CMD2020GEFES mini-colloquium

Quantum thermoelectrics and heat currents in the nanoscale
Rafael Sánchez, Linda Zotti, Edmund Leary, Janine Splettstoesser

The drive to an energy-sustainable future requires a fundamental understanding of heat and electrical transport at the nanoscale. Transport in quantum electrical conductors has recently expanded its scope to include the study of heat and thermoelectric currents. This is in part due to the improved experimental control of temperature gradients and thermometry in a variety of systems including interacting quantum dots, molecular junctions, chiral edge states in the quantum Hall regime, or tunnel junctions. They have demonstrated salient thermal and thermoelectric properties due to e.g., effects of confinement, quantum interference, and the role of interactions and non-linearities. In practice, they work as efficient thermoelectric generators, refrigerators, energy harvesters, and thermal rectifiers. Fundamentally, the investigation of heat transport at the nanoscale sheds light on phenomena based on electron-electron interactions, phase coherence and coupling to non-equilibrium environments (such as molecular vibrations, phonon baths, cavity photons, or electromagnetic fluctuations) not present in macroscopic configurations. They also allow for direct measurements of entropy production or mutual information transfer. For these reasons, the interest of mesoscopic thermal devices lies at the intersection of fields as diverse as quantum and stochastic thermodynamics, quantum transport and energy management.

Overall, this colloquium provides an excellent opportunity for bringing together theoreticians and experimentalists from different fields such as molecular electronics, quantum dots and metallic nanocontacts, all working under the common umbrella of thermal conductance and thermoelectricity.
Wednesday, 02 September 2020

Zoom host: Isabel Guillamón.


10:10-10:50 **Thermal conductance and thermoelectricity of single-atom and single-molecule junctions.** Fabian Pauly (invited).


Thursday, 03 September 2020

Zoom host: Isabel Guillamón.

9:30-10:10 **Thermocurrent Coulomb diamonds of a single-molecule transistor.** Herre van der Zant (invited).

10:10-10:50 **Simulating time-dependent thermoelectric transport in quantum systems.** Adel Kara Slimane, Philipp Reck and Geneviève Fleury (invited).


11:10-11:30 **Power-efficiency-fluctuations trade-off in steady-state heat engines: The role of interactions.** Giuliano Benenti.

11:30-11:50 **Strongly reduced thermal conductivity of supported multilayer graphene nanowires.** S. Timpa, J. Rastikian, S. Suffīt, P. Lafarge, C. Barraud, and Maria Luisa Della Rocca.

CMD2020GEFES
11:50-12:10 **Cooling by Powering the Quantum Hall Effect.** David Sánchez, Rafael Sánchez, Rosa López, and Björn Sothmann.

12:10-12:30 **The Nernst effect in Corbino geometry.** A. V. Kavokin, B. L. Altshuler, S. G. Sharapov, P. S. Grigoryev, and Andrey Varlamov.

**Special sessions Thursday Afternoon**

Zoom host: Isabel Guillamón. Pre-recorded talks and poster videos on YouTube.

**Pre-recorded talks**

1. **Low-Frequency Imaginary Impedance at the Superconducting Transition of 2H-NbSe2.** David Perconte, Samuel Mañas-Valero, Eugenio Coronado, Isabel Guillamón, and Hermann Suderow.


4. **Density functional theory studies of the effect of B, Al, N and P impurities on the electronic structure of Si0.3Sn0.7Ge alloy.** Collins E. Ouserigha, Ayibapreye K. Benjamin.

**Posters**

1. **Connectivity dependent thermoelectric properties of single thiophene molecule.** Hatef Sadeghi, Abdalghani Daaoub and Nickel Blankevoort, rest of authors.


7. **Single-material unipolar thermoelectrics at nanoscale.** Alhun Aydin, Altug Sisman, Jonas Fransson.

Friday, 04 September 2020

Zoom host: Isabel Guillamón.


CMD2020GEFES