Chapter 3 contains material on transient conduction including chart and analytical solutions, as well as finite-difference methods. I found Chapters 2 and 3 particularly well documented. Especially, the derivation of finite-difference equations, the development of stability criteria and the need for grid- and time-step independency of the solution are subjects well worth including in a modern text on heat transfer. I would have liked, however, the inclusion of some sample programs to compute for example the temperature distribution for the plane slab solved in Chapter 2.

Chapter 4 is devoted to radiation, including calculation of Net Radiant Loss from Non-gray Surfaces and the Radiation Surface Coefficient of Heat Transfer. The presentation of the contents of this chapter is also very satisfying.

Chapter 5 provides, in a conventional manner, a fluid flow background to forced convection (laminar two-dimensional flow in tubes and ducts, turbulent flow in pipes, external flow over bodies, integral methods, boundary layers) and presents experimental correlations for forced convection through tubes, over flat plates, over cylinders, spheres and tube banks in crossflow.

Chapter 6 deals with natural convection, presenting differential and integral equations and design correlations for vertical plates and cylinders, inclined planes, horizontal cylinders, spheres, and enclosures. The presentation is conventional. Chapter 7 introduces the subject of heat transfer with change of phase (laminar and turbulent film condensation, boiling heat transfer, subcooled nucleate boiling). At the ends of Chapters 5–7 are useful summary tables of the experimental correlations and analytical and semianalytical results for the corresponding heat transfer coefficients.

Chapter 8 introduces the analysis of heat exchangers (parallel-flow, counter-flow and multiple pass heat exchangers, fouling factors, effectiveness method for performance analysis).

The presentation is again conventional.

Chapter 9 is devoted to such special topics as liquid metal heat transfer, transpiration and film cooling and differential similarity. The latter is somehow lost in this chapter and, because of its conceptual and practical importance, it should be brought forward in a future edition, to be used as a prelude to Chapters 5 and 6.

The four appendices are devoted to selected thermophysical properties, emissivities, tables of Bessel and Error functions and to unit conversion factors. A subject index closes the book.

I particularly appreciated the detailed solutions to more than 100 examples in the text and the numerous homework problems that are chosen judiciously to supplement the theory, mathematical methods and experimental information needed to understand the heat transfer phenomena and to solve actual problems. I consider however as a drawback the absence of answers to the homework problems at the end of each chapter. Such answers should be published as a separate volume, in future editions, and will undoubtedly enhance the appeal of the book to both students and lecturers alike.

The text is very well presented with no serious misprints, good layout, clear diagrams, and extremely well laid out mathematical expressions. The references include several good texts which provide more details on the relevant topics, and the sample problems are well thought out and interesting. The general quality of the book is difficult to fault; quality paper, a clear typeface and good binding result in a very attractive book.

It is thoroughly recommended for engineering students and teachers and for the individual scientist and engineer who needs a good reference book.

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R. K. Shah, E. C. Subbarao and R. A. Mashelkar (Editors), **Heat Transfer Equipment Design.** Hemisphere, Washington, DC, 1988, xii+804 pp., £78.50.

This book contains papers presented at the Advanced Study Institute on Heat Transfer Equipment, held in Poona, India, during 16–27 June 1986.

The papers are presented, in a logical manner, in nine sections with the following titles:

1. General review.
2. Mechanical design of exchangers.
3. Fundamentals of single-phase convection as applied to heat exchangers.
4. Thermal design of single-phase exchangers.
5. Fundamentals of two-phase flow heat transfer.
6. Thermal design of two-phase exchangers.
7. Heat transfer augmentation.
8. Fundamentals of rheology and thermal design of heat exchangers for non-Newtonian fluids.
9. Some important operating problems.

This work of over 800 pages with numerous tables, figures and correlations covers the whole field of heat exchanger design, from the basic science to practical aspects. The papers, as it is always the case in this type of Conference Proceedings, are varied both in approach and level of sophistication. It is difficult in one review to do justice to every part of this work, and detailed criticism of each section is better left to users and specialists.

One's first reaction is to be reminded of the vast addition to knowledge of heat and mass transfer, gained in the last few decades. Heat exchangers are required in a wide range of engineering plants and new developments. They were traditionally designed, quite successfully, using only elementary scientific data, but efficiency and performance have since been improved, due to the advances in heat transfer theory and advent of computers. Yet, this book contains only very few examples of the use of computers in heat exchanger design. Indeed, there is only one paper (by D. B. Spalding) that demonstrates the advantages to heat exchanger design of using advanced computational fluid mechanics to predict (rather than guess) the flow field.

This I find a pity for the heat-exchanger-design community, i.e. to rely solely on traditional design methods. Of course it will be a long time before heat exchangers are designed entirely on scientific data, and there will always be an element of art in design based on experience. Yet, there is certainly always scope for innovative and imaginative thought, that can be assisted by more computations.

Section 1 contains a classification of heat transfer equipment, design methodology and effect of uncertainties on the design of systems of heat exchangers. Section 2 presents a review of current codes and standards. Section 3 deals with correlations and Section 4 with the design methodology of heat exchangers (Delaware method, computer programs, synthesis of optimal heat exchanger networks, rotary regenerator design procedures, nuclear heat exchangers, mechanically aided heat exchangers, fluidized bed heat exchangers, waste heat recovery, etc.).

Section 5 is concerned with fundamentals of two-phase heat transfer (boiling in tubes and tube bundles, theory of condensation and in-tube condensation) and is followed by the design considerations, Section 6 (heat pipes, heat pumps, exchangers used in refrigeration systems, reflex condensers, power plant surface condensers, etc.).

Section 7 consists of only two papers on heat transfer augmentation, and the last two sections deal with fundamentals of rheology and thermal design of heat exchangers for non-Newtonian fluids, and operating problems such as flow-induced vibrations and flow instability, respectively.

The book is well set out, well bound and it is easy to find

one's way about although it is rather a large book. All papers included are informative, free from serious misprints and errors, with up-to-date references. They differ in quality of typeface but they are all clear with fair diagrams and well laid out mathematical formulae.

The book is likely to become a good reference for all engaged in industrial design and in applied heat and mass transfer research.

It is gladly recommended to anyone who is seeking guidelines for designing many types of heat exchangers, and to the academics who wish to develop advanced courses in this applied field.

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NAIM AFGHAN (Editor), Archives of Heat Transfer. Hemisphere, 1988.

THIS VOLUME is published to mark the Twentieth Anniversary of the International Centre for Heat and Mass Transfer. Annual symposia at Herceg Novi and at Dubrovnik on selected areas of the subject have provided a noteworthy contribution to a more leisurely exchange of information on heat and mass transfer than is afforded by most international conferences. The volume marks each year from 1968 to 1987 with a comment from the Chairman of the symposium committee and with a paper, selected by him, which is intended to represent the state of the art at that time, or which in retrospect had great impact on the subject.

Clearly this is not the volume to turn to for a comprehensive and coherent account of any specific field of heat or mass transfer: that is not its intention. There are certainly several papers that made a notable contribution to the subject and that will invite re-reading not merely for their historical interest: for example Kutateladze on turbulent boundary layers in the limit of low viscosity, Rohsenow on condensation of liquid metal vapours, Petukhov on mixed convection. Others provide a useful introduction for non-specialists—Brenner on suspension rheology, and Mayinger on liquid/gas interfacial heat transfer. However, it must be said that much of the material will already be on the shelves of those who have been in the habit of attending other international heat transfer conferences, or who have subscribed to the many review volumes on the subject.

The 'Chairman's comments' provide an opportunity to look back and place the content of their symposium in context with our current understanding—more particularly in the case of the earlier symposia. In some cases this opportunity has been grasped, but in others the contribution is a summary that might well have been written immediately after the symposium. In many cases no mention is made of the paper they selected as representative or important; indeed one suspects that in one case either the Chairman's selection has been misinterpreted, or he has chosen to illustrate how wrong a prediction can be in retrospect! (Professor Styrikovich commenting on a symposium on modern energy systems).

I cannot recommend the volume to the reader who seeks a general review of progress over the past 20 years, or who wishes to have on his shelves a collection of the most significant contributions to the subject in this period. Habitués of the International Centre must judge for themselves whether it is a fitting momento.

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