Argonne NATIONAL LABORATORY

Miles Padgett

"Light's Darkness"

Miles Padgett is Professor of Optics in the Department of Physics and Astronomy at the University of Glasgow. He heads a 15-person-strong research team covering the full spectrum, from blue-sky research to applied commercial development, funded by a combination of government, charity, and industry. In 2001 he was elected to Fellowship of the Royal Society of Edinburgh. Padgett has an international reputation for his contributions to the fundamental understanding of light's momentum, including conversion of optical tweezers into optical spanners, observation of a rotational form of the Doppler shift, and a new form of Heisenberg's uncertainty principle. The applied aspects of his work have led to several commercial products and services, including; an ultraviolet pollution monitor and a new technique for oil prospecting. Padgett's group has published more than 150 papers that have amassed better than 2,000 citations in the world's leading scientific journals. He has made numerous TV, radio, and popular press contributions and delivered many public lectures promoting science and technology to the widest possible audience.

Optical vortices and orbital angular momentum are currently topical subjects in the optics literature. Although seemingly esoteric, they are, in fact, the generic state of light and arise whenever three or more plane waves interfere. To be observed by eye the light must be monochromatic. Laser speckle is one such example, where the optical energy circulates around each black spot, giving a local orbital angular momentum.

This talk will report three on-going studies. First, when considering a volume of interfering waves, the laser specs map out threads of complete darkness embedded in the light. Do these threads form loops? Links? Or even knots? Second, when looking through a rapidly spinning window, the image of the world on the other side is rotated: true or false? Finally, the entanglement of orbital angular momentum states means measuring the angular position of one photon sets the angular momentum of another: is this an angular version of the EPR (Einstein, Podolsky, and Rosen) paradox?

(Figure: "Light's angular momentum," Physics and Astronomy Group, University of Glasgow

Note day change: Friday, June 8, 2007

3:00 p.m.

Bldg. 402, APS Auditorium • Argonne National Laboratory

APS Colloquium