COLLOQUIUM

UNIVERSITY OF PITTSBURGH

FRIDAY, March 31, 2017

704 THACKERAY HALL

3:30 P.M.

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THE PROBLEM WITH HILBERT'S 6th PROBLEM

ABSTRACT: In his famous 1900 ICM address Hilbert proposed his famous list of problems for the 20th century. Among these was his 6th problem which was less clearly formulated than the others but dealt with a rigorous derivation of the macroscopic equations of continuum mechanics from the available microscopic theory of his time, i.e. statistical mechanics and specifically Boltzmann's kinetic theory of gases. The problem has drawn attention from analysts over the years and even Hilbert himself made a contribution. In this talk I will note how an exact summation of the Chapman-Enskog expansion for the Boltzmann equation due to Ilya Karlin (ETH) and Alexander Gorban (Leicester) can be used to represent solutions of the Boltzmann equation and then show that these solutions CANNOT converge the classical balance laws of mass, momentum, and energy associated the Euler equation of compressible gas dynamics. Hence alas Hilbert's program (at least with respect to gas dynamics) has a negative outcome.

Refreshments served at 3:00 p.m.
in the Math Dept. COMMON ROOM, Thackeray 705