

Water Waves and Ship Hydrodynamics

2nd Edition

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An Introduction

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 Springer

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Preface to the Second Edition

This book is a revision and extension of the book published by R. Timman, A.J. Hermans and G.C. Hsiao based on the lecture notes of courses presented by Timman at the University of Delaware in 1971 and by Hermans at the Technical University of Delft. The main topic of the original text is based on linearised free surface water wave theory. For many years the first edition of the book is used by Aad Hermans as material for a course in ship hydrodynamics presented to Master students in applied mathematics and naval architecture at the Technical University of Delft. Influenced by the progress in the research in water waves and especially in ship hydrodynamics the contents of the course has changed gradually. For instance in offshore engineering the topic like the low-frequency motion of objects moored to a buoy has become an important issue during this period. Therefore an introduction in this field has been added. For didactic reasons the very simple rather abstract problem of the motion of a vertical wall is added. The reason to do so is that most effects that play a role can be treated analytically, while for a general three dimensional object some terms can only be obtained numerically. The use of numerical programs is normal practice in this field, therefor an introduction in the theory of integral equations is presented and some specific problems which may arises, such how to avoid non-physical resonance at the so called irregular frequencies may be avoided. In the first edition a derivation of the structure of the equations of motion in all six degrees of freedom is presented. Because the functions derived there are not easily computed in a practical case, we restrict ourselves to the derivation of the equation of motion in one degree of freedom.

Delft, The Netherlands

A.J. Hermans

Preface to the First Edition

In the spring of 1971, Reinier Timman visited the University of Delaware during which time he gave a series of lectures on water waves from which these notes grew. Those of us privileged to be present during that time will never forget the experience. Rein Timman is not easily forgotten.

His seemingly inexhaustible energy completely overwhelmed us. Who could forget the numbing effect of a succession of long wine-filled evenings of lively conversation on literature, politics, education, you name it, followed early next day by the appearance of the apparently totally refreshed red-haired giant eager to discuss mathematical problems with keen insight and remarkable understanding, ready to lecture on fluid dynamics and optimal control theory or a host of other subjects and ready to work into the evening until the cycle repeated. He thought faster, knew more, drank more and slept less than any of the mortals; he literally wore us out. What a rare privilege indeed to have participated in this intellectual orgy. Timman's lively interest in almost everything coupled with his buoyant enthusiasm and infectious optimism epitomised his approach to life, No delicate nibbling at the fringes, he wanted every morsel of every course.

In these times of narrow specialisation, truly renaissance figures are, if not extinct, at least a highly endangered species. But Timman was one of that rare breed. His knowledge in virtually all areas of classical applied mathematics was prodigious. I still marvel that while I was his doctoral student in Delft in the late fifties working on a problem in electromagnetic scattering he had at the same time students working in water waves, cavitation, elasticity, aerodynamics and numerical analysis. He was a boundless source of inspiration to his students in all of these varied fields.

His inattention to detail is legendary but this did not hamper his ability to focus on what was really important in a problem. With a wave of his large hand he would dismiss unimportant errors while concentrating on central ideas, leaving to us the task of setting things right mathematically. This nonchalant attitude toward minus signs and numerical factors was probably deliberate. He wanted people to see the forest, not the trees; to focus on the heart of the problem, not inconsequential superficialities. He had little use for the all too prevalent penchant for examining someone's work looking for errors. He would read a paper looking for the gold, not the dross; looking for what was right, not what was wrong.

Of course this did not make life easy for those around him but it did make it interesting. This will be attested to by George Hsiao and Richard Weinacht whose revised version of the notes from Timman's water wave lectures appeared as a University of Delaware report. Timman and Hsiao then planned to further revise and expand these notes and publish them in book form, but the project came to an abrupt halt with Reinier Timman's untimely death in 1975. It might have remained unfinished had not Aad Hermans' visit of Delaware in 1980 breathed new life into it. Together George Hsiao and Aad Hermans have completed the task of revising the notes, reorganising the presentation, restoring the factors of 2 which Timman had cavalierly omitted, and adding some new material. The first four chapters are based substantially on the original notes, while the fifth chapter and appendices have been added.

It is gratifying to see the completion of these notes. It is not unreasonable to hope that they will provide a useful introduction to water waves for a new generation of mathematicians and engineers. This area was perhaps first among equals in the broad spectrum of Timman's interests. If these notes succeed in stimulating a new generation to concentrate on the challenging problems remaining in this field, they will serve a fitting memorial to a remarkable man whose like will not be soon seen again.

Newark, Delaware
March, 1985

R.E. Kleinman

Acknowledgements to the First Edition

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March, 1985

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G.C. Hsiao

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