Book Reviews

Genetic Recombination

Mechanisms in Recombination. Proceedings of a conference, Gatlinburg, Tenn., Apr. 1974. RHODA F. GRELL, Ed. Plenum, New York, 1974. xii, 460 pp., illus. $32.50.

T. H. Morgan discovered in 1911 that linked characters in *Drosophila* could "cross-over" in the progeny. Fifty years later M. Meselson and J. J. Weigle demonstrated by isotope labeling in phage λ of *Escherichia coli* that exchange comes about not by copying partly from one parent and partly from the other during chromosome duplication but by breakage and rejoining of parental DNA molecules. The rejoining is believed to be by pairing of complementary strands of DNA, one from each parent, to form a segment of heteroduplex DNA. If such a segment includes the site of a genetic difference between the parents, there will be mismatched or unpaired nucleotides in the double helix. Recently there has been a convergence of outlook among those working on prokaryotes and those working on eukaryotes, with the realization that in both groups of organisms enzyme systems can repair such distorted molecules by a process of excision and resynthesis.

It is gratifying in the present work, which contains nearly 40 contributions to a symposium on recombination, to see further similarities emerging in the recombination mechanisms now favored for different organisms. For example, the occurrence of long heteroduplex segments arising by branch migration, after the initial annealing of short complementary strands from each parent, is now widely supported. N. D. Zinder formerly favored a break-and-copy recombination mechanism for phage f1 of *E. coli* because the alternative hypothesis required such extensive heteroduplex segments. He now prefers the heteroduplex model, because of the unexpected resistance to the *E. coli* B restriction system shown by recombinant progeny from crosses between sensitive and resistant phages when the resistance arises from methylation of nucleotides at the sites in the f1 DNA recognized by the restriction system. The resistance in the progeny is believed to result from methylation of the sensitive strand when the strand is paired with a methylated one in a heteroduplex.

M. S. Fox and R. L. White conclude from density-labeling experiments with phage λ that long heteroduplex segments are formed during recombination and that these segments are of only one kind, with 3′-terminal ends to the overlapping strands. This finding has led F. W. Stahl and M. M. Stahl to modify their model for λ recombination. Although Fox and White's results might be taken to imply that general recombination in λ is nonreciprocal and limited to a particular kind of exchange, studies by W. Wackernagel and C. M. Radding on transformation and transduction in *E. coli* using, among others, the general recombination system of λ, suggest that reciprocal recombination sometimes occurs. These conclusions are not necessarily in conflict, however, since the recombinant progeny observed in crosses between λ mutants are limited to those which get packaged in a phage coat: the peculiarities of this packaging are an important feature of the Stahls' model.

Another example of convergence of outlook is provided by J.-G. Tiraby and M. S. Fox's suggestion, for which they have experimental support, that mismatch correction in pneumococcal transformation does not favor the recipient molecule, as previously supposed, but that the bias arises because excision of one strand of the heteroduplex is lethal when it extends as far as a gap in the other strand. The length of strand excised in mismatch correction in *Drosophila* is the subject of a contribution by A. Chovnick and associates. Previous estimates of this length in yeast were based on x-ray mapping, but C. W. Moore and F. Sherman, using mutants of known separations in the iso-1-cytochrome c gene of yeast, show that this technique is quite unreliable.

These few examples of the contents of this book reveal it to be essential reading for anyone wishing to know the current state of genetic recombination. The book is well produced and contains few errors. I deplore, however, the unnecessary duplication of terms. For example, "crossed-strand exchange," "Holliday structure," "cross-links," "double-bridge complex," "crossed-strand chiasma," "DNA strand chiasma," and, most misleadingly, just "chiasma," are used by various authors for one and the same structure.

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Carbohydrates in Plants

Plant Carbohydrate Biochemistry. Proceedings of a symposium, Edinburgh, April 1973. J. B. PRIDHAM, Ed. Academic Press, New York, 1974. xiv, 270 pp., illus. $18.50. Annual Proceedings of the Phytochemical Society, No. 10.

Its title notwithstanding, this book provides only a limited view of plant carbohydrate biochemistry, a view devoted in the main to polysaccharide biosynthesis and breakdown. Of the 16 chapters, 10 deal almost exclusively with starch, cell wall components, algal polysaccharides, and glycoproteins. Only one, a brief but elegantly condensed chapter by D. A. Walker, examines the central process of carbohydrate biochemistry in plants, primary photosynthetic carboxylation. In this carefully prepared section, Walker defines "primary carboxylating mechanism" and proceeds to outline its essential features. In so doing he renders a great service to those seeking a clear-cut explanation for the functional relationship of Benson-Calvin cycle activity to "C-4" photosynthesis and crasselean acid metabolism.

The following paper by T. Ap Rees *et al.* offers a useful discussion of gluconeogenesis. In plants this process provides a biosynthetic mechanism for mobilizing reserve products. As such, it plays a role second only to that of photosynthesis. Useful experimental findings from this Cambridge group suggest that fine control of interactions between gluconeogenesis and glycolysis, exerted perhaps at the level of phosphofructokinase and pyruvate kinase, regulates the flow of carbon between oxaloacetate and sugar.

A valuable chapter by J. B. Pridham and P. M. Dey on the nature and function of higher plant α-glactosidases reports changes in the level of a low-molecular-weight form of the enzyme during germination of *Vicia faba* seeds. Since little attention has been given to sugar metabolism in plants that use the raffinose series for phloem transport, this study on the α-ga-