meiosis, the functioning of the nucleolus organizer, and the genetic activity of B chromosomes. The recent literature is emphasized in both reviews, with 260 and 181 references, out of 376 and 277 respectively, coming from the last 20 years.

As the editor notes, the prime justification for the preparation of any new edition is to provide an updating of information, and this volume certainly fulfills that objective. The reading is at times dependent on a solid background, but certainly this work will be a valuable reference work for students of corn.

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Pathways of Lipid Metabolism

Lipid Metabolism in Mammals. Fred Snyder, Ed. Plenum, New York, 1977. In two volumes. Vol. 1. xviii, 402 pp., illus. $42.50. Vol. 2. xviii, 390 pp., illus. $42.50. Monographs in Lipid Research.

The organization of these two volumes on the basis of organs and tissues effectively recognizes that knowledge of lipid metabolism in one tissue is no assurance of understanding the process in other tissues. The more common practice of discussing the events in liver and adipose tissue (which are excellently covered in volume 1 by Van Golde and Van den Bergh and by Shapiro, respectively) is not adequate to delineate the differences that will be encountered in many specialized tissues. For example, Grigor notes the marked anatomical differences in skin tissues and refers the reader to specialized sebaceous structures: the preputial gland, the harderian gland (reviewed in detail by Rock in a separate chapter), the meiobium gland, and, for further comparisons, the uropygial gland of birds.

Coverage of the metabolism of isoprenoids appears to be less extensive than that of the glycerolipids and sphingolipids, although some important features of isoprenoids are covered in the chapters on kidney (Tou and Huggins), eye (Broekhuyse and Daemen), and skin.

Although each of the 22 chapters contains sufficient detail and references to give a useful orientation to graduate students, postdoctoral trainees, and experienced investigators, many chapters might have been expanded twofold or more to cover the known material more fully. In many of these chapters, however, references to reviews of some special aspects of the subject are provided. For example, the brief discussion of mammary gland lipids by Dils notes three recent major reviews that effectively cover the literature up to 1974. Dils then comments on the newer developments, particularly with regard to hormonal control of milk fat synthesis, including references to publications in 1976. Most of the chapters have relatively few references to publications in 1975 and many have none for 1976. The brevity of the index is another indication that the work is designed not as a handbook on detailed differences among tissues, but as an organ-oriented source of references. For those whose indoctrination has stressed the commonalities in metabolism, these volumes give convincing evidence of the value of the organ-oriented approach. The editor has proved that the viewpoint can be productive, and this reviewer is convinced that it deserves further application.

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Calcium Ion Interactions

Calcium-Binding Proteins and Calcium Function. Proceedings of a symposium, Ithaca, N.Y., June 1977. R. H. WASSERMAN, R. A. CORRADINO, E. CARAFOLI, R. H. KRETSINGER, D. H. MACLENNAN, and F. L. SIEGEL, Eds. Elsevier/North-Holland, New York, 1977. xiv, 514 pp., illus. $45.

Since the recognition of the universal role of the calcium ion in biological systems, several books have appeared that deal with its interactions. The organization of the present book is novel, focusing on the tissues from which the calcium-binding proteins were isolated rather than on the topics of calcium function, as is usual. In each of the seven parts of the book there are longer introductory papers followed by shorter reports. There are 80 papers altogether. Rapid publication has been facilitated by offset printing from typescript.

The Ca^{2+}-dependent regulator or modulator protein of the nervous tissue is discussed in three papers (Wolff *et al.*, Vanaman *et al.*, and Childers *et al.*). This protein, which is found in all regions of the brain, activates brain cyclic nucleotide phosphodiesterase and adenylate cyclase, providing a Ca^{2+}-dependent regulation of cyclic nucleotide levels in response to stimulus. The bovine brain modulator protein possesses a remarkable similarity in its primary structure to the Ca^{2+}-binding subunit of rabbit skeletal muscle troponin (TNC). Moreover, the brain protein can substitute for TNC in a rabbit skeletal actomyosin system. This and other observations suggest that the "modulator protein may be a central regulator for the complete cycle of stimulus, response, and relaxation in animal cells" (Vanaman *et al.*, p. 115).

The sarcoplasmic reticulum (SR), the classical organelle for Ca^{2+} binding and function, is the subject of many papers. Racker proposes new mechanisms for Ca^{2+} transport driven by adenosine triphosphate (ATP) and for ATP formation during reversal of Ca^{2+} transport in SR. A model for the Ca^{2+} plus Mg^{2+} adenosine triphosphatase in the SR membrane is suggested by Shamoo and Abramson. According to the interesting work of Gillis and Gerday, the parvalbumins, which are soluble in the muscle water, can play the role of a shuttle mechanism for calcium between myofibrils and the SR.

The Ca^{2+}-binding proteins of muscle contain high- and low-affinity sites; these are characterized by Potter and collaborators in a review paper. From sequence studies, it has been possible to classify the Ca^{2+}-binding sites as being either Ca^{2+}-Mg^{2+} or Ca^{2+}-specific. The kinetics of fluorescent studies indicate that the conformational change induced by the Ca^{2+} binding to the Ca^{2+}-specific sites of TNC occurs very rapidly. These results are consistent with the idea that the Ca^{2+}-specific sites are the sites that regulate muscle contraction.

The relevance of vitamin D–dependent and vitamin K–dependent Ca^{2+}-binding proteins to health is apparent. The former are discussed by Wasserman and Feher and the latter by Suttie *et al.* and by Nelsestuen. The γ-carboxyglutamic-acid-containing proteins from bone are reported on by Price *et al.* and by Hauschka and Gallop; they may function as calcium buffers or may regulate the steady-state distribution of insoluble phases of calcium phosphate in bone.

Among the extracellular Ca^{2+}-binding proteins, proline-rich phosphoproteins from salivary acid are of special interest (Bennick *et al.*). It seems likely that these proteins inhibit precipitation of calcium phosphate in the oral cavity. Their high proline content may ensure a conformational stability "in an environment where there can be relatively large variations in *p*H and ionic strength."

The book includes two additional parts, one dealing with intracellular Ca^{2+}-binding proteins of various origins and the other with the underlying physical chemistry of calcium.

Experts in calcium biology will recog-