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**Isabelle Gallagher\*** ([gallagher@math.ens.fr](mailto:gallagher@math.ens.fr)), Ecole Normale Supérieure, 45, rue d'Ulm, Paris, France. *From Newton to Navier-Stokes, or how to connect fluid mechanics equations from microscopic to macroscopic scales.*

The question of deriving Fluid Mechanics equations from deterministic systems of interacting particles obeying Newton's laws, in the limit when the number of particles goes to infinity, is a longstanding open problem suggested by Hilbert in his 6th problem. One step in the program consists in deriving Fluid Mechanics Equations from the Boltzmann equation on the one hand, and the Boltzmann equation from particle systems on the other. In this talk we shall show how to answer Hilbert's question at a formal level, and why it is very difficult, and actually an open problem to this day, to make the argument rigorous. We shall also discuss a few successful attempts in this program, in particular the works of Golse and Saint Raymond which provide a rigorous derivation of the incompressible Navier-Stokes equations from the Boltzmann equation. (Received September 24, 2017)