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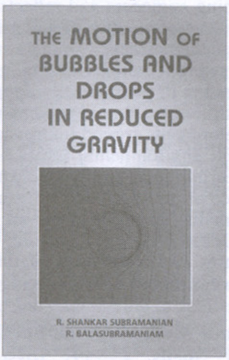
5R50. Motion of Bubbles and Drops in Reduced Gravity. - RS Subramanian *(Clarkson Univ, Potsdam NY)* and R Balasubramaniam *(Natl Center for Microgravity Res on Fluids and Combust, NASA John H Glenn Res Center, Cleveland OH)*. Cambridge UP, Cambridge, UK. 2001. 471 pp. ISBN 0-521-49605-5. $100.00.

Reviewed by N Clark (Dept of Civil Eng, Eng, and Mineral Resources, West Virginia Univ, 125 Eng Sci, PO Box 6106, Morgantown WV 26506-6106).

The existence of bubbles and drops is predicated on the presence of interfacial tension, but their motion is more often than not caused by gravity. The authors have teamed up to produce this book that examines the behavior of bubbles and drops without influence of the earth's pull. The authors observe that bubbles and drops are frequently encountered in spacecraft laboratory experiments with which they have direct experience. Although this topic is highly specialized, their book will double as a broader reference because it also dwells on related multiphase issues.



The book is divided into four parts. Part 1 commences with a careful review of the governing equations, discussion of surfactants and surface tension, and an introduction to reduced gravity in spacecraft. The authors continue in Part 2 on the topic of motion of single bubbles and drops. They consider the cases of motion when inertia is negligible, and when inertial effects are moderate. Drops and bubbles at high Reynolds' numbers are also treated. The authors provide fundamental analyses to describe the motion of an isolated drop caused by surface tension gradients, which are often induced by variations of temperature across the field (thermocapillary motion). Careful attention is paid to limiting cases, such as when convective energy transport is small, or else dominant, and surfactants are discussed in appropriate detail. Illustrations in this section are well considered and provide a valuable interpretation of the theory.

In Part 3, the authors address interactions of bubbles and drops. This topic is of interest firstly because it is necessary in designing single drop experiments to estimate the influence of neighboring drops and avoid their influence by choosing sufficiently large drop spacing. Secondly, the interaction of drops is important in understanding the circumstances leading to coalescence. The authors carefully explain the difficulties that arise in tackling a theoretical description of drops under the influence of a neighboring boundary. Part 3 amplifies the analysis well by providing useful illustrations, such as those of streamlines in the vicinity of interacting bubbles. The authors present relevant experimental data periodically to demonstrate agreement with theory. Part 4 discusses interphase mass transfer. Analytic solutions are developed and compared with numerical computations. This section provides a strong basis for necessary future research. The last chapter deviates a little from the overall theme, but provides a useful account of flows driven by variations in surface tension.

This book is thorough and rigorous. With 400 references, the work of prior researchers is well acknowledged. The Table of Contents, Index, and Introductions to the chapters make the material easy to navigate, and the authors have taken the trouble in the text to refer the readers to related sections elsewhere in the book. Motion of Bubbles and Drops in Reduced Gravity will be of value to applied mathematicians, physicists, and fluids engineers working in the fields of reduced gravity or multiphase systems, and may impact a number of materials researchers. *Motion of Bubbles and Drops in Reduced Gravity* is an essential purchase as a reference text for libraries at universities and research laboratories, but is too specialized as a graduate text at all but a few universities. However, those engaged in this challenging field are well advised to place copies on their bookshelves.