
Hilbert's sixth problem: particles and waves

Yu Deng

University of Chicago

A major part of Hilbert's sixth problem asks for the mathematical justification of the passage from atomistic interactions to the laws of motion of continuum. In the particle setting, this corresponds to the well known program of going from Newtonian particle dynamics to fluid equations via Boltzmann's equation. In the wave setting, one starts from nonlinear dispersive equations and aims at deriving the wave kinetic equation, i.e. wave analog of Boltzmann's equation.

In this talk I will present recent works, joint with Zaher Hani and Xiao Ma, that lead to resolution of both problems, starting from hard sphere dynamics for particles, and the cubic NLS equation for waves. The two proofs follow the similar framework but have very different features.
