Uprzejmie zawiadamiamy, że w **ŚRODĘ**

20 maja 2015 r., o godz. 10:00

w sali 203 (bud. 1) odbędzie się seminarium, na który

Dr Olli-Pentti Saira

Low Temperature Laboratory, Aalto University, Finland

wygłosi referat na temat:

„Thermal fluctuations in small metallic systems”

I will present experimental work illuminating the unique thermal phenomena which occur in nanostructures at millikelvin temperatures. A combination of energy-sensitive electronic transport, minuscule heat capacities and strongly material and temperature-dependent heat conductivity enables new device concepts for thermometers, calorimeters and electronic refrigeration [1]. The experiments I will describe in detail also make use of the NIS tunnel junction and the clean NS interface (N - normal, S - superconducting) as electro-thermal circuit elements.

In Ref. [2], we measured the distribution of dissipated energy as individual electrons are shuffled between the electrodes of a single-electron box. This distribution becomes increasingly non-Gaussian for higher driving frequencies. Furthermore, with a finite probability the amount of dissipated heat is negative, illustrating statistical violations of the Second Law. We show that the experimental distributions are consistent with non-equilibrium fluctuation relations [3,4] that can be considered generalizations of the Second Law for small systems.

I will also describe our on-going efforts aimed at observing temperature fluctuations in a small piece of copper. As noted by Landau and Lifshitz [5] among others, the temperature of a small body will undergo equilibrium fluctuations with an r.m.s. amplitude that depends only on its temperature and heat capacity. These fluctuations set a fundamental limit on the energy resolution of calorimeters, although they can be easily overwhelmed by other noise sources. Recently, we have demonstrated a high-bandwidth cross-correlation measurement of tunnel junction thermometers that should allow for the measurement of the temperature fluctuation spectrum.

[1] Giazotto et al., RMP 78, 217 (2006),
[2] Saira et al., PRL 109 180601 (2012).
[3] C. Jarzynski, PRL 78 2690 (1997).
[4] G. Crooks, PRE 60, 2721 (1999).
[5] Landau and Lifshitz, Statistical Physics, 3rd ed. Part 1 (1980)

Serdecznie zapraszamy

Roman Puźniak
Henryk Szymczak
Andrzej Wiśniewski