Book Reviews

Cardiac Contractility

The Physiological Basis of Starling's Law of the Heart. Proceedings of a symposium, London, Sept. 1973. Associated Scientific Publishers (Elsevier, Excerpta Medica, North-Holland), New York, 1974. x, 298 pp., illus. $15.40. Ciba Foundation Symposium 24 (new series).

This book provides new insight into the mechanisms underlying the physiological phenomenon described by Starling's law of the heart—that is, that the force of cardiac contraction increases as the heart fills. The articles and discussions contain new information that suggests that the sliding filament hypothesis formulated in 1966 in A. F. Huxley's laboratory may not be completely adequate to explain sarcomere length-tension curves. B. R. Jewell points out that the improved estimate for the length of the thin filament, 1.50 μm instead of 1.60 μm, means that the plateau of the length-tension curve should occur at sarcomere lengths of 1.9 to 2.15 μm, not at the lengths of 2.0 to 2.25 μm measured in 1966.

The finding reported by Taylor and Riidel, that at short sarcomere lengths muscle fibers are not properly activated, raises the possibility that the relation between sarcomere length and the efficiency of excitation-contraction coupling is one of the factors in determining the length-tension curve.

In addition to the articles, the book includes four excellent general discussions. The first is of cross bridges and the underlying basis of the length-tension curve. X-ray diffraction data and electron microscopy data with regard to formation of cross bridges are compared, and serious discrepancies are found between the length-tension curves of skeletal muscle and cardiac muscle. Skeletal muscle has a relatively broad plateau of peak tension between sarcomere lengths of 2.0 and 2.2 μm, in comparison to cardiac muscle, which develops a peak tension at a sarcomere length of 2.2 μm. In cardiac muscle, tension drops off sharply on either side of the peak length, as opposed to the shallow decrease in tension on either side of the plateau observed in skeletal muscle. The second and third discussions concern force-velocity relations and sarcomere lengths of cardiac muscle. The final discussion is of particular interest, since it concerns the consequences of stretch and shape changes on radial diffusion of oxygen, ions, resting metabolism, and excitation-contraction coupling. The possibility is raised that the increase in cardiac tension as a function of stretch may be related to an increase in efficiency of excitation-contraction coupling as well as to the number and quality of cross bridges formed.

The 14 articles in the book are uniformly good and make an excellent contribution to our knowledge about cardiac muscle. The book should be very valuable to cardiac physiologists and cardiologists.

C. PAUL BIANCHI
Department of Pharmacology, University of Pennsylvania School of Medicine, Philadelphia

Reproductive Process

Fertilization in Higher Plants. Proceedings of a symposium, Nijmegen, Netherlands, Aug. 1974. H. F. LINSKENS, Ed. North-Holland, Amsterdam, and Elsevier, New York, 1974. xiv, 374 pp., illus. $26.95.

As the editor and many of its contributors remind us, man's use of plants for food depends heavily on the process covered by this volume. It is well to be reminded, also, now that somatic cell genetics is being perhaps oversold as the plant-breeding technology of the future, that this is the way plants do it when left, more or less, to their own devices.

There is much to be learned from the 43 papers, some of it discouraging. One wonders, for instance, why much of the work from the Soviet Union seems barely to have left the 19th century, and whether that fact has any relationship to the sorry state of agriculture there. Fortunately, the condition does not obtain in Eastern Europe generally. One of the most technically advanced presentations is that of Erdelská based on microcinematography within the embryo sac of *Galanthus*. Again, one can hardly describe as old-fashioned the investigation by Ryczkowski on oxygen tension and respiration with the *Haemanthus* ovule, although the data presented may well be beyond the limits of the techniques used.

Among the pollen studies, two solid contributions by Pfahler on *Zea* genotypes in fertilization are noteworthy, as is the short, thought-provoking article by Mulcahy on the adaptive significance of gametic competition in plants. Vasil provides an illuminating and scholarly review of the histology and physiology of pollen-stigma relationships. Some elegant light microscopy by Wilms documents the branching of *Spinacia* pollen tubes, which is probably a postfertilization phenomenon.

In the physiological domain, perhaps the most impressive paper is that of Linskens, demonstrating and graphically summarizing the different patterns of radioactive sugar and amino acid translocation with *Petunia* flowers following compatible (cross-pollinated) and incompatible (self) fertilization. The absence from the paper of precisely comparable graphs for nonpollinated material is pedagogically regrettable, though not a serious flaw.

Although one would be happy to discover, through such a symposium, that major advances, advances with great fundamental and practical significance, are being made, to say that about this volume would be to exaggerate. But when such advances do occur, they will be built on the foundations established by research and meetings of this kind.

WILLIAM S. HILLMAN
Biology Department, Brookhaven National Laboratory, Upton, New York

Nitrogen and Plants

The Biology of Nitrogen Fixation. A. QUISPEL, Ed. North-Holland, Amsterdam, and Elsevier, New York, 1974. x, 770 pp., illus. $63.50. Frontiers of Biology, vol. 33.

This book is a comprehensive treatment of the biological aspects of dinitrogen fixation, and as such it is well done. It covers not only the well-known aspects of N_2 fixation but many of the as yet unglamorized aspects, such as the N_2 fixation that occurs on plant leaves (phyllosphere) and in the area surrounding plant roots (rhizosphere). From reading this book the more biochemically or chemically oriented researchers in the field can gain detailed information on (or find references to) practically all those biological aspects