Nobel Physics Prize Awarded For Work at UC San Diego

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Three physicists who conducted a series of experiments that led to the creation at UC San Diego nearly 10 years ago of a new material with physical properties that had never before been seen have been awarded this year's Nobel Prize in Physics.

Sheldon Schultz, a research professor of physics at UC San Diego, David R. Smith, a former UCSD physicist now a professor of engineering at Duke University, and Sir John Pendry, a physics professor at Imperial College in London, will share the award for their development of this new "metamaterial," which has created a new subdiscipline of physics.

This morning's announcement from the Royal Swedish Academy follows last year's award of the 2008 Nobel Prize in Chemistry to Roger Tsien, a professor of pharmacology and chemistry and biochemistry at UC San Diego.

More info on prize available at: http://ucsdnews.ucsd.edu/newsrel/science/NobelPrize09/media.asp

"The entire UC San Diego community congratulates Sheldon Schultz for winning this year's Nobel Prize in physics. We're especially proud that this is the second straight year that research conducted at UC San Diego has been recognized with the Nobel Prize; it is confirmation of our university's strength and leadership among academic institutions worldwide," said Chancellor Marye Anne Fox. "It's also a timely reminder, on the eve of our university's 50th anniversary, of how this institution was shaped by recruiting the best and the brightest faculty. Shelly Schultz was a founding member of UC San Diego's physics faculty and now he and his former student, David Smith, are our latest Nobel Prize winners."

"It's extremely rare for a university to be awarded a Nobel Prize two years in a row," said Mark Thiemens, dean of UC San Diego's Division of Physical Sciences. "And it's even more rare to have those two Nobels awarded in consecutive years in the physical sciences. This really underlines the strength of our university in physics, chemistry and mathematics."

"Professor Sheldon Schultz represents the very best of UC science," said UC President Mark Yudof. "The Nobel prize signifies the global importance of his work as well as the contributions that the University of California makes every day to the lives of Californians and to people around the world. The entire UC community congratulates Prof. Schultz for this remarkable achievement."

Schultz, a research professor of physics, has been investigating how electromagnetic radiation such as microwaves and visible light behaves as it passes through solid materials.

In 2000, he and Smith, who received both his undergraduate and doctoral degrees in physics at UC San Diego and was then a post doctoral member in Schultz's group, created a new material with physical properties that had never been seen before.

"Since coming to UC San Diego in 1960 as one of the founding members of the physics department, Schultz has played a major role in shaping the research activities here, positively impacting thousands of physics students, including Smith, and overseeing a series of ground-breaking experiments that led to this Nobel Prize," said Arthur B. Ellis, vice chancellor for research.

"The research of Shelly Schultz and David Smith here at UC San Diego's physics department, which has been among the most highly cited in physics, has inspired a growing new field of study that explores the novel physical properties that emerge when ordinary substances are arranged in repeating patterns of particular shapes," said Thiemens.

Constructed relatively simply out of copper wires and rings imprinted onto fiberglass sheets, the material transmitted microwaves in ways opposite to those observed in all other known materials, natural or manufactured.

"It was a great bonus," said Schultz, whose group made the discovery 40 years after Schultz began his research work at UC San Diego. "We developed this first material in 2000, just as I retired from being the Director of the Center for Magnetic Recording Research. So I had this exciting new work to keep me busy."

A beam of electromagnetic radiation will bend (or refract) as it crosses the boundary between one material and another - from air to glass, for example. A measure called the index of refraction describes the angle of the bending and depends on the physical properties of the substance. Prior to 2000 the direction of the bending had always been the same. However, based on their measurements of the properties of their newly constructed material they predicted that samples could be fabricated where the beam would bend in the opposite direction.

In 2001, Smith, Schultz and UCSD graduate student Richard Shelby demonstrated that their array of rings and wires bent microwaves in the opposite direction, a property now described as negative index of refraction. Samples that have the correct physical construction to have negative bending are commonly called NIMs (Negative Index of refraction Materials)

More background on discovery at: http://ucsdnews.ucsd.edu/newsrel/science/NobelPrize09/backgrounder.asp

The UCSD physicists built on the work of British physicist Sir John Pendry, who in 1998, created a material that reversed the electric field by adjusting the spacing of a lattice made from thin conducting wires. In 1999, Pendry proposed and created a material, consisting of a lattice made up of split-rings of metal, which resulted in reversing the magnetic field.

Although a Russian physicist, Victor Veselago, had theoretically considered the possibility of negative refraction in 1968, Schultz and Smith were the first to experimentally demonstrate it in 2001.

"I never dreamt of this," Schultz said. "If a student had put up their hand in my class and asked if a material could have the negative bending property, I would have said 'Let's not worry about it. Although mathematically possible, it's a non-physical solution.' "

In fact, their initial reports met with skepticism. "But we and many others worked to provide additional proof and the skeptics were proved wrong." Schultz said. In 2003, the journal *Science* chose their finding and subsequent work as one of the "Top Ten Breakthroughs" of the year.

"This is quite a wonderful thing," said Brian Maple, chair of the physics department at UC San Diego. "This particular area of research, the design of novel materials, called metamaterials, with unusual physical properties that arise from repeating patterns of ordinary substances, has created a new sub-discipline within physics."

Born on January 21, 1933 in New York City, Schultz received his undergraduate degree in mechanical engineering from the Stevens Institute of Technology. He joined UC San Diego in 1960 after completing a Ph.D. thesis at Columbia University advised by Polycarp Kusch, who won the Nobel Prize in Physics in 1955.

Sixteen UC San Diego faculty members have won the Nobel Prize. Current UC San Diego Nobel Prize winners include: Renato Dulbecco, physiology/medicine (1975); Harry Markowitz, economics (1990); Paul Crutzen, (1995), chemistry; Mario J. Molina, chemistry (1995); Robert F. Engle, economics (2003); Roger Tsien, chemistry (2008). The 2007 Nobel Peace Prize was awarded to former vice president Al Gore and the Intergovernmental Panel on Climate Change, whose roster of researchers lists nearly two dozen Scripps Institution of Oceanography scientists including Mario Molina, Veerabhadran Ramanathan, Richard Somerville and Lynne Talley.

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