had some exposure to the subject. In the United Kingdom most second year science or engineering students would find the text quite straightforward; the author himself suggests it is suitable for senior or postgraduate students in the United States. However, what does present difficulties is the intended discipline. The problem is that the book deals with a large number of subjects, including magnetic systems, superconductivity and elastic systems as well as the more conventional topics: equations of state, multcomponent fluid systems, chemical reactions, rather briefly and superficially. Professor Hsieh is a mechanical engineer and in his preface he singles out mechanical and chemical engineers for special mention. Yet I cannot imagine many teachers of engineering finding this book suitable for adoption in their course. There is no mention of compression or expansion processes or power generation; the chemical engineer will note also the absence of any discussion on refrigeration and the total inadequacy, for his purposes, of the chapter on chemical reactions. Perhaps one should take one's clue from the title—"Principles of Thermodynamics"—which might suggest a book on an altogether higher plane. But if this was the author's intention then I am afraid he has not been too successful. All too often one comes across sections that lack rigour and are at times misleading or, more rarely, simply wrong. At £14.45 in the U.K., I do not think many people will find the book a good buy.

G. SAVILLE

D. R. GASKELL, **Introduction to Metallurgical Thermodynamics,** McGraw Hill, New York (1973). pp xx & 520.

THIS student text book is intended for use by materials scientists and metallurgists and should cover most of their undergraduate needs. It discusses the subject in quite a leisurely manner although the order in which the fundamental topics are covered does seem to this reviewer, at least, rather idiosyncratic at times. However, any student who masters the contents of this book should leave with a sound working knowledge of metallurgical thermodynamics.

The author takes an essentially classical approach to the subject with only a brief aside on the statistical interpretation of entropy. This latter is not, of course, a rigorous exposition and it leaves much unsaid, but it is good to see an account of elementary statistical ideas which does not fall into the usual trap of describing only configurational entropy when it is thermal entropy which is the most frequently encountered.

The first half of the book is concerned with fundamentals—the laws of thermodynamics and their immediate consequences—and the applications quoted as examples are almost always based on the gaseous state, and often the perfect gaseous state at that. It is not until the second half of the book that one reaches systems of metallurgical interest when the discussion turns to the thermodynamics of solutions and chemically reacting mixtures.

There are numerous worked exercises throughout the book and problems for the student to tackle himself. Apart from a mention of S.I. in the preface, the units used are almost exclusively the calorie, the atmosphere and the entropy unit, which suggests that the book might date rather quickly. Indeed, my main criticism of the book is its use of rather dated examples which although no doubt based on experimental data which are little worse than modern measurements, do not lead the student to believe that what he is studying is an active subject. It is probably through the author's use of dated material that he was led to describe, correctly, on one page the absolute temperature of the ice point as 273.15 K, and then eight pages further on discuss at length the ideal gas scale based on the absolute zero being at −273.16 K, a situation which is ideally designed to confuse the student when one remembers that the modern definition of the triple point of water (not the ice point) is 273.16 K exactly.

G. SAVILLE

EUGENE F. ADIUTORI, **The New Heat Transfer, Vol. 3, Equipment Design and Analysis.** Ventura Press, Cincinnati (1977).

THIS book gives details of calculations relating to specific pieces of equipment, given the necessary specifications and appropriate heat flux–temperature difference relationships. It does not deal with the theory and mechanism of heat-transfer processes. It is not a text book suitable for students but may prove useful for those designers who are happy with Adiutori's "new" notation.

In the early chapters the author continues his tirade against the heat-transfer coefficient, transport properties and dimensionless groups. One can agree that quantities such as heat-transfer coefficient, which are not properties, have limited usefulness. When the ratio between the heat flux q and the temperature difference ΔT is not constant, it is not generally helpful to introduce a third variable $h = q/\Delta T$ into the problem.

The argument against the heat-transfer coefficient does not, however, hold for "genuine" properties such as electrical resistance. Thus, having noted that for a given conductor at a fixed temperature, the ratio of the applied potential to the electric current is constant, I can see no advantage in refusing (as does Adiutori) to acknowledge the existence of a *property* of the conductor, its resistance, which is independent of the current and potential. Similarly, to take an example which Adiutori does not use, given the proportionality between the force acting on a body and its acceleration, I do not think it is helpful to ignore the inference that there exists a property of the body, its mass.

The author proposes that general non-dimensional relationships be replaced by specific ones, each valid for a particular fluid. The roles played by the various fluid properties are replaced by a single temperature dependence. This gives a much simpler relationship which would prove useful where extensive computation was required for the special case. Adiutori does not draw attention to the fact that many (as many as there are fluids of interest) equations are required to replace one general relationship and that, while an equation for any fluid can be obtained from the general one (if the temperature dependence of each of the fluid properties is known) equations for different fluids cannot be obtained from an equation for a particular one.

The use of symbols to denote quantities "in" specific units (i.e. the true quantity *divided by* its units) rather than to denote the quantity itself (i.e. the *product* of a number and units) is claimed to be "better from an engineering standpoint". An obvious disadvantage of this is that different symbols are required to accommodate all possible units. More serious, this practice obscures the fact that a physical quantity is a product of a number and units. Further, it is not possible to check the dimensional homogeneity of equations. The sort of confusion that can arise may be illustrated by an example from the book. The equation given [p. 1.45, equation (77)] for the pressure drop for laminar flow in a pipe is:

$$\Delta P_{\text{lam}} = \frac{32\,\mu L}{g D^2} V$$

where g is given in the nomenclature "gravity constant". Apart from the misleading implication that gravity is involved in this problem, no value is given for g. In order that the above equation shall give the correct result, with the units used for the other quantities, g is, in fact, approximately equal to the number 6×10^{10}!

While some parts of this book may be useful, it seems to me that Adiutori takes a restricted view of the subject and wishes to avoid those generalisations which lead to insights and advances.

J. W. ROSE