NANYANG TECHNOLOGICAL UNIVERSITY

The Photonics Institute

PAP Seminar Announcement

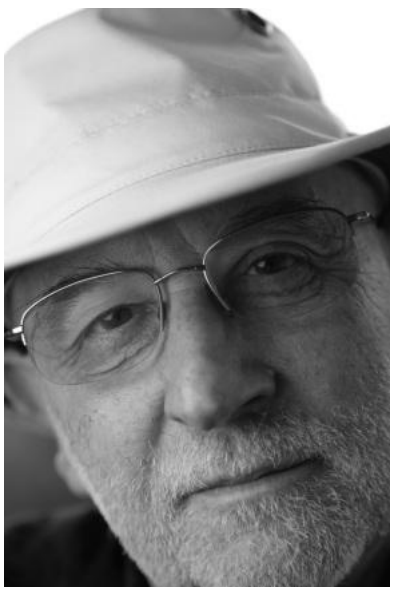
Optical curl forces and beyond

By

Prof Sir Michael Berry

H H Wills Physics Laboratory, University of Bristol, UK

Date: 13 April (Wednesday)
Time: 2.000m - 3.00pm
Venue: SPMS LT1, SPMS-04-07
Host: Asst Prof Yidong Chong & Prof N. Zheludev



Abstract

A physical example of a force that depends on position but is not derivable from a potential, that is, a nonconservative force with non-zero curl, is the force on a dielectric particle in an optical field. The resulting dynamics need not be Hamiltonian or Lagrangian, yet is non-dissipative, with unusual chaotic dynamics. Noether's theorem does not apply, so the link between symmetries and conservation laws is broken. Although unambiguous in optics, the physical existence of curl forces has been controversial among engineers. Motion under curl forces near optical vortices can be understood in detail, and the full series of 'superadiabatic' correction forces derived, leading to an exact slow manifold in which fast (internal) and slow (external) motion of the particle is separated. These classical optical forces have quantum effects

Short Biography

Sir Michael Berry received his PhD in Physics from St Andrews University in 1965, and has been on the faculty of Bristol University for over 50 years, where he is now the Melville Wills Professor of Physics (Emeritus). He has made numerous groundbreaking contributions in the fields of quantum chaos and optics; one of his theoretical discoveries, the Pancharatnam-Berry phase, has found profound and widespread use in optics, condensed-matter physics, and many other fields of physics. He is a Fellow of the Royal Society, and has won numerous prestigious awards including the Maxwell Prize (1978), the Dirac Prize (1990), and the Ig Nobel Prize (2000).

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