

1071-70-4

**Tai-Ping Liu\*** ([liu@math.stanford.edu](mailto:liu@math.stanford.edu)), Department of Mathematics, 450 Serra Mall Stanford, Stanford, CA 94305. *Hilbert Sixth Problem.*

Abstract: When Hilbert formulated his Sixth Problem, he had in mind mostly the relationship of the kinetic theory with Newtonian interacting particle systems and with the fluid dynamics. The relationship of the Boltzmann equation in the kinetic theory with the Newtonian interacting particle systems has been largely unresolved mathematically. There are more than one fundamental issues on this part of Hilbert Sixth Problem. The celebrated work of Lanford (1975) represents an important, but preliminary, step in this direction. The relationship of the Boltzmann equation with the fluid dynamics is a very rich area. There is the well-known series of works on the convergence of the Diperna-Lions weak Boltzmann solutions to the Leray weak solution of incompressible Navier-Stokes equations. The study of the shock waves starting from the kinetic theory has been initiated in recent years. The kinetic theory is closer to the first principle in physics, particularly on the formulation of the boundary condition. There is now a field of Modern Fluid Dynamics resulting from the study of the kinetic theory. This talk aims at exploring these and other issues, and highlighting the major open problem. (Received March 09, 2011)