

The Boltzmann equation: mathematics and applications

Carlo Cercignani
Politecnico di Milano (Italy)

The talk will be subdivided into two parts. The first will presents a recent result by the author concerning the existence of the solution of the Boltzmann equation for Maxwell molecules, without any cutoff in the collision kernel, when the solution depends on just one variable. At variance with the well-known theorem of DiPerna-Lions, conservation of energy is also shown to hold.

The second part will concern rarefied gas dynamics problems, governed by the Boltzmann equation and concerning the theory of micromachines (MEMS) and nanomachines (NENS). These devices are increasingly applied to a great variety of industrial and medical problems. In these problems, given the small dimensions of the devices, it is necessary to use the kinetic theory, instead of the usual fluid dynamics, based on the Navier - Stokes equations, to describe the motion of air in the gaps of the devices. Some variational and simple numerical solutions will be discussed and compared with costly Monte Carlo simulations.