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BOOK REVIEWS

Linear Water Waves: A Mathematical Approach. By N. Kuznetsov, V. Maz'ya & B. Vainberg. Cambridge University Press, 2002. 513 pp. ISBN 0521 80853 7. £70 or $100.

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Just a glance at the sea frequently shows water waves breaking, so one might think that the linearization of the water wave problem has little applicability since it gives a mathematical problem posed in a domain with a flat free surface. However, there are numerous examples, especially in deep water, where linear theory gives a good approximation to the wave motion, and hence to the forces on marine structures. Elaborate computer codes, mostly depending on linear theory, assist in the design of off-shore structures and ships. However, except for a photograph on the cover, Kuznetsov and his co-authors have written an entirely mathematical book.

The book commences with a brief survey of the linear water-wave problem, which gives a warning of its restricted viewpoint by mentioning group velocity, on page 5, and immediately noting its absence from the remainder of the book. The book is divided into three parts: time-harmonic waves, ship waves on calm water, and unsteady waves. Throughout the first two of these parts there is heavy emphasis on proving, in detail, solvability and uniqueness, or not, of mathematical problems in these areas. Part 3 has a slightly different character with more emphasis on asymptotic solutions. The mathematical approach used is primarily that of finding appropriate Green's functions and integral equations. Each of the 10 chapters concludes with a brief outline of contributions available in published works: 370 references are listed.

The book is aimed at mathematicians, but even so it has restricted content. It is almost devoid of actual solutions, even for circular cylinders. Its main topics of solvability and uniqueness are important. Integral-equation methods are very useful for computing solutions, but care is needed. There are a number of practically important areas where solutions are not unique, and integral-equation methods can introduce spurious non-physical solutions. However, the book contains no convenient summary of the results presented. An opportunity to show some of the many interesting results and methods for linear water waves has been lost, for example D. V. Evan's proof (1976, A theory for wave-power absorption by oscillating bodies, *J. Fluid Mech.* vol. 77, pp. 1–25) that a moving circular cylinder can absorb all the energy from an incident periodic wave train: this was later confirmed by experiments.

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