addition to the antipredator function of the wings, the book examines such associated behavior as the moths' selection of backgrounds similar in reflectance to their wings and their choice of an appropriate orientation on barklike substrates. The theory that polymorphism is a means of preventing the presentation of a predictable image to predators is examined in connection with a study of damage patterns (beak marks) on moths that escaped attacks by caged birds.

The information summarized in the book is based on the work of Sargent and his associates published during the past decade and on new data accumulated by Sargent, C. G. Kellogg, and S. A. Hessel at three sites in Massachusetts and Connecticut. The percentages of the total catch made up by individual species showed seasonal fluctuations of great magnitude, varying from 5 to 35 percent in one case, and samples that were analyzed at five-year intervals were misleading indicators of scarcity, decline, or increase. Thus, many years were required to demonstrate the nature of the fluctuations among species. In other sections, Sargent urges that representative moths be kept—unsightly specimens as well as the immaculate ones commonly kept by lepidopterists—to document extremes of variation, seasonal occurrence, and other phenomena. In surveying sampling techniques, Sargent found that in 1970 a mercury vapor trap was 6 to 10 times more effective in attracting individual underwings than was black light, white light, or sugar bait, but that in 1971 it was only 1.8 times as effective as sugar. He also found that sugaring, the legendary, favored method for collecting *Catocala*, samples differentially: some species are partial to bait and would be judged rare without the use of it (one species was six times more abundant at sugar bait than at lights), but seven species never came to bait, including two which were among the 10 most common when light was used.

Although there are 20 times as many kinds of moths as there are of butterflies, there are probably 10 times as many collectors and students of butterflies in the United States as there are collectors of moths, and an important aim of this book is to provide a guide for identification. The text gives detailed accounts of 71 species and contains color plates depicting 126 specimens. Although a number of authoritative lepidopterists and major museums are acknowledged, this reader is unable to perceive the basis for the species determinations or for the distributional and biological data given. It appears that Sargent accepted existing taxonomic decisions and the associated literature, which generally with Lepidoptera means perpetuation of wholesale errors. Unfortunately, too, the color plates are mediocre, in part because a black background was used. Therefore the innovative goal, to communicate scientific research in terms understandable to laymen and to encourage their participation in it, may be blunted by the disappointing identification manual component of the book.

JERRY A. POWELL
Department of Entomological Sciences, University of California, Berkeley, California

Cell Biology

Calcium in Biological Systems. Papers from a symposium, Englefield Green, Surrey, England, Sept. 1975. Published for the Society for Experimental Biology by Cambridge University Press, New York, 1976. viii, 486 pp., illus., + plates. $42.50. Symposia of the Society for Experimental Biology, no. 30.

Almost a century has passed since Ringer first described the requirement of the bivalent cation Ca^{2+} for the maintenance of the contractility of dissected muscle. Following the sensational experiment of Heilbrunn and Wiercinski in 1947, which showed that injection of Ca^{2+} into muscle causes contraction, Sandow postulated that Ca^{2+} serves as a link between excitation and contraction, a theory that became widely accepted after it was shown that the sarcoplasmic reticulum stores Ca^{2+} in the muscle. Soon it was realized that Ca^{2+} is a central regulatory substance controlling various cellular activities. Thereupon, the Ca^{2+} ion was promoted to the level of a second messenger of animal cells, a rank previously given to the cyclic nucleotides.

Calcium in Biological Systems is a collection of 21 papers dealing with the chemistry of calcium, its homeostasis, and the many cellular events it triggers. The coverage of the chemical aspects includes papers on the coordination geometry of calcium complexes (R. J. P. Williams), the calcium ionophores (M. R. Truter), and the detection of minute amounts of Ca^{2+} in the cytoplasm by use of the photoprotein aequorin (O. Shimomura and F. H. Johnson).

An important biochemical feature of calcium is its low intracellular concentration, which is controlled by established processes involving mitochondrial calcium uptake and the calcium pump of the plasma membrane (P. F. Baker; E. Carafoli and M. Crompton; A. B. Borle and J. H. Anderson; R. W. Meech). A. R. Terepka and collaborators, however, propose that calcium may be transported through cell membranes while sequestered in vesicles. This would be a new mechanism with two apparent advantages: "protection of mitochondria from exposure to high concentrations of calcium, and the avoidance of wide and potentially toxic fluctuations in cytosol ionic calcium levels." This idea is supported by K. Simkiss, who has found in invertebrate tissue intracellular granules that are often rich in calcium.

J. C. Foreman and collaborators report that rat peritoneal mast cells release histamine when stimulated by an antigen-antibody reaction or by dextran, provided calcium is present. The movement of ^{45}Ca and experiments with the calcium ionophore, A 23187, suggest that the entry of calcium into the cell is a primary event in the secretory mechanism. Cyclic AMP inhibits calcium transport across the cell membrane through the physiological calcium channels. The authors suggest the possibility that changes in cyclic AMP concentrations within the cell control the degree of secretion by limiting calcium entry. The involvement of both cyclic nucleotides and calcium in the control of cell division is described by M. J. Berridge, who builds a model around the feedback interactions that operate between these different second messengers.

The molecular basis of the calcium-induced contraction of the primitive organelle of *Zoothamnium* is analyzed by W. B. Amos and collaborators. The contractile apparatus, named spasmoneme, runs longitudinally within the stalk. During contraction, the spasmoneme equals striated muscle in power output per unit mass, although the basic elements of myofibrillar and flagellar motility, actin and tubulin, are lacking. The high power output is likely to be produced by a direct interaction between calcium and spasmin, the major protein component of the spasmoneme. Amos and his colleagues suggest that "the basic contractile event is a conformational change which the characteristic protein, spasmin, undergoes when it binds calcium ions."

Pioneers of muscle biochemistry (S. Ebashi, A. G. Szent-Györgyi) and physiology (R. Niedergerke, C. C. Ashley) evaluate the current state of knowledge concerning the interaction of Ca^{2+} with regulatory proteins and the events occurring during contractile activation of muscle. The concluding synopsis by A. Weber is essentially a broad perspective of calcium biology.

This volume lacks papers discussing work on Ca^{2+} uptake by reconstituted sarcoplasmic reticulum membranes, an important research undertaking in which there have been many recent advances. On the whole, however, it should have a widespread appeal to both researchers and teachers in biology.

MICHAEL BÁRÁNY
Department of Biological Chemistry, University of Illinois, Chicago

Fruit Flies

The Genetics and Biology of Drosophila. M. ASHBURNER and E. NOVITSKI, Eds. Academic Press, New York, 1976. Vol. 1a, xx pp. + pp. 1–486, illus., + plates + index. Vol. 1b, xx pp. + pp. 487–954, illus., + index. Vol. 1c, xvi pp. + pp. 955–1430, illus., + index. Each volume, $42.50.

In their preface to this first volume of a three-volume work, the editors point out that it has been 50 years since the publication of *The Genetics of Drosophila* by Morgan, Bridges, and Sturtevant and 25 years since the publication of *Biology of Drosophila*, edited by Demerec. The immense literature that has developed in the intervening years poses an awesome hurdle for anyone planning to work with *Drosophila*, and even the active researcher can be familiar with only a limited portion of this literature. A major aim of this work is to bring together a collection of reviews that would serve as a guidebook for the newcomer and be useful to workers in the field as well. In addition to summarizing the present state of our knowledge, the editors hoped that the work would serve to point out areas of deficiency.

Volume 1 (really three volumes labeled 1a, 1b, and 1c) is devoted to the formal genetics of *Drosophila*. Its 31 chapters represent the efforts of 39 authors plus a collective entity, the "UBC Drosophila Research Group." A task of this magnitude poses seemingly insuperable logistic problems at every step in production and demands extensive compromise. Nevertheless, the volume is a pleasant surprise. In general, the aspirations of the editors have been fulfilled, and this collection will surely find its place beside other standard reference works found in every active and well-financed *Drosophila* research laboratory.

The chapters that focus on genetic studies with *Drosophila melanogaster* fall roughly into six overlapping areas—cytogenetics, radiation and chemical studies, recombination, chromosome distribution, mosaics and related phenomena, and organization of genetic material. Studies with *Drosophila hydei* and *Drosophila virilis* are treated in separate chapters. Each of the three parts of volume 1 has its own extensive author, subject, species, and genetic variation indexes. Readers will undoubtedly differ in their assessment of the various chapters, but all are at least of considerable use as bibliographic sources.

My chief adverse comment relates to the price of the volume. In view of the cost, the editors might have restricted the volume to topics with the greatest general usefulness and longevity rather than attempting broad coverage. Indeed, some of the chapters were badly out of date by publication time. Others review subjects on which no substantial progress has been made in recent years. For example, little has been added to our understanding of interchromosomal effects (chapter 7) and position-effect variegation (chapter 24) over the past 25 years. Except for minor additions to bibliography, ample reviews of these (and several other topics) are readily available elsewhere. At least a third and possibly half of the coverage might well have been eliminated on these grounds.

ARTHUR CHOVNICK
Genetics and Cell Biology Section, Biological Sciences Group, University of Connecticut, Storrs

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