# REVIEW

**Annual Review of Fluid Mechanics,** Volume 2. Edited by M. VAN DYKE, W. G. VINCENTI and J. V. WEHAUSEN. Annual Reviews, Inc., 1970. 462 pp. $10.00.

As we belatedly review this second volume of *Annual Review of Fluid Mechanics*, volume 3 is already in the bookshops, and volume 4 is in an advanced state of preparation. The series has evidently come to stay, and a very good thing too. Volume 2 maintains the general high standard set in volume 1, and every serious student of fluid mechanics is sure to find at least one paper in it that he would describe as compulsory (if not compulsive) reading; at least one, quite probably two, possibly even three, but more than that only if he has a most unusual capacity for absorbing information over a wide range of topics. The width of the range is not so much evident from the titles of the 15 papers included – two on boundary layer theory, six (!) on geophysical fluid dynamics, three on two-phase flow and porous media, and one each on numerical modelling, ship hydrodynamics, non-linear wave propagation, and vibrational relaxation – as from a study of the union and intersection of the sets of authors referred to in the course of each paper (and this is possible by virtue of the excellent indexing by the editors). Of the 1074 authors cited altogether, 59 are referred to in more than one paper, 14 in more than 2, 5 in more than 3 and one in more than 4 (no prizes for guessing this one!). There are few authors who can *effectively* span more than one topic, and presumably a proportionately small number of readers. The comments that follow from a typical reader have for this reason a highly subjective quality.

The articles vary considerably both in style and in quality. It is clearly a very difficult matter to write a balanced review of a well-defined branch of the subject, eschewing both the tendency merely to catalogue everything that has been done in the field, leaving no room for critical or constructive comment, and the tendency to concentrate on one's own contributions and to give a too personal interpretation. The ideal review should presumably seek to identify those contributions which are most significant, to relate diverse approaches to a topic, to illuminate areas of disagreement, and to highlight problems that are as yet unsolved. In these respects, I like the articles by L. S. G. Kovasznay on "The turbulent boundary layer", by M. Hendershott and W. Munk on "Tides", by A. S. Monin on "The atmospheric boundary layer" and by N. A. Phillips on "Models for weather prediction". I had an impression of a more personal interpretation in the case of the articles by G. Veronis on "The analogy between rotating and stratified fluids", by J. N. Newman on "Applications of slender-body theory in ship hydrodynamics", by W. Lick on "Nonlinear wave propagation in fluids", and by A. R. Robinson on "Boundary layers in ocean circulation models"; but in most cases the personal slant is dictated largely by the nature of subjects and the contributions that the authors themselves have made to them. H. W. Emmons gives a particularly personal view in his "Critique of

numerical modeling of fluid-mechanics phenomena". I could not help feeling that his pessimism concerning the possibility of useful numerical calculations on real (i.e. three-dimensional) turbulence was misplaced, in view of the progress now being made by S. A. Orszag and others in this area.

H. Brenner develops an even more personal point of view in his "Rheology of two-phase systems". A view, but hardly a review; it is a systematic and sophisticated development of the subject that would really seem more appropriate to a regular journal of rheology or of fluid mechanics than to a volume earmarked for reviews. This is hard-core rheology of particulate suspensions, and will be of interest primarily to those already thoroughly immersed in the topic; but there is little concession to the casual reader (and is this series of volumes not aiming at casual readers?) who wishes to acquire something of the flavour of the subject.

J. R. Philip steers a difficult course through the vast literature of his subject "Flow in porous media", whose applications extend over numerous areas of science and technology (no less than 23 are listed in the opening paragraphs). J. R. Spreiter and A. Y. Alksne face a similar problem on "Solar-wind flow past objects in the solar system"; a vast amount of data has recently become available through satellite measurements, and the authors do well to reduce this to digestible proportions. The reader may be alarmed, rather than encouraged, to learn that if he follows up some of the references given, he will thereby be led "immediately to hundreds more"; perhaps it was no slip of the pen that led these authors to refer to the "enormity of the original literature on this subject".

I had little strength left for the last two papers, J. W. Rich and C. E. Treanor on "Vibrational relaxation in gas-dynamic flows" and F. E. Marble on "Dynamics of dusty gases". I did however find L. G. Loitsianskii's introductory historical article on "The development of boundary-layer theory in the USSR" of peculiar interest in that it collects together a large number of useful references to papers published in the USSR on boundary-layer theory, many of which must be virtually unknown in the West; as the editors say in the preface, the article provides a refreshingly novel view of a familiar subject.

Congratulations to these editors for extracting from the authors such an interesting collection of stimulating contributions.

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