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cholesterol in the mammal, and outlining the various experimental approaches that have been used, he goes on to discuss, in quite short chapters, transport and storage, biosynthesis, metabolism and the physiological and pharmacological controls of biosynthesis. Then he turns to the more clinical aspects and in further chapters discusses blood cholesterol, atherosclerosis, cancer, gallstones and the nervous system. This impressive coverage is the great strength of the book, since it allows an inexpert reader to acquire painlessly a considerable body of knowledge. On the other hand, because the coverage is so vast, a reader who is an expert in any of the areas that are covered will put the book down with some sense of disappointment, because, of necessity, the coverage of any particular topic is somewhat superficial. Hence, biochemical details, where known, are given in outline only, so a final-year biochemistry student will have to look further for these (but 1556 references are quoted in full). However, a majority of the readers of the volume will probably not need these, as this book is essentially for the non-specialist.

With this in mind, I find little with which to argue. Since it is a personal account, others might have produced a different balance, but it is a readable well-produced book which I hope will find a place in most University libraries.

M. J. P. HIGGINS

Amino Acid Metabolism

D. A. BENDER

John Wiley and Sons, Chichester, 1978, pp. 234, £5.50 (paperback)

How are methyl groups made available for incorporation into creatine, adrenaline, lecithin and other compounds? Chapter three of *Amino Acid Metabolism* shows in detail how these are derived from one-carbon fragments of glycine and serine. Why is valine glucogenic but leucine ketogenic? We can turn to Chapter 5 to remind ourselves of the catabolic pathways for the branched-chain amino acids. What hormones and what chemical transmitters in the central nervous system are produced metabolically from the aromatic amino acids and what pathways are involved? The answers can be found in Chapters 6 and 7. A few topics chosen at random to convey some concrete idea of the contents of Dr. Bender's book.

We could, of course, consult various reference books and specialized reviews on aspects of amino acid metabolism, but it is certainly an advantage to have all the basic information brought together within about 200 pages of one octavo volume. A major difficulty in the writing, one imagines, was the selection and condensation from a wealth of detailed reports and commentaries steadily accumulating in the journals and specialist reviews. Dr. Bender has managed this rather well. Keeping a sense of priorities, he covers all the details of biosynthesis, catabolism and role in metabolism for all the common amino acids. His first chapter deals with the nitrogen cycle showing the various ways in which from its various forms (including N_2) it is ultimately assimilated into the amino acids and proteins of micro-organisms, plants and animals. Prof. A. E. Bender contributes a final chapter on nutritional aspects. Chemistry, enzymology, metabolism and physiology are all given due weight; the book has a perspective.

Full marks must be given too for the organization of the material into a genuinely readable text; quite an achievement when so much ground is covered. The figures, chiefly structures linked in metabolic sequences, are admirably clear, never overloaded.

There are a few slips. It would appear that 'glutamate aminotransferase' and 'aspartate aminotransferase' of Table 2.3 should be 'glutamate–oxaloacetate aminotransferase' and 'glutamate–pyruvate aminotransferase' respectively. Fig. 5.3 gives structures of 2-oxoglutarate, glutamate and glutamate semialdehyde when they should be 2-oxoadipate, 2-aminoadipate and 2-aminoadipate semialdehyde. Glutamate is reduced, not oxidized, to the semialdehyde (pp. 81–83). A more serious error is to assign D-α-amino acid oxidase

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(surely a peroxisomal enzyme) to the mitochondria, 'coupled directly to the electron transport chain' (p. 17).

And on two issues the author's scientific judgement must be questioned. For years a number of biochemists have been sniping at the Braunstein hypothesis of transdeamination via glutamate, and ammunition has been available. Nevertheless it still appears to be the best idea we have to explain ammonia liberation from several amino acids and we should not lightly discard it as Dr. Bender seems to do. To say the least of it, there is more in its favour than for the notion 'that a considerable proportion of mammalian ammonia production from amino acids is by transdeamination involving glycine aminotransferase and (glycine) oxidase' (p. 17; p. 63). I also doubt, when considering possible mechanisms for amino acid transport across the cell membrane, whether one should give pride of place to Meister's suggestion of a γ-glutamyl cycle.

But I would not wish to end on a critical note. *Amino Acid Metabolism* has so many positive features; I know I shall be using it a lot.

E. V. ROWSELL

Structure of Eukaryotic Chromosomes and Chromatin

H. G. CALLAN and A. KLUG (Editors)

The Royal Society, London, 1978, pp. 186, £16.30

This title is the publication of the proceedings of a Royal Society Discussion held in February, 1977. It is a paper-covered issue of a journal [*Philos. Trans. R. Soc. London Ser. B* **283**, 231–416 (1978)] and consists of the texts contributed by the speakers for 29 talks. Certain reviewers are rumoured to base their pieces on a paraphrase of the contents page of a book. This is hardly possible here, partly because four of the contributions have the same title ('Introductory Remarks') and more importantly because some of the contributions are no more than the shortest of abstracts with two or three references. I have therefore chosen to summarize the contents (in the order in which they appear) of the more extended pieces of writing.

In the introductory 'Introductory Remarks' A. Klug contributes a concise but useful review of nucleosome structure, with some thoughts about future developments especially for our understanding of DNA packing, and with 35 key references. This is followed by three original scientific papers on: histone interactions in nucleosomes and evidence for oscillation of DNA between nucleosome and more open structures (P. Oudet, P. Chambon and others); reconstituted complexes between thymus histones and λdv DNA (H. G. Zachau and others); evidence that nucleosomes are not sequence specific (A. Prunell and R. D. Kornberg). There is a review of evidence for different classes of nucleosome (G. P. Georgier and others), two short reviews on histone–DNA interactions and a convenient and short paper by H. M. Sobell and others that summarizes their extremely important work on the bending of DNA molecules. SV40 chromatin is reviewed by Zentgraf and others.

H. C. Macgregor contributes a valuable discussion of the evolution of very large amphibian chromosomes, and M. L. Birnstiel and his colleagues review the regulation of histone gene expression. W. W. Franke and V. Scheer, J. M. Gottesfeld and H. G. Callan and others review topics in the transcription of chromatin. The quality of the work, especially on lampbrush chromosomes, is outstanding. There are short reviews of the transcription of exogenous DNA and of nuclei by J. B. Gurdon and his colleagues.

The book closes with papers by B. Daneholt, A. Tissieres, A. Worcel and others on insect systems (Balbiani ring 2 in *Chironomus*, heat-shock proteins and chromatin structure in *Drosophila*) that define transcriptional units in chromatin.

The Royal Society certainly organized a superb and very timely symposium on an exciting area of molecular biology. You can be strongly advised to go to your library and read the appropriate volume of *Transactions*. However, does this volume stand on

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Disorders that affect the metabolism of amino acids include phenylketonuria, tyrosinemia, homocystinuria, non-ketotic hyperglycinemia, and maple syrup urine disease.Â Persons with urea cycle disorders are at risk for recurrent crises with elevated ammonia levels, especially during times of infection; untreated or repeated episodes of high ammonia levels may cause intellectual disability and developmental impairment. Liver transplantation can cure some of these disorders. Amino acid transport disorders. Protein metabolism denotes the various biochemical processes responsible for the synthesis of proteins and amino acids (anabolism), and the breakdown of proteins by catabolism. The steps of protein synthesis include transcription, translation, and post translational modifications. During transcription, RNA polymerase transcribes a coding region of the DNA in a cell producing a sequence of RNA, specifically messenger RNA (mRNA). This mRNA sequence contains codons: 3 nucleotide long segments that code