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Lecture Series

Asymptotic methods in kinetic theory of gases: An introduction

Professor Kazuo Aoki

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Part 1 (14 August 2017): The first half of this part is devoted to a brief introduction to kinetic theory of gases, which contains a summary of the Boltzmann equation and its basic properties, the boundary conditions, etc. Then, we consider the free-molecular gas (or the Knudsen gas), i.e., a gas which is so rarefied that the collisions between gas molecules can be neglected (that is, the mean free path of the gas molecules is infinitely long compared with the characteristic length of the system). We present an exact solution that describes the effect of boundary temperature in a quite general situation.

Part 2 (15 August 2017): In this part, we consider the near continuum regime (or near the fluid-dynamic limit), i.e., the case where the mean free path is small compared with the characteristic length. We show the outline of the formal asymptotic analysis of the steady boundary-value problem of the Boltzmann equation that provides the fluid-dynamic type equations, their boundary conditions of slip type, and the kinetic correction to fluid-dynamic solutions in the vicinity of the boundary (the Knudsen layer) systematically. A special emphasis is put on the case in which the fluid-dynamic limit thus obtained is not covered by the conventional fluid dynamics (the ghost effect).

Date: Monday, 14 August 2017 (Part 1) and
Tuesday, 15 August 2017 (Part 2)
Venue: Rm 219, Lady Shaw Building,
The Chinese University of Hong Kong, Shatin
Time: 2:30 p.m. – 4:00 p.m.

All are Welcome!