

Book review by Denys Dutykh (ENS Cachan, CMLA)

« **Hydrodynamics and sound** »

by M.S. Howe

*June 3, 2007*

Hydrodynamics (literally, “water motion”) is a branch of mechanics which studies the motion of liquids. However, this distinction from fluid dynamics as a whole is not always fully observed. Hydrodynamics is at the same time fascinating by itself and extremely important from the practical point of view. For example, one can think about numerous applications ranging from engineering to environmental sciences including oceanography and hydraulics.

Fluid mechanics has revealed many challenging problems in physics, mathematics (e.g. the famous unsolved question of global well-posedness of the three-dimensional Navier-Stokes equations) and scientific computing (development of new efficient numerical schemes). Applications always lead to new problems. It clearly indicates that this field of science is far from being exhausted and there is a permanent demand of specialists who will be able to face these challenges.

The present book should be considered as a first course in fluid dynamics. The comprehension of this text only requires the knowledge of basic concepts from continuum mechanics, real and complex analysis. Advantageously, it makes this book accessible to a 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 well-established researcher but also an excellent pedagogue. He succeeded in explaining in a comprehensive manner complex topics of hydrodynamics and in making 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. The next two chapters deal with ideal flows (two-dimensional and rotational, respectively). Chapter five is an elementary introduction to the astonishing topic of surface gravity waves. The book ends with 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). 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 turn toward more specialized literature.