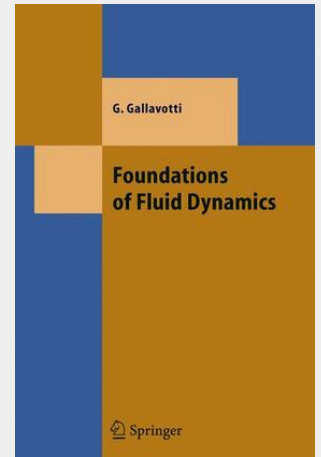


## Foundations of Fluid Dynamics

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The imagination is struck by the substantial conceptual identity between the problems met in the theoretical study of physical phenomena. It is absolutely unexpected and surprising, whether one studies equilibrium statistical mechanics, or quantum field theory, or solid state physics, or celestial mechanics, harmonic analysis, elasticity, general relativity or fluid mechanics and chaos in turbulence. So when in 1988 I was made chair of Fluid Mechanics at the Università La Sapienza, not out of recognition of work I did on the subject (there was none) but, rather, to avoid my teaching mechanics, from which I could have a strong cultural influence on mathematical physics in Rome, I was not excessively worried, although I was clearly in the wrong place. The subject is wide, hence in the last decade I could do nothing else but go through books and libraries looking for something that was within the range of the methods and experiences of my past work. The first great surprise was to realize that the mathematical theory of fluids is in an even more primitive state than I was aware of. Nevertheless it still seems to me that a detailed analysis of the mathematical problems is essential for anyone who wishes to do research into fluids. Therefore, I dedicated (Chap. 3) all the space necessary to a complete exposition of the theories of Leray, of Scheffer and of Caffarelli, Kohn and Nirenberg, taken directly from the original works.

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