Minicolloquium

Physique mésoscopique : PM1

NanoConduction and NanoRadiation

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Understanding and controlling heat transfer at very short time and length scales has become very crucial and challenging in the last decade due to the continuous development in nanotechnology and the rapid evolution in the synthesis and fabrication of different materials at a nanometer scale. Energy (heat) deposition and propagation through a material can be very different depending on the situation. The excitation, the structure, the dimension of the material, and the nature of the energy (heat) carriers determine the way energy (heat) behaves at the microscopic scale. At short length scales, two heat transfer mechanisms become dominant, namely near field thermal radiation (mediated by photons) and interface conduction (mediated by phonons) between two solid materials. The study of these two heat transfer mechanisms has seen a tremendous development in the last decade. In addition to the purely fundamental aspects of the phenomena, the interest is motivated by the increasing application potential in different technological domains.

The study of radiation heat transfer between two solid materials is particularly important in the exploitation of renewable energy sources, such as in photovoltaics and thermophotovoltaics. Moreover, several conceptual thermal devices, such as thermal rectifiers/diodes, thermal transistors, and thermal memories, have been suggested and theorized, which in principle makes it possible to control heat and process information via phonons and photons. A better understanding of conduction at the nanoscale is also of tremendous importance for thermoelectric applications.

At short time and length scales, the distinction between diffusive and ballistic regimes of heat transport becomes very relevant as Fourier's law becomes invalid and many non-Fourier heat conduction models both local and nonlocal have been developed to overcome problems associated with the Fourier's model (e.g., infinite speed of propagation of heat). In fact, nonlocal effects may become very important at very short length scales.

This mini-colloquium aims to address the latest advances regarding the study of energy (heat) transfer at very short time and length scales. The goal is to bridge the gap between experiments and theory, fundamental issues and applications to move towards a deeper understanding of the physics and the related devices.

Keywords : Phonons Coherence, Thermal Conductivity, Thermal Interface Resistance, Phonons-Plasmons Coupling, Near Field Radiation, Thermal Rectification, Fluctuations in low dimensional structures.

Talk: 15 min (including discussion).
Invited talk: 30 min (including discussion).
Language: English (preferred) or French.

Registration on the conference website: jmc15.sciencesconf.org

More information can be found on the website or contact organizers *Younes Ezzahri* and *Laurent Chaput*.

Important dates:

April 15th 2016: deadline for student grant application.
May 1st 2016: deadline for abstract submission.
May 15th 2016: Notification of acceptance for oral and poster presentations.