

In part I, the mechanics section begins with Hamilton's principle (here called the principle of least action) and gives a concise and elegant account of the relation between invariance and conservation laws. Central orbits, collisions, oscillations, motion of a rigid body, and non-inertial frames of reference are discussed. Hamiltonian mechanics, the Hamilton-Jacobi equation and adiabatic invariants conclude this section.

(Any physicist capable of reading the book will not be disturbed by equation (19.6) where a coordinate of an oscillating system is represented by a complex number.) Two chapters on the special theory of relativity follow.

Part II deals with electrodynamics and begins with an action principle, the Hamiltonian for a charged particle in an electromagnetic field, the electromagnetic field tensor. Thereafter a surprising number of useful topics are discussed in an elegant and economical manner. These include the electromagnetic moments of systems of charges, electromagnetic waves, diffraction, retarded potentials, radiation damping, and scattering.

There are a very few things which I should like to see changed; for example, it is not shown that the retarded potentials satisfy the Lorentz condition which was assumed in their derivation. However, these are small points in comparison with the scope and economy of the treatment. The physicist who is thoroughly versed in this "minimum of material" will be well equipped. It may be that to learn the material from this book he will have to read carefully and reflect. However, he will probably enjoy doing it and it will be a good training for the persevering student.

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People Need Protein

Proteins in Human Nutrition. Edited by J. W. G. Porter and B. A. Rolls. Pp. xi + 560. (Based on the Proceedings of a NATO Advanced Study Institute on the Chemistry, Biology and Physics of Protein Evaluation, held in Reading, England, March 1972.) (Academic Press, London and New York, 1973.) £9.50.

A GREAT deal has been published in the last few years on the subject of proteins in human nutrition, and my first reaction to the title of this book was that it was unlikely to contain much that is interesting or new. I soon found this impression to be entirely wrong: the book is a most valuable contribution, informative, lively and stimulating. It is arranged in four sections: protein supplies and requirements; the evaluation of protein quality; the role of food science and technology; and factors affecting the utilization of proteins.

Three main themes can be identified in this symposium. The first is the problem of applying existing knowledge, particularly in relation to the needs of developing countries. Mauron, in his introduction, throws out the challenge: "We are now aware that protein malnutrition is more an economic problem than a medical one, more a matter of food distribution than of production. . . . In few fields is there such a distressing gap between knowledge and its implementation".

The opening chapters on world supplies of protein paint on the whole, rather surprisingly, an encouraging picture. Jalil and Tahir from FAO conclude that "there is a solid basis for optimism that rapid progress can now be made in closing the protein gap", and Worgan, writing on unconventional sources of protein, states that in relation to total food output there need never be a deficiency of protein. To produce food, however, achieves nothing unless it can be purchased and eaten. Other contributors from FAO make the point very clearly that dietary adequacy is directly tied to income, and emphasize the importance of distribution of income and purchasing power. This is brought up again by Rosen, in an article on the use of oilseed proteins, who stresses that "it is only by greater study of and greater emphasis on these less scientific (that is, economic) factors governing the use of proteins that we shall start to be able to stem the increasing gap".

The second theme is whether there really is a protein gap, or whether the real problem is an energy gap or a total food gap. There is a clear difference of opinion among the contributors, although it is not argued out in any detail. Payne states that "At the physiological level probably no country has an overall shortage of protein, so that the problem, if any, is one of unequal distribution . . .". The phrase "at the physiological level" is a reminder that the question whether there is a protein gap can only be answered if we know the requirements for protein. The one deficiency in this book is that it contains very little discussion on this subject. A remark quoted from Cathcart is pertinent: "Any diet can be regarded as defective if you put your so-called standard high enough". Whitehead's chapter on the protein needs of malnourished children provides practical confirmation of the rather low estimates of protein requirements put forward by FAO/WHO; these form the basis for Payne's point of view.

The third theme, which takes up about half the book, is that of protein quality and protein value. It is fascinating to find that after more than sixty years of intensive work on this subject, there was almost total disagreement among the

participants on nearly every aspect of it. Hegsted emphasizes the discrepancies between chemical score and biological assays. In a trenchantly critical chapter he concludes that there is no such thing as a reliable bio-assay of protein quality. Other contributors take a much less pessimistic, or perhaps less critical, attitude. Equally, there is disagreement about whether results obtained in rats can be applied to man; whether the same measurements of protein quality apply for maintenance and for growth; and even whether estimates of protein quality have any relevance to actual human diets. Pirie has the last word: for thirty years he has claimed that a numerical measure of protein value is impossible, but no one has paid attention.

The later chapters are less controversial; they deal with the problems of the food technologist in assessing and predicting qualities such as texture and flavour, and with factors which impair the utilization of proteins. Liener's chapter on toxic factors in protein foods is outstanding, and makes one wonder whether it is safe to eat.

A multi-author book of this kind does not come together by itself. The editors are to be congratulated on the way in which the balance and standards have been maintained. The printing and layout are also exceptionally good. The book as a whole will be of value not only to the worker who already has some experience, but also to the more general reader who wants an over-view of current research and thinking in this field.

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Organisms under Pressure

The Effects of Pressure on Organisms. By M. A. Sleight and A. G. MacDonald. Pp. xii + 516. (Cambridge University: London, September 1972.) £8.

THIS book should prove to be a welcome addition to the literature dealing with the influence of pressure on biological processes, providing, as it does, a convenient, authoritative, and broadly comprehensive source of information to anyone who is carrying on research in this field or is potentially interested in taking it up. Topics ranging from basic aspects of the physics and physical chemistry of increased pressures to the effects of pressure on relatively simple molecular systems as well as on such complex processes as adaptation, vertical migratory behaviour of fishes, and physiological processes of both marine and terrestrial animals including man, are included among the twenty-four articles plus three abstracts based on papers given at the 26th symposium of the Society for Experimental Biology, 1971. The symposium organizers deserve congratulations for, among other accomplishments,