Both books seem to avoid the thorny problem of concentration dependence of parameters. Experience shows that one stumbling block for most astute non-physical undergraduates studying physical chemistry is the apparent inability of its theories to deal with properties of solutions at finite concentrations; simply assigning the deviations to virial coefficients (which are not mentioned in *Physical Chemistry*) is not sufficient. I had hoped that the authors of these books may have found a satisfying simple solution for explaining these important solute–solvent interactions. Despite this small disappointment, I feel I could strongly recommend my students to use these textbooks in the future, but I suspect that the cost of Marshall's will be the greatest barrier to all but the most enthusiastic.

S. P. Spragg

S. P. Spragg is Lecturer in Physical Chemistry at the University of Birmingham, UK.

Primary and secondary metabolism

PRIMARY metabolites or metabolites that are esesntial to organisms by providing materials and energy for their maintenance and growth have traditionally been studied by biochemists. *Primary Metabolism: A Mechanistic Approach*, by J. Staunton (Clarendon, Oxford University Press: Oxford; £6.50), takes a chemist's view of the reactions involved in primary metabolic pathways and, as the title suggests, looks at the steps from a mechanistic point of view.

The text commences with an excellent treatment of the main reactions involved in the pathways. The energetics and mechanisms are explained with particular clarity. The role of ATP and other energy-rich phosphates is considered in detail and this is followed by a study of thioesters including coenzyme A derivatives. Subsequent chapters deal with other important cofactors; thiamine pyrophosphate, lipoic acid, nicotinamides and the flavins are introduced and their catalytic roles explained. Current theories on the organisation of the electron transport system are presented in a clear and convincing manner. Here and throughout the book areas under active investigation are indicated.

Having set the scene and described the principal characters, the author describes some of the major metabolic pathways. The catabalism of glucose and its role as an energy source is first described, then photosynthesis and the anabolism of glucose is considered with emphasis on the energetics. The remaining chapters discuss the use of fatty acids as an alternative energy store, transformations of tetrahydrofollic acid derivatives and amino acid metabolism. Mechanisms are discussed for each reaction and the overall strategy and interlocking nature of the pathways are presented in an admirable way that leaves the reader marvelling at the beauty and intricacy of the transformations.

The book can be confidently recommended to all students of chemistry and biochemistry as a well balanced and refreshing account of primary metabolism. Research workers will also find stimulating ideas for both biological research and organic synthesis within the book.

Secondary metabolites are those metabolites, often called natural products, that seem to be non-essential to the organism. *Secondary Metabolism*, by J. Mann (Clarendon/Oxford University Press: Oxford; £9.75) surveys our current knowledge of the biosynthesis of these metabolites and emphasises the ecological, toxicological and pharmacological properties of the compounds.

The text begins by introducing some aspects of primary metabolism essential to the understanding of secondary metabolism. The second chapter deals with compounds derived from acetate, including prostaglandins and polyketides. Chemical analogies are given for the more important biological reactions emphasising that any theory of biological transformations must be based on sound mechanistic reasoning. The third chapter dealing with isoprenoids pays particular attention to the stereochemistry of the transformations. Well established results are used for most of the examples and when a pathway or mechanism is not substantiated this is clearly stated.

Aromatic compounds derived from shikimic acid and the alkaloids are discussed in the next two chapters. Metabolites of particular contemporary interest have been chosen to illustrate the biosynthetic pathways. The treatment of the major classes of secondary metabolites is completed with chapter six which concentrates on metabolites of mixed biosynthetic origin. The final chapter gives an enlightening view of the ecological aspects of secondary metabolites and throughout the book the functions of the compounds are stressed to give purpose to the biosynthetic study.

The text is well organised, covers a large area of natural product chemistry suitable for undergraduates and is a valuable introduction for those beginning research in this field. At the end of each chapter there is a small number of problems selected from the recent literature, and the student is referred to the original literature for solutions. The author stresses that it is not a reference text but there is a comprehensive list of such texts in the list of books and reviews suggested for further reading. Overall this is an excellent book and should be very popular.

R. A. Hill

R. A. Hill is Lecturer in Organic Chemistry at the University of Glasgow, UK.

Physics applied to biology

BECAUSE of the complexity and number of variables involved in biological phenomena it is difficult to get precise quantitative data on which to base theories of structure, function and organisation. Yet as understanding progresses it is becoming more common to interpret biology in physical terms, and move towards the goal that "all science as it goes to perfection becomes mathematical in form". Physical and mathematical formulation are the inevitable direction in which the biological sciences must develop. There is a growing appreciation of the need to increase the quantitative and mathematical content of courses in the life sciences. To meet this educational requirement a number of books have been published over the past decade at the introductory, intermediate and specialised levels of physics and mathematics applied to biology.

The present text is at the first level, and although it is claimed to be written for degree and diploma students, who only have a knowledge of ordinary level school physics and mathematics, its content is just above that of an advanced level school syllabus. It broadly covers the field given in the first MB syllabus to Medical students, and, like the latter course, attempts to introduce basic physics by graphical methods without the use of calculus. There are a number of good textbooks available in this field and any new addition will as a consequence be subject to very critical appraisal. In curricula content it is well balanced, starting with a chapter on force, motion and energy, followed by chapters on waves, atomic and molecular structure, electricity, light, heat, and finishing with radioactivity and radiobiology. Most of the text is precise, and in respect of descriptive material well presented. It is with the problem of introducing new concepts and conveying an understanding of the principles of physics that the book