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Book review by Denys Dutykh (ENS Cachan, CMLA)

« **Hydrodynamics and sound** »

by M.S. Howe

June 3, 2007

Hydrodynamics is a branch of mechanics which studies the motion of fluids. This science is chanced to be fascinating itself and extremely important in practical sense at the same time. For example, one can think about numerous applications ranging from engineering to environmental sciences through oceanography and hydraulics.

Fluid mechanics have revealed many challenging problems in physics, mathematics (e.g. the famous unsolved question of global well-posedness of 3D Navier-Stokes equations) and scientific computing (development of new performant numerical schemes). Applications permanently give rise to new problems. It clearly indicates that this field of science is far from being finished and there is a permanent demand on specialists able to face these tasks.

The present book should be considered as a first course in fluid dynamics. The comprehension of this text necessitates only the knowledge of basic concepts from continuum mechanics, real and complex analysis. Advantageously, it makes this book accessible to wide range of readers.

The author is a professor in the Department of Aerospace and Mechanical Engineering at Boston University. Professor Howe is not only a confirmed researcher but an excellent pedagogue as well. He succeeded to explain in a comprehensive manner complex topics of hydrodynamics and made the reading a fascinating scientific journey. This book has all the chances to become a classical textbook on this subject.

It is organized as follows. In the first chapter the author presents the governing equations of fluid motion while in the second one he considers a special case of potential flows. Next two chapters deal with ideal flows (two dimensional and rotational, respectively). The chapter five is an elementary introduction to an astonishing topic of surface gravity waves. This book is ended by some basic acoustics.

The reviewer would like to mention one shortcoming. Unfortunately the author does not say anything about numerical methods used in computational fluid dynamics (CFD). We recall that these technics have become the method of reference in industrial applications. Evidently, CFD can be taught further in a separate course, but it is important to mention this subject even at early stages.

In conclusion, Howe's book should be recommended to all students willing to discover the wonderful world of hydrodynamics. More experienced readers should address more specialized literature.