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BOOK REVIEW

Bubbles, Drops and Particles. R. Clift, J. R. Grace and M. E. Weber. Academic Press, 1978. 380 pp.

In the preface to this book, the authors cite as their principle objective, "... a comprehensive critical review of the literature as it applies to the fluid dynamics, heat transfer, and mass transfer of single bubbles, drops and particles". They go on to say that they "... have tried primarily to provide a reference text for research workers concerned with multiphase phenomena and a source of information, reference and background material for engineers, students and teachers...". The book itself appears to this reviewer to be more accurately described as an exhaustive compilation of references for a small number of topics from within the broad problem area indicated in the original statement of objectives. Specifically, with the exception of the last four chapters (9–12) the book is restricted to steady translational motions of single particles, bubbles or drops through unbounded, incompressible, Newtonian fluids, with emphasis on existing theoretical or empirical correlations for the drag (or terminal velocity), and for the rates of convective heat or mass transport in the absence of chemical reaction. There is no question that the list of references on this topic is extensive, and the book may be worthwhile to some readers on this basis alone. However, it is difficult to see how the book could be used for other purposes, even within the topics that it attempts to cover. It is first and foremost a listing of what has been done. Methods of analysis or experimental technique are not discussed sufficiently to allow the reader to assess or reproduce the results which appear without reference back to the original papers. Furthermore, the explanations of the underlying physical phenomena are not sufficiently comprehensive or developed to allow much more than a superficial understanding by the reader who is not already familiar with the material. Finally, it is difficult to see what use could be made of this book by the engineer or research worker who is genuinely interested in applications to systems where there is more than a *single* bubble, drop or particle. Admittedly, this is a difficult problem, but it is regrettable that the authors provide no assistance whatsoever in this regard, especially in a book which otherwise emphasizes drag and transport correlations rather than fundamental physical insight.

It is impossible to read or review this book of 380 pages, especially given the title "*Bubbles, Drops and Particles*", without reacting strongly to the extremely narrow scope of the subject matter which is included. In fairness, the last four chapters (9–12) do attempt to encompass a variety of problems which fall outside the area of steady translation in an unbounded Newtonian fluid that is encompassed in the first eight chapters. The titles, "Wall Effects" (Chap. 9), "Surface Effects, Field Gradients, and other Influences" (Chap. 10), "Accelerated Motion without Volume Change" (Chap. 11), and "Formation and Breakup of Fluid Particles" (Chap. 12), are indicative of the subject matter which the authors attempt to cover. Unfortunately, however, this part of the book not only suffers from all of the weaknesses that have already been discussed with regard to Chaps. 1–8, but it loses the one redeeming feature of a comprehensive reference list. To some extent, this is a reflection of the many topics which the authors do not consider at all. However, even in those areas where previous studies are mentioned, the coverage of pertinent literature is nowhere near the standard of completeness which characterized the earlier chapters. The coverage of particle motions in fluids which are not quiescent is essentially limited to a few brief pages about shear flow and no mention is made of heat or mass transfer in this case, most of the extensive literature on wall effects is totally ignored, multiparticle effects are again deleted entirely, and no mention is made of

non-Newtonian fluids which play an important role in many technologies involving bubble, drop or particle motions. Although a much longer list could be made of topics that were not considered, the above is sufficient to indicate the glaring deficiencies of the book in this regard.

For the reader who has a need for a comprehensive listing of the literature up to approximately 1976 on the fluid mechanics and associated heat or mass transfer problem for translation of single particles, bubbles or drops in an infinite Newtonian fluid, this book is possibly worth obtaining. For other purposes, or other problems involving particle, bubble or drop motions, it is seriously deficient, in my opinion.

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