UC SANTA BARBARA

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UCSB Researchers Who Made Elusive Discovery Win Prestigious AAAS Newcomb Cleveland Prize

An elusive discovery by four researchers at the University of California, Santa Barbara has earned them the prestigious 2004-2005 AAAS Newcomb Cleveland Prize, the oldest award conferred by the American Association for the Advancement of Science (AAAS), publisher of the journal Science.

The AAAS announced the award today at its annual meeting, being held in St. Louis, and will present it at a ceremony for the recipients on Saturday, February 18.

In a paper published in Science, the research team reported observing the "spin Hall effect" - the first time it has been seen in an experiment. Their report, "Observation of the Spin Hall Effect in Semiconductors," was published online in Science Express on November 11, 2004 and in the print edition of Science on December 10, 2004. At the time of publication, all four authors were affiliated with the Center for Spintronics and Quantum Computation at UC Santa Barbara.

The authors of the paper are: Yuichiro K. Kato, Roberto C. Myers, Arthur C. Gossard, and David Awschalom. Awschalom is a professor of physics, electrical and computer engineering, and director of the Center for Spintronics and Quantum Computation at UCSB. Arthur Gossard is a UCSB professor of materials and also of electrical and computer engineering. Myers, currently a graduate student in materials at UCSB,

works jointly with Awschalom and Gossard. Kato was a graduate student working in David Awschalom's group at the time of the experiments and is now a post-doctoral student in chemistry at Stanford University.

The Prize was established in 1923, with funds donated by Newcomb Cleveland of New York City, to recognize outstanding Science articles. It is presented annually to the author(s) of the best research article or report published in Science between June 1 of each year and May 31 of the following year. The value of the prize is presently $25,000; the recipient also receives a bronze medal. Today the award is supported by Affymetrix of Santa Clara, Calif.

The winning paper shows the appearance of novel spin effects in semiconducting materials induced by electric fields along the length of the material. Using an elegant optical technique, the authors were able to show that, along with a conventional charge current, a perpendicular "spin current" is induced across the semiconductor and accumulates at the edges. They then examined possible sources of the effect, showing that it is not the result of intrinsic coupling, but rather a form of scattering that did not depend on the nature of the semiconducting material used.

"The extraordinary care of the experiments and the clarity with which the mechanism of the effect was deduced has led to extraordinary attention from the condensed-matter and materials science communities," said Science Editor in Chief Donald Kennedy.

"This is an outstanding contribution to the field of physics."

Affymetrix added its support to the AAAS Newcomb Cleveland Prize in 2003. Stephen P.A. Fodor, the company's founder, chair and chief executive officer, and his colleagues, were awarded the Newcomb Cleveland Prize in 1990 for their landmark publication which first introduced microarray technology to the scientific community.

"Receiving the Newcomb Cleveland Award in 1990 was the first important public acknowledgment of our invention," said Fodor. "It is important to recognize and encourage the innovative work of new scientists as their work will become the foundation for future research and discovery."

In 1879, Edward Hall placed a thin layer of gold in a strong magnetic field, connected a battery to the opposite sides of this film, and measured the current flowing through it. He discovered that a small voltage appeared across this film that

was proportional to the strength of magnetic field multiplied by the current. In 1971, two Russian physicists predicted that a similar effect could be expected in spin physics, but the spin Hall effect defied experimental detection for 33 years.

The Hall effect did not find practical application until the second half of the 20th century, when it was used to mass-produce semiconductor chips, and today it is widely used in sensors and electronics. The research team at UC Santa Barbara first discovered the signatures of the spin Hall effect in semiconductor chips made from gallium arsenide, which is similar to those used in cell phones, and also studied the effect in samples made from indium gallium arsenide. Although the practical applications of this team's discovery are yet unknown, they may arise in sensing technologies, spintronics, quantum computing, and quantum communication.

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About the Award's Sponsors:

The American Association for the Advancement of Science (AAAS) is the world's largest general scientific society, and publisher of the journal, Science (www.sciencemag.org). AAAS was founded in 1848, and serves 262 affiliated societies and academies of science, reaching 10 million individuals. Science has the largest paid circulation of any peer-reviewed general science journal in the world, with an estimated total readership of 1 million. The non-profit AAAS (www.aaas.org) is open to all and fulfills its mission to "advance science and serve society" through initiatives in science policy, international programs, science education, and more. For the latest research news, log onto EurekAlert!, www.eurekalert.org, the premier science-news Web site, a service of AAAS.

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For more information on AAAS awards, see http://www.aaas.org/aboutaaas/awards.

About UC Santa Barbara

The University of California, Santa Barbara is a leading research institution that also provides a comprehensive liberal arts learning experience. Our academic community of faculty, students, and staff is characterized by a culture of interdisciplinary collaboration that is responsive to the needs of our multicultural and global society. All of this takes place within a living and learning environment like no other, as we draw inspiration from the beauty and resources of our extraordinary location at the edge of the Pacific Ocean.