



量子材料科学中心 International Center for Quantum Materials Weekly Seminar

CAN WE CONTROL THE HEAT CURRENT? A major societal problem for the 21st century



Giulio Casati

Center for Complex Systems, University of Insubria, Como-Italy

Time: 4:00 pm, Jan. 16, 2013 (Wednesday)

时间: 2013年1月16日 (周三) 下午 4:00

Venue: Conference Room A (607), No. 5 Science Building

地点: 理科五号楼607会议室

Abstract

The understanding of the microscopic mechanisms which determine the macroscopic laws of heat transport is one of the main problems of statistical mechanics. On the other hand, providing a sustainable supply of energy to the world's population will become a major societal problem for the 21st century as fossil fuel supplies decrease and world demand and environmental concern increases. Thermoelectric phenomena, which involve the conversion between thermal and electrical energy, and provide a method for heating and cooling materials, are expected to play an increasingly important role in meeting the energy challenge of the future. Here we discuss a new approach, which is rooted in nonlinear dynamical systems, for increasing the efficiency of thermoelectric machines. The main focus will be on the physical mechanisms, unveiled by these dynamical models, which lead to high thermoelectric efficiency, approaching the Carnot limit.

About the Speaker

Professor Casati is the Director of the "Centre for Nonlinear and Complex Systems"-Como and a Full Professor of Theoretical Physics, University of Insubria-Como. His scientific interests include classical and quantum chaos, nonlinear dynamics and complex systems, transport phenomena, quantum computing, statistical physics, theoretical physics. His main scientific contributions are discovery of quantum dynamical localization phenomenon, relevance of chaos in quantum mechanics, quantum limitations of chaotic excitation of hydrogen atom in monochromatic fields, connections between quantization of non-integrable systems and the statistical theory of spectra, scaling behaviour of localization in quantum chaos, validity of Fourier law in one-dimensional many body classical system, discovery of the thermal rectifier, of the thermal transistor and of the wave diode, and a new approach to increase thermoelectric efficiency. His scientific achievements are recognized by Italian Prize for Physics "F. Somaini" (1991), Enrico Fermi Prize (2008), and International prize for Physics 2010- Accademia Nazionale dei Lincei.