Séminaire LIONS

Thermodynamic approach to calculation of thermoelectric and thermomagnetic coefficients

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In this talk I will start recalling the definitions of thermoelectric and thermomagnetic coefficients and discussing difficulties existing in their microscopic description. Then I will demonstrate the link between conductivity and coefficients of Seebeck, Nernst-Ettingshausen, Peltier, and Thompson and Reghi-Leduc via the temperature derivatives of the chemical potential and magnetization of a system. The obtained general expressions will be applied to three-, two- and one-dimensional systems of charge carriers having a parabolic or Dirac spectrum. The method allows for predicting thermoelectric and thermomagnetic properties of novel materials and systems.

In order to demonstrate how the method works I will show several examples, including normal method, fluctuating superconductor and graphene in magnetic field.

At the end of the talk I will speak about the specifics of Boltzmann systems of strongly interacting charged particles (electrolytes) and will discuss different, including the nonlinear, regimes of Seebeck effect which can occur there.