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BOOK REVIEW

Bubbly Flows. Edited by M. SOMMERFELD. Springer, 2004. 351 pp. ISBN 3 540 40791 X. EUR 99.95 or £77.00 or $129.00.

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The large number of papers published in the *Journal of Fluid Mechanics* over the past decade on problems involving bubbles is testament to the advances being made and to our incomplete understanding of bubble dynamics. Between 1996 to 2002 the Deutsche Forschungsgemeinschaft (DFG) provided 6.9 million Euros of research support through a focused program to improve the physical understanding of gas–liquid, and gas–solid–liquid flows as they occur in chemical reactors. Two areas were emphasized: developing improved measurement techniques and advancing modelling approaches. This volume summarizes the outcome of these studies.

The 25 papers are approximately equally divided between experimental studies and numerical simulations. The experimental studies range from now-standard particle image velocimetry to more novel X-ray tomography, and address problems ranging in complexity from the interaction and coalescence of pairs of bubbles to characterizing complex three-phase flows. The numerical studies similarly range from modelling the dynamics of individual bubbles to models for three-phase turbulent flows with phase interactions.

Much of the work that forms the basis for the papers in this volume has already been published in the refereed literature. A minority of papers focus on otherwise unpublished results. Despite the breadth of topics and approaches covered, the volume is not ideal as a review or introduction to the subject because in general the short papers do not include a comprehensive review of past work, nor do they emphasize a critical assessment of the current state of understanding. Moreover, there is duplication of topics and the notation is not consistent (and sometimes not defined) between papers. Nevertheless, some of the papers are pedagogic and explain dynamics in a clear manner, notably the paper by Brücker & Schröder on the shape and path oscillations of bubbles, and the implications for how bubbles interact. Yet the key elements of this paper can be found in Brücker's 1999 *Physics of Fluids* paper (vol. 11, p. 1781). For these reasons, it is difficult to recommend that individuals purchase this volume given its high cost, though it certainly deserves a place in research libraries. Its main value is in the snapshot it provides of the research challenges faced in the 1990s for this class of problems.

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