Ames Lab physicist wins European Union's highest science prize

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Costas Soukoulis leads team that will share portion of 1 million euro Descartes Prizes

Costas Soukoulis, a senior physicist at the U.S. Department of Energy's Ames Laboratory and an Iowa State University Distinguished Professor of physics and astronomy, coordinates the research team that has won the Descartes Prize for Excellence in Scientific Collaborative Research, the European Union's highest honor in the field of science. He and his collaborators received the prestigious award for creating a novel class of artificial metamaterials called left-handed materials, or LHMs, which exhibit fascinating properties that cannot be found in naturally occurring materials.

LHMs exhibit negative refraction, bending light in the opposite direction to that seen in natural materials. They can be fabricated to have zero reflectance for all angles hit by incoming electromagnetic waves. In addition, they can focus light without the need for curved surfaces. These and other amazing properties promise a wide range of potential applications for LHMs.

Soukoulis, who has also been an associate with the research center FORTH, in Crete, Greece, since 1984, said he was lucky to work with a top-notch team of international researchers in creating the new subclass of materials. The team includes Professor Sir John Pendry, Imperial College, UK; Professor Ekmel Ozbay, Bilkent University, Turkey; Professor Martin Wegener, University of Karlsruhe, Germany; Professor David Smith, Duke University, USA; and Professor E. N. Economou

and Dr. Maria Kafesaki, both from FORTH and the University of Crete. The research team was awarded the Descartes Prize for Research in Physics at a ceremony held at the Royal Society in London on Dec. 2. Of the 1,000,000 euro Descartes Prize money, the team members will share 200,000 euro ($235, 634) given for their winning project, "Extending Electromagnetism through Novel Artificial Materials, or "EXEL."

"Our EXEL team was able to demonstrate the experimental reality of LHMs and their consistency with the laws of physics," said Soukoulis. "This realization opened up the possibility of unprecedented applications and devices." The team has already shown how the ability to focus radio waves could lead to smaller, better-performing magnetic resonance imaging machines for medical and biomedical diagnostics. Numerous applications in the cellular communications industry are also envisioned, including antennas and waveguides that are 100 times smaller and much lighter than those of today. Even slight improvements to these types of devices can make a significant financial impact.

Ames Laboratory Director Tom Barton praised the work of Soukoulis and the EXEL team, saying, "It probably would be difficult to overstate the potential importance of this historic scientific achievement to the future of optical technology. The Ames Lab and Iowa State University are indeed proud of the pivotal role played by Professor Soukoulis."

Accepting the Descartes Prize, Soukoulis paid tribute to the organizations that have supported his research on LHMs. "I would like to express my gratitude to Ames Laboratory and Iowa State University for accommodating my teaching duties to allow me to also pursue research on left-handed materials in Europe," he said. "I would like to thank the U.S. Department of Energy for their support during the last 20 years. Our Ames Laboratory work on photonic crystals led to the field of negative index materials and metamaterials."

The Descartes Prize for Excellence in Scientific Research, now in its sixth year, recognizes outstanding scientific and technological results achieved through international collaborative research in diverse disciplines. Winners are selected by a grand jury of experts in science, industry and the general public.

Source: Ames Laboratory