Thermodynamics and statistical mechanics

Thermodynamics and Statistical Mechanics By P.T. Landsberg. (Oxford University Press: Oxford, 1979.) £9.75.

IN this book, Professor Landsberg brings together thermodynamics and statistical mechanics to provide a coherent account of these interrelated branches of physical theory. The two subjects are treated sequentially in the text — a wise decision, as attempts to develop the two side by side usually result in the essential structures of both becoming obscured. The value of classical thermodynamics lies in what it can do without invoking microscopic models and it is best learnt by confining discussion initially to the macroscopic level. The terms of reference of Professor Landsberg's book are those of the physicist. In addition to including those topics common to most standard texts, there are chapters on fluctuations and transport properties, sections on negative temperatures and critical exponents, and introductions to irreversible thermodynamics and the theory of chemical reactions. The text also deals with subjects of current interest such as conversion and conservation of energy, black holes, and the early stages in the formation of the Universe.

Thermodynamics and statistical mechanics are both well established subjects so that any new text can only find justification if it has special merit in excellence of exposition or in its choice of emphasis. This book has some attractive features: sections containing core material are distinguished so that the reader may restrict his study to the central development if he wishes; worked solutions are given to the problems; and there are references to papers and comments on a selection of other books so that topics of interest may easily be pursued. The text is at its best (and it is then very good) in some of the sections dealing with particular applications; examples are the expanding universe, negative temperatures, and energy conversion. The general exposition, however, is unsatisfactory. Professor Landsberg states that he is fascinated by the relationship between physics and mathematics; this fascination, however, has unfortunate consequences in the text. The language used in the basic development of the subjects is highly formal, and mathematical structure frequently precedes physical explanation of what the structure is being erected for. As a result, one sometimes has the impression that physical results are eventually produced rather like rabbits from a conjurer's hat. It was diverting to discover that the phase rule is the same as the Euler formula relating the number of vertices, edges and faces of a convex polyhedron; but knowledge of the fact gave me no new insight into the physical world. Is it necessary or even helpful to the typical student to be faced with density matrices, Hessian determinants, Pfaffians and the signs of symbolic logic? It is, in fact, difficult to imagine the kind of student who, coming with little previous knowledge of thermodynamics and statistical mechanics, could find this a good book through which to learn them.

There are other grounds for criticism. It is surprising to find no mention of thermodynamic temperature, no formal definition of the kelvin, no mention by name of the principle of equal *a priori* probability. It is confusing to find both chemists' wavenumber ($1/\lambda$) and physicists' wavenumber ($2\pi/\lambda$) used in different parts of the text. It is disconcerting to find important results such as the Maxwell Relations or general equilibrium conditions derived in problems at the ends of chapters. It is irritating to find the Carnot cycle being used in the text before it is defined, again in a problem.

The book is also disappointing as regards its production. Oxford University Press has chosen, presumably in order to keep down costs, to use photographic reproduction of typescript. This can give a text of entirely acceptable appearance providing that the typescript is meticulously prepared. Here, however, alterations are frequently all too visible; in some cases corrections have been made and symbols inserted in ink by hand; and, in at least one place, there is a gap in the text where words have been deleted.

There is some very good material in Professor Landsberg's *Thermodynamics and Statistical Physics*; but the style of his exposition will make it inaccessible to most students. It is a book to be dipped into by those who already know the subject, not a book to learn it from.

C.J. Adkins

C.J. Adkins is Lecturer in Physics at the Cavendish Laboratory, University of Cambridge, UK.

Obesity models

Animal Models of Obesity. Edited by M.F.W. Festing. Pp. 258. (Macmillan: London, 1979.) £17.50.

SYMPOSIA proceedings are all too often fabulously expensive and hopelessly delayed in publication, so that their only logical home is the library of a well heeled insititute of scientific history. This volume — subtitled *MRC Laboratory Animals Centre Symposium No I* — is the exception to that rule. Though not cheap, it is, by today's standards reasonable in price, and, to judge from its plastic dustcover, the publishers see its home as much in the laboratory as the library. And there it will be found, for it is an authoratative text which covers a major experimental field in nutrition and is likely to be the only repository for a great deal of useful technical information, like Derek Miller's recipes for energy-dense diets, or David Lovell's outstandingly lucid guide on husbandary techniques for colonies of genetically obese rodents. But it is more than a technical guide, it is a unique review of a fast growing field, and one in which biochemists, geneticists, immunologists and nutritionists all meet, to exchange information and to generate ideas.

The book succeeds in giving the impression of interaction, both because of Dr Festing's careful editorial guidance, reflected in, for example, the frequent cross references between chapters, and because the symposium on which it was based was a fairly parochial, virtually all-British affair, in which all the contributors have closely followed each other's work. This parochiality is a trait which I find stengthens, rather than weakens, the feeling of a debate, and it is made possible by the fact that Britain is a leader in obesity research.

The symposium was orignally entitled *Genetic Models of Obesity in Laboratory Animals* but the change in title here is more than justified by the extent to which a number of authors, particularly Miller, Stock and Rothwell, James *et al.* and Garrow, have turned away from the simple gentic models such as the *ob/ob* or *db/db* mouse and the Zucker rat, and studied 'dietary-induced obesity': that in which no simple genetic component can be discerned. It may be, as many authors claim, that these are more appropriate models for the study of obesity in man, which is, after all, the justification for all the work.

At the same time, however, the simple genetic models have a scientific attraction which increases with every new defect they are shown to possess. This volume brings out the multitude of differences that the single Mendelian recessive *ob/ob* gene gives rise to, and in reading it, it is difficult to resist playing the game that so obviously fascinates many of the authors: to fit this metabolic mélange into the single enzyme defect that genetical orthodoxy requires. The man who solves that puzzle will perform a scientific feat that is in no way diminished by the fact that it will not provide a cure for obesity. It is a prize which is there for the grabbing, and anyone who wants to pursue it could do no better than to start with this eminently readable text.

John Rivers

John Rivers is a Lecturer in Nutrition at the London School of Hygiene and Tropical Medicine, London, UK.