

Chiara SAFFIRIO (University of Basel)

The Boltzmann equation: from microscopic to macroscopic scales

A major question in non-equilibrium statistical mechanics concerns the rigorous derivation of effective macroscopic equations from the microscopic laws of classical and quantum mechanics.

In this course we will address the aforementioned question in the framework of kinetic theory of gases. More precisely, we will focus on the derivation of the Boltzmann equation from a microscopic system of N interacting particles.

The course is divided into two parts: in the first part we will review the celebrated result by O. Lanford from 1975 on the derivation of the Boltzmann equation from a system of N hard spheres in the low-density limit, for short times; in the second part the focus will shift towards recent developments on the derivation of the Boltzmann equation and related open problems, underlying which are the limitations of the Boltzmann description in the current state of the art.