

siderably greater than most physicists possess; and it may well be that most geologists would have welcomed a fuller discussion of some of the magnetic aspects of the work. It is almost impossible to refrain from directing attention to one of the graphs, which shows rather widely scattered points with a straight line drawn through them, and has the abscissa labelled 'susceptibility'.

One of the great difficulties in these studies is that the raw materials of the Earth's crust, the frozen lavas, the conglomerated sediments, even when they fall into well-characterized types, are usually not well defined magnetically. The magnetic properties in which interest is centred are often dependent on the presence of minute fractions of ferromagnetic constituents, difficult even to identify with certainty, in states of aggregation in which the low field magnetic behaviour is least well understood, and often far from stable chemically.

It is partly for this reason that in some ways this book is disappointing, for the prospect of deriving from measurements of rock magnetism the history of the Earth's magnetic field seems more remote than when the extensive work started. Much more must be known about the awkward recording instruments, the rocks themselves, before reliable conclusions can be drawn from their indications; *ignotum per ignotius* perhaps aptly summarizes the present positions in regard to the larger questions. The author is undaunted. Here is an extremely important problem, he says in effect, calling for the concerted efforts of many physicists and chemists, and of geologists from all over the world. His boundless enthusiasm can be admired and envied, even by those who, in connexion with this particular field, cannot fully share it. The field, however, is one which abounds in novelty and in which there is great scope for further work; and to those already concerned with the field, or hovering on the edge of it, Blackett's book will undoubtedly provide stimulus and inspiration.

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## RESEARCH PROBLEMS IN BIOCHEMISTRY

### Essays in Biochemistry

Edited by Samuel Graff. Pp. x+345. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1956.) 52s. net.

THESE twenty-five essays were written as a tribute to Prof. Hans T. Clarke on his retirement from the chair of biochemistry in the College of Physicians and Surgeons, Columbia University. The authors, who are all former students or colleagues of Prof. Clarke, were given a free hand by the editor, and some of them have taken advantage of this and have written in a freely speculative vein. Such writing tends to be discouraged by the more serious scientific journals and it is good, therefore, that this opportunity has been taken of thinking aloud about the possible future of some research problems. The essays include such titles as "The Very Big and the Very Small" (E. Chargaff), "On the Nature of Cancer" (S. Graff), "On the Bigness of Enzymes" (D. Rittenberg), "Unbalanced Growth and Death" (S. S. Cohen). There is a specially interesting account of glycogen turnover by D. and M. R. Stetten. They gave doses of glucose, uniformly labelled with radio-

active carbon, to rats and rabbits, and then studied the distribution of the isotope in the glycogen of the body after different periods of time. The glycogen molecule is depicted as a branched structure like a tree, in which the branches keep dividing into two as they grow out from the centre. By exposure of the glycogen alternately to one or other of two suitable enzymes, it was possible to remove successive peripheral layers of the molecule and break it down much as an onion might be peeled. It then turned out that the radioactivity was not uniformly distributed throughout the molecule but was, at first, greatest at the periphery. The results showed that the glycogen molecule, in acting as a glucose reservoir in the body, is not broken down and built up as a whole molecule, but that branches are added on or lopped off at the outside.

In a theoretical discussion of asymmetric reactions, H. Hirschmann puts forward a simple criterion for deciding whether, in a given case, one of two identical groups in a molecule can take part selectively in a reaction. This discussion starts off from the suggestion of A. G. Ogston of the possible consequences of three-point attachment of a substance to its enzyme, a suggestion which, though published only as a short letter (*Nature*, 162, 963; 1948), not only succeeded in reinstating citric acid in the tricarboxylic cycle of biological oxidation, but also had a considerable influence on the theory of asymmetric reactions in general.

Other essays deal with the development of a substitute for plasma protein (M. and M. R. Bovarnick), steroid hormones (L. L. Engel), bacterial viruses (E. A. Evans), peptide synthesis (J. S. Fruton), porphyrin synthesis (D. Shemin) and the determination of protein structure (W. H. Stein). In the concluding essay, S. Zamenhof deals with the nature of the transforming principle which, when added to *Haemophilus influenzae*, brings about persistent changes in the organism. This principle (which is almost certainly a form, or forms, of deoxyribonucleic acid) is taken up by the bacterial cell and then produces changes in it such as might arise naturally by spontaneous mutation.

It could scarcely be expected that all the essays would reach the high level of some of those mentioned, or that everyone would wish to read right through the book; but there is sufficient variety among these essays to make them interesting to every biochemist.

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## ADVANCES IN PLANT PHYSIOLOGY

### Annual Review of Plant Physiology

Edited by Lawrence R. Blinks, in association with Leonard Machlis and John G. Torrey. Vol. 7. Pp. viii+456. (Palo Alto, Calif.: Annual Reviews, Inc., 1956.) 7 dollars.

THIS "Annual Review" contains seventeen articles ranging widely, as in previous years, over the field of plant physiology. Problems of metabolism are reviewed in accounts of energy transformations in photosynthesis by L. M. N. Duysens, nitrogen fixation by photosynthetic organisms by G. E. Fogg, the mechanisms of uptake and transport of mineral nutrients by E. Epstein, phos-