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On the Navier–Stokes Equations

More than 2500 years after the famous statement by Heracleitos the investigation of fluid flow is more than ever of fundamental importance. Due to a large number of technical, experimental and computational innovations and related theoretical problems the investigation of fluid flow represents a challenging and exciting subject requiring a wide variety of profound mathematical methods, efficient numerical algorithms and complex experimental simulations. Fascinating from the mathematical point of view, of course, is the fact that the fundamental equations of Navier–Stokes, formulated the first time by the French engineer Navier in 1822, could not be solved in the general three–dimensional case up to now.

The lecture introduces the Navier–Stokes equations shortly from historical and physical point of view, touches some fundamental mathematical problems concerning weak and strong solutions and discusses currently still open questions.