

## BOOK REVIEW

**Developments in Heat Transfer:** Edited by W. M. ROHSENOW. Edward Arnold (Publishers) Ltd., London, 1964, 530 pp.

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THIS volume is based on lectures presented to an annual course at M.I.T. on modern developments in heat transfer, by workers from universities and industry. It is written for graduates, and whilst it is not intended as a basic text in the subject, it does embrace most aspects of heat and mass transfer. It is to be distinguished from those collections of review articles, sometimes of rather uneven quality and frequently embracing quite unrelated topics, that have been published under rather similar titles in recent years. By comparison it is a more coherent whole, and a greater proportion of its contents will interest the non-specialist.

A list of chapter headings is appended to this review; very broadly, the volume includes a fairly basic treatment

of topics such as convective heat and mass transfer, boiling and two-phase flow, together with more specialized extensions such as the treatment of heat transfer in chemical reactions, magnetohydrodynamic flows, rarefied gases and non-Newtonian fluids, and a number of more specific applications such as the hypersonic ablation of graphite, and the heat-transfer problems of space power supplies. Whilst there are the expected differences in style and quality which are probably inevitable in a compendium of this type, the editor's claim that the individual lecturers have attempted to go back to the fundamental principles is largely justified. It is unfortunate that many have proceeded by rather different routes and with different degrees of clarity to what are, in a number of instances, the same fundamental principles. The chapter on mass transfer, for example, might have benefited from closer integration with that on "Velocity, Temperature, and Concentration Fields within Fluids", and the chapter on "Hypersonic Heat Transfer" with that on "Heat Transfer in Rarefied Gases". The less experienced student may therefore encounter difficulties which are avoided by the better basic texts. This is perhaps a small price to pay for the genuine attempt on the part of most contributors to base their exposition on the fundamentals of their subject.

Perhaps the most surprising omission in the book is that of forced convection in anything but boundary-layer flow (except for the specialized cases of non-Newtonian fluids and liquid metals). There is also inadequate discussion of the fundamentals of turbulent diffusion, a topic which is still one of the most intractable in the whole of the subject. With these reservations, the treatment of forced convection is adequate, although there is little reason to prefer the derivation of the fundamental equations to those given in many good texts. The chapters dealing with the extension of basic forced convection into the more specialized fields of rarefied gases, non-Newtonian fluids and chemically reacting fluids can be recommended as useful introductions to those fields; liquid metal heat transfer is dealt with rather briefly, and most readers will seek a more extensive review of the subject.

The chapter on boiling underlines both the considerable progress which has been made in the past twenty years, and the magnitude of the problems which have yet to be overcome. It is useful, if perhaps rather uncritical, assembly of the many lines of development in this fascinating field. The complementary problem of two-phase flow is dealt with in a clear and interesting manner, and can be thoroughly recommended as an introduction.

Space does not permit a detailed review of all the more specialized sections of the book. It is sufficient to note that they are for the most part authoritative, and will

interest the general reader as well as providing useful introductions to a deeper study. This is particularly the case with the section on magnetohydrodynamic flows.

Finally, one must consider the relationship between a volume such as this and, on the one hand, the basic texts in the subject, and on the other hand, research publications. That it contains a considerable amount of interesting information for anyone in the field cannot be denied; the general difficulty of finding people who are willing to take time off from their researches to write

authoritative reviews underlines this point. On the other hand the scope of the subject is already so wide that the difficulties in producing a coherent treatment of the whole at an advanced level are overwhelming. Perhaps a solution will be found in the production of monographs covering more limited sections of the subject; the reader will then more easily decide whether he must possess the book himself, or whether he is content to know that it exists for reference.

W. B. HALL