rapid change. Because the index gives sub-section numbers instead of pages, these numbers should have been printed at the top of each page.

There are ten sections.

1. *Fission Properties* is "limited to those characteristics of the fission process most often utilized in reactor design," and is not "a definitive review of the fission process."

2. *Selected Cross Section Data* includes related quantities such as η, α, average logarithmic energy loss and transport scattering factor. There is a long review of theoretical formulae and experiments on energy transfer between neutrons and moderators, twenty pages of angular-distribution coefficients for fast-neutron scattering, and all the standard information on capture and fission cross sections.

3. *Constants For Thermal Homogeneous Reactors* opens with the calculation of thermal-neutron spectra and then gives some experimental results and effective cross sections. This is followed by lattice parameters and criticality data. The judgment implied in the claim that "theory has been included to the extent considered necessary for the exposition of the data" is justified here and throughout the book.

4. *Lattice Constants for Thermal Heterogeneous Systems.* The various methods of calculation of individual parameters, e.g., diffusion, spherical hermonic method, and P_N approximation, transport theory, are outlined. Many experimental results are presented on a wide variety of lattices.

5. *Control and Dynamics of Thermal Reactors* includes discussion of control-rod theory (extrapolation distance at surface of rod) and many aspects of control-rod worths in reactors: long term changes, covering xenon poisoning, accumulation of gross fission products, accumulation and destruction of fissile nuclides, burnable poisons, and measured reactivities; reactor kinetics, periods, noise and correlations, transfer functions and stability. and reactor excursions.

6. *Intermediate Reactors,* appropriately shorter than the previous two sections, contains the fullest discussion of age-diffusion equations.

7. *Fast Reactors* opens with multigroup equations and constants. The tables of multigroup constants occupy about 20 pages. The remainder of this section contains criticality information and dynamic considerations.

8. *Shielding Constants.* The suggestion in the Preface that this section might be omitted from future editions is regrettable. Most shielding calculations are now done with sophisticated computer programs, but the information in the 35 pages of Section 8 is useful for many purposes and is in keeping with the rest of the book.

9. *Constants Related to Interpretation of Experimental Data.* Some of the material here could well be dropped for example, the characteristics of photomultiplier tubes and possibly of scintillators. The information on foil activation, self-shielding, range-energy relations and neutron sources is useful.

10. *Digital Computer Codes,* summarizes over 75 selected reactor physics computer programs grouped according to subject.

This book should be on the shelf of every reactor physicist, and the low price puts it within his reach.

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Engineering Heat Transfer. By S. T. Hsu. D. Van Nostrand Co., New York (1963). $14.50.

A check of library card files reveals that from 1957 to 1963, English textbooks suitable for senior under-graduate to first-year graduate-level introductory courses in heat transfer have been published at a nearly uniform rate of more than two new books per year. This might be considered an unusually high publication rate, especially when it is noted that, with a few exceptions, the recent texts cover almost exactly the same material in almost exactly the same style. But previous to this period, similar texts, which emphasized basic principles and analysis rather than engineering method, were not generally available in this country. (The book by Eckert[1], *Introduction to the Transfer of Heat and Mass,* was an exception to this, but was not often used as an undergraduate text.) With the rapid growth of heat transfer as an important branch of basic engineering science, the need for such texts as aides to instruction became apparent relatively suddenly. The recognition of this need by many potential authors prompted them to start work almost simultaneously, and partly

[1]E. R. G. ECKERT, *Introduction to the Transfer of Heat and Mass,* McGraw-Hill, New York (1950).

explains the recent large publication rate, as well as the similarities and duplication.

Perhaps, then, it is not realistic to expect that the more recent books offer either some improvement in completeness over comparable predecessors, as did the text by Kreith[2] in 1958, or a fresh unified approach, as did the text by Bird, Stewart, and Lightfoot[3] in 1960. But it does not seem too unreasonable to require that the more recent of these texts maintain standards of clarity, completeness and sophistication at least comparable to those published previously. The recent text, *Engineering Heat Transfer,* by S. T. Hsu, does not meet these requirements.

This reviewer is especially disturbed by the author's writing style. The quantity of poorly constructed sentences, grammatical errors, and awkward phraseology is objectionably large—especially in a book intended for students. Aside from the poor example set, the clarity of explanatory material suffers immensely. Consider such sentences as, "This undesirable property creates a problem in selecting insulation material for electrical application, especially since usually, the higher the voltage, the heavier the insulation should be." (p. 12); or "The thickness of the substance [shown in a figure] is abnormally exaggerated in order to illustrate the difference between absorption and transmission." (p. 113). These certainly set poor examples for the student to emulate, but at least their meaning is fairly clear. But what about "The parabolic velocity profile of laminar flow is fully developed in the length of the tube under the heat transfer process." (p. 285), or "These equations are not only limited to one-dimensional cases, but also are valid only on the assumption that velocity is uniform across the cross section of the stream." (p. 233). These are bound to cause difficulties even for the best of students.

The length of the book is nearly twice that of others with similar coverage and intent. Yet, as an introductory text, there are many serious omissions. Although there are 90 pages devoted to heat conduction, problems with internal heat generation are not discussed except for mentioning that they exist, followed by a display of the applicable differential equation. (This omission is especially annoying in view of the claim made on the book jacket that the book is "closely tied to nuclear engineering".) Steady-state heat conduction, with thermal conductivity a linear function of temperature, is discussed, but no mention or use is made of the Kirchhoff temperature transformation. Two chapters are devoted to thermal radiation. But there is no mention of, nor reference to, current calculation procedures for radiant heat exchange, except by inference in a much later chapter on electrical analogues. Space is devoted to "Principles of Similarity and Dimensional Analysis," but no clear indications are given concerning the relation between these principles and dimensionless forms of the differential equations describing a physical process. Laminar-boundary-layer momentum and energy equations are derived in differential form, but the analytical simplifications resulting from the boundary-layer approximations are not discussed, nor is their use indicated in the derivations. Integral forms of the boundary-layer equations are not even mentioned.

The reviewer is also unfavorably impressed by the lack of sophistication to which the student will be exposed when using this book. Consider the very first sentence of Chapter 1 which informs the reader that "Heat is a form of invisible energy . . . "; or the inference on page 73 that the solution of the second-order ordinary linear differential equation with constant coefficients is beyond the readers knowledge; or the statement of page 205 that "It [a gas] is always compressible, and since an ideal fluid must be not only frictionless but also incompressible, a compressible frictionless fluid is regarded not as an ideal fluid, but merely as a fluid without viscosity."

The quoted price for the book is $14.50. It is not a good buy.

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About the reviewer: Mr. Stein is on the staff of the Reactor Engineering Division at Argonne National Laboratory where he has been employed since 1962. Prior to this, he was manager of the heat transfer section at the Nuclear Development Corporation of America, and before that was at the AEC Heat Transfer Research Facility at Columbia University, having been named its director in 1959.

[2] F. KREITH, *Principles of Heat Transfer,* International Textbook, (1958).

[3] R. B. BIRD, W. E. STEWART and E. N. LIGHTFOOT, *Transport Phenomena,* John Wiley & Sons, New York (1960).