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Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme
Fachbereich Physik, Universität Stuttgart

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hybrid

Login data will be announced by e-mail and on the colloquium webpage.

Dienstag, 25. Oktober 2022 | **16.15 Uhr** | **Lecture Hall 2D5**

Stuttgarter Max-Planck-Institute, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

What is measured when measuring a thermoelectric coefficient?

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Abstract

A thermal gradient generates an electric field in any solid hosting mobile electrons. In presence of a finite magnetic field (or Berry curvature) this electric field has a transverse component. These are known as Seebeck and Nernst coefficients. Callen argued, back in 1948, that the Seebeck effect quantifies the entropy carried by a flow of charged particles in absence of thermal gradient. We begin to understand that the Nernst conductivity quantifies the entropy carried by a flow of magnetic flux in absence of thermal gradient.

I will show that in a variety of solids, ranging from semi-metals to superconductors, from correlated metals to topological magnets, experiments indicate that the rough amplitude of the thermoelectric response is set by fundamental units and material-dependent length scales. Specifically, the Nernst conductivity scales with the square of the mean-free-path in metals. In magnets it acquires an anomalous component which scales with the square of the fictitious magnetic length. Finally, ephemeral Cooper pairs, present in the normal state of a superconductor, generate a Nernst signal scaling with the square of the superconducting coherence length.