

**Riemann Problem for a Boltzmann shock wave with the hard sphere model.**  
Shih-Hsien Yu, National University of Singapore

In this talk we will present an initial value problem of the Boltzmann equation with a macroscopic shock wave data. This data is a discontinuous initial data. The evolution of this singular initial data to a time asymptotic Boltzmann shock layer contains several different time scales. The first time scale is due to the kinetic hyperbolic property. The second time scale is due to balance of the kinetic hyperbolic property and the equilibrating property due to the linear collision operator. It resembles to structure a linear Navier-Stokes equation. The third is due to the macroscopic nonlinearity; and nonlinear hydrodynamic structures start to arise. The basic mechanism is due to a Burgers' equation type nonlinearity. The last time scale is a large time scale behavior. It is the time scale for the asymptotic time stability of a Boltzmann shock layer.