induced Acoustic Oscillations of Gas Bubbles." Photo / Lee Berry

He discovered that in this case less is more. Applying low doses of plasma directly or indirectly to the muscles resulted in longer cells with greater growth, while high doses sometimes killed the cells, or resulted in shorter cells. Wounds also healed more quickly and successfully when using an indirect, low dose approach.

Lee Berry noted, "An interesting finding was there was a 'Goldilocks' level that, apparently, optimally balanced the positive effect of enhanced growth with the negatives of too much plasma." The judges were impressed with Kinsey's ingenuity in developing the plasma source and his careful attention to controls and statistical significance. "Equally impressive were his enthusiasm and ideas for future work on the project," said Berry.

An essay on "Plasma Medicine" is part of the CPS "About Plasmas" series, and is easily accessible via the publications section of the CPS web site. Though the majority of science fair projects approach plasmas from the point of view of physics or astrophysics, more students are choosing to explore medical/biological applications of plasma. The last time CPS awarded a prize to a plasma medicine project was in 2010, when Turkish student Bilge Zeren Aksu explored the possibility of killing cancer cells with oxygen plasmas.

Of the remaining fourteen plasma-related projects, eight received a total of nine other awards at the event.

Electrically-Induced Acoustic Oscillations of Gas Bubbles: Shailaja Humane, Watchung Hills Regional High School, Warren, NJ,
Received the Physics and Astronomy Second Award ($1500)

Continued on next page

Continued from page 1

Plasmatic Events during Electrolysis of Aqueous Solutions: Benedickt Pintat, Walther-Rathenau-Gymnasium, Bitterfeld-Wolfen, Germany
Received American Chemical Society Honorable Mention

Investigating the Acoustic Flame Interaction with the Effects of Magnetic field and Plasma: Omar Abdulrahman Alhazzaa, Najd National School, Riyadh, Riyadh, Saudi Arabia
Received Society of Experimental Test Pilots, United Technologies Corporation Honorable Mention. $3000 in UTC stock

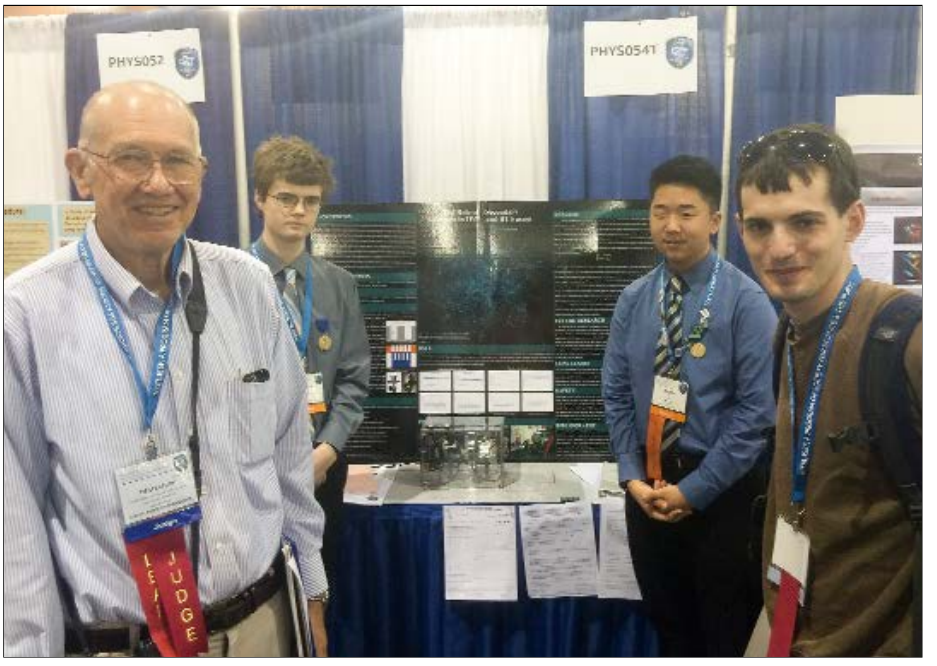
Novel Synthesis of Water-Soluble Paramagnetic Polymer Nanoparticles (Metal Free) for Selective Drug Delivery and Cancer Therapy Applications: Arnob Das, Jesuit High School, Portland, OR
Received Materials Science Second Award ($1500) and Arizona State University New American University Scholarship

Spectroscopic Analysis of Titanium Oxide Presence in Stars: Sarah Amina Maazouz, Liberty High School, Hillsboro, OR,
Received European Organization of Nuclear Research – CERN – all expense paid trip to CERN

Analysis of Chemical Vapor Deposition Diamonds for Neutron Detection on OMEGA: Ishir Seth, Brighton High School, Rochester, NY
Received Physics and Astronomy Fourth Award ($500); Alternate for CERN trip

Holistic Flare Prediction using Aggregated Solar Cycle 23-24 Magnetograms and Intensitygrams: Shengdong Wang, Hamilton High School, Chandler, AZ,
Received Arizona State University New American University Scholarship

Astrophysical Modeling of Wolf Rayet Stars Using Low Resolution Gratings: Ivo Jose Goncalves, Daniel Alexandre Diaz da Costa, Mauro Barbosa Franqueira, 18, Escola Secundária Dona Maria II, Braga, Portugal
Received Physics and Astronomy Fourth Award ($500)



CPS Chair Lee Berry (left) with (left to right) Noah Hoppis and Kevin Lee, who presented their project on "The Role of Secondary Electrons in IEC and BT Fusion." Photo / Arturo Dominguez

CPS judge Arturo Dominguez was impressed with the student work. "As with last year, these high-schoolers blew me away. They did some amazing work, many at advanced undergraduate level. I was particularly impressed by the number of projects that incorporated plasma physics in fields other than fusion and astrophysics, such as the winning entry. The fact that there were projects exploring plasma physics in biology, water purification, rocket propulsion, etc., highlights the versatility of the field. It's inspiring to see these young minds getting interested in the field."

The Intel International Science and Engineering Fair, a program of Society for Science & the Public, is the world's largest pre-college science competition, and includes more than 1,700 high school students from more than 75 countries, regions and territories. Each year, the finalists showcase their independent research as they compete for approximately $4 million in awards. The Intel International Science and Engineering Fair encourages millions of students worldwide to explore their passion for innovation and develop solutions for global challenges.

Students are able to compete as a finalist in the Intel International Science and Engineering Fair after winning a top prize from a Society-affiliated fair (419 of which are bringing finalists this year) in more than 75 countries, regions and territories. In addition to presenting their research on a international stage, Intel International Science and Engineering Fair finalists are judged by and interact with doctoral level scientists as they compete for prizes. Each year, more than 400 finalists receive awards and prizes for their groundbreaking research. We hope that the interactions with other finalists and the judges, as well as the recognition and awards, encourage the students to continue their involvement in science and technology.

The CPS Intel ISEF 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.