Int. J. Heat Mass Transfer. Vol. 17, pp. 1627–1630. Pergamon Press 1974. Printed in Great Britain

BOOK REVIEWS

Advances in Heat Transfer, Vol. 7, 8, 9. Edited by T. F. Irvine, Jr. and J. P. Hartnett. Academic Press, New York and London; Vol. 7 (1971), Vol. 8 (1972), Vol. 9 (1973).

NINE volumes of *Advances in Heat Transfer* have been published since 1964. Volumes 7 through 9 are the subject of this review, but a few remarks will be given first about the series as a whole.

Each volume contains between 4 and 6 articles of about 100 pages in length which, the editors assert, are "designed to fill the information gap between regularly scheduled journals and university level textbooks". The authors of the individual articles are usually well known research workers in their respective fields. Some are better suited than others to compose review pieces of the type published. The bulk of the authors are from the United States, but the rest of the world, particularly Eastern Europe, is also represented.

Most of the articles deal with fundamental, rather than applied topics, but all but two of the volumes have contained at least one article which I would term "applied". Volume 9 contains two such articles.

The field most frequently addressed has been thermal radiation, perhaps out of proportion to its importance (5 articles), while turbulent flows, including boundary layers, rank second with 4 articles. Only one article has appeared which can be considered to amount to a survey of heat transfer problems affecting a single field—it appeared in Volume 4 and relates to "Heat Transfer in Biotechnology". Three articles have appeared dealing explicitly with experimental methods, and at the risk of disclosing my own personal bias, I would like to suggest to the editors that they consider more such for future volumes. The remainder of the articles deal with a variety of topics. In no particular order, they include: mass transfer in boundary layers (3), natural convection (3), mathematical methods (3), boiling and condensation (3), multiphase flow (2), MHD and plasmas (2), high speed and low density flows (3), thermophysical properties (2) and channel flows (2). Topics which have merited only a single article include laminar boundary layers, non-Newtonian flow, liquid metal flows and unsteady flow phenomena. Combined effects have been dealt with occasionally as have current areas of interest such as heat pipes and thermosyphons and the effects of reduced gravity on heat transfer.

Research workers will find the *Advances* a useful starting point for their own research, since the state of the art up to about a year or two before the article appears is discussed and the references are current. The authors are usually deeply involved in the fields themselves and are familiar with reports, dissertations and publications which the casual investigator might overlook. Some of the articles appear to be more a survey of the authors own work than a comprehensive survey of the field but this is perhaps unavoidable given the nature of human emotion. Designers will find some of the articles useful and some not. In my view, the editors would be well advised to try to persuade future authors to address specific design problems and to write their articles in such a way that designers will find them easier to use.

The editors have prepared both Authors and Subject indexes. The latter should be helpful to users of the books and the former to readers who are interested to learn how often and in what context their own work has been cited (or not, as the case may be).

Volumes 7 through 9 deal largely with topics which have been discussed in earlier volumes and which, in most instances are old enough to be considered "classical". The single "new" technology (not to imply that significant advances haven't been made in many of the others) is discussed in Volume 7 in an article on heat pipes. The electrochemical method, a quite new technique for developing experimentally information on mass transfer coefficients is also described in Volume 7.

Volume 7 was published in May, 1971 whereas the latest article referenced was in early 1969. This fact may reflect the normal publication time lag, and if so indicates that the *Advances* are about as poorly off in that regard as most research journals.

Articles in Volumes 7–9 which deal with topics treated in earlier volumes are thermal radiation (Volume 7), natural convection (two articles, Volumes 8 and 9), mathematical methods (Volume 8), condensation (Volume 8), multiphase flow (Volume 8), turbulent boundary layers (Volume 8), cryogenics (Volume 9) and low density flows (Volume 7).

Individual articles appearing in Volumes 7 through 9 are listed below in the order in which they appear along with a brief description of the contents of each. The number of references is also given and the year in which the last one appeared. It should not be presumed, however, that the review is therefore complete up to that year, since in a number of instances only one or two references are cited for that year and those are often the authors own.

On the whole, the editors, Messrs. Irvine and Hartnett are to be congratulated on taking on and continuing the task of providing the heat transfer community with this series of volumes.

Contents and brief synopses

Volume 7

W. B. Hall, *Heat Transfer Near the Critical Point.* Discusses physical properties including the importance of their variation, equations of motion. Results in forced, free and combined convection and boiling. 57 references to 1969.

T. Mizushina, *The Electrochemical Method in Transport Phenomena.* Theory (brief), applications and results in which electrical current measurements yield mass transfer rates. 59 references to 1969.

G. S. Springer, *Heat Transfer in Rarefied Gases.* Free molecular and transitional flows, mostly external. Table of accommodation coefficients. 154 references to 1970.

E. R. F. Winter and W. O. Barsch, *The Heat Pipe.* Description of the phenomenon. Literature survey covering most aspects of heat pipes. 170 references to 1971.

R. J. Goldstein, *Film Cooling.* Primarily results of experimental studies. Both slots and single and multiple hole geometries. 72 references to 1970.

Volume 8

I. J. Kumar, *Recent Mathematical Methods in Heat Transfer.* Brief descriptions of several mathematical techniques which have been applied to heat transfer problems and an indication of where more detailed information can be found. 285 references to 1971.

A. Žukauskas, *Heat Transfer from Tubes in Crossflow.* Single tubes and tube banks, both heat transfer and flow resistance. 83 references to 1970.

S. Ostrach, *Natural Convection in Enclosures.* Internal flows caused by wall heating in rectangular and cylindrical cavities. 52 references to 1970.

R. D. Cess and S. N. Tiwari, *Infrared Radiation Energy Transfer in Gases.* Band absorption models and their use in calculating radiative transfer. 59 references to 1970.

Z. Zarič, *Wall Turbulence Studies.* Discussion of turbulence measurements in wall layers. Mostly hot-wire anemometer results—many produced by the author. 64 references to 1970.

Volume 9

D. Japikse, *Advances in Thermosyphon Technology.* Analysis and experimental results on both open and closed thermosyphons. Discussion of several applications. 117 references to 1972.

C. A. Depew and T. J. Kramer, *Heat Transfer to Flowing Gas–Solid Mixtures.* Turbulent channel flows of dilute mixtures of solids and gases. Discussion of transport properties. 77 references to 1971.

H. Merte, Jr, *Condensation Heat Transfer.* Nucleation in bulk and on surfaces. Condensation rates. 148 references to 1971.

B. Gebhart, *Natural Convection Flows and Stability.* Flows over surfaces and in bouyant plumes. Effect of mass diffusion. Instability. 107 references to 1972.

C. L. Tien and G. R. Cunnington, *Cryogenic Insulation Heat Transfer.* Discussion of types of insulation. Analysis and experimental results. Test methods and applications. 108 references to 1972.

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Heat Bibliography. Published 1972 by the Department of Trade and Industry, 475 pages, £5·35.

NEARLY 8000 references to the world's literature on Heat and Mass Transfer and similar subjects are contained in the 1972 *Heat Bibliography.* The Fluids Group of the National Engineering Laboratory compiled the bibliography which is available from Her Majesty's Stationary Office, 49 High Holborn, London W.C.1. or branches throughout the United Kingdom.

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Heat and Mass Transfer in Boundary Layers, Vols. I and II. Edited by N. Afgan, Z. Zaric and P. Anastasijevic. Pergamon Press, September 1973.

THESE two volumes (of 1012 pages in all) contain the proceedings of the International Summer School on Heat and Mass Transfer in Turbulent Boundary Layers, held at Herceg Novi in September 1968, and some invited lectures and abstracts of other papers of the International Seminar on Heat and Mass Transfer in Flows with Separated Regions and Measurement Techniques, held in the same place one year later.

The latter meeting was the first of the yearly seminars sponsored by the International Centre for Heat and Mass Transfer. In view of the fact that one of the special objectives of the Centre is to promote and assist the exchange of technical information in the field, it is perhaps unfortunate that it was only possible to publish abstracts of 65 of the contributions to the seminar.

As it is, these volumes contain 60 papers from the Summer School and eight from the Seminar, in addition to the 65 abstracts. To list them all, and to comment usefully on each, would strain both the hospitality of this Journal and the ability of this reviewer, who will therefore limit himself to indicating the scope and nature of the meetings by making specific mention of just a few of the papers, chosen (almost!) at random.

V. V. Struminskii considered some aspects of non-linear stability theory related to transition and laminarization. S. S. Kutateladze discussed the turbulent boundary layer in the case of vanishing viscosity; A. Fartier's paper is on a similar topic. J. Mathieu reported on the influence of an external turbulent flow on velocity and temperature distributions in the boundary layer. Transpiration cooling was discussed by J. P. Hartnett and V. M. K. Sastri, by M. R. Head and F. A. Dvorak, and by others. D. B. Spalding described (in his inimitable style) his numerical method for predicting the properties of two-dimensional boundary layers; several other papers came from the Imperial College group. Z. Zaric reviewed some methods of measuring these properties, especially in the close vicinity of the wall. M. A. Styrikovich considered heat and mass transfer in a boiling boundary layer, while W. M. Rohsenow and E. Fedorovich looked at the post-burnout region where the wall is dry and mist flow exists.

Nearly half the papers (25) at the Summer School originated in the USSR and provide a convenient statement of the approaches then used in that country to methods for analyzing turbulent boundary layers (including the effects of transpiration, mass transfer and two-phase flows) as well as giving some limited experimental data in such situations. The UK (with 10 papers), Yugoslavia (9) and France (8) are well represented. The remaining papers came from the USA (4), Sweden (2), Germany (1) and India (1). Thus the "international" nature of the meeting is a little uneven, and does not reflect the quantity or quality of the work being done throughout the heat transfer community. Nevertheless, there is, of course, a wealth of material here covering (in addition to the topics already mentioned) combined forced and free convection boiling heat transfer, duct flow, flow over tubes, flames, heat transfer near the critical state, measurement techniques and other subjects.

The proceedings of the seminar on Heat and Mass Transfer in Flows with Separated Regions and Measurement Techniques (on the title page, the last three words are omitted) opens with a paper by H. H. Korst which analyzes the dynamic and thermodynamic mechanisms involved in in the Chapman-Korst model of separated flows, which is based upon a study of individual components of the flow, such as the attached boundary layer before separation, its modification during separation, the developing and fully developed free shear layer, reattachment, flow recirculation, etc. C. W. Hirt develops a set of generalized turbulence