



Vignettes: Fiction and Nonfiction

We know . . . that little candles have flames nearly as big as large candles. How large were the flames of candles in Lilliput? And the more you think, the more questions you come up with: how large were the raindrops in Lilliput and Brobdingnag? Were the physical laws for water there different from the ones in our own world? And finally the physicists ask: how large were the atoms in those places? What kind of chemical reactions would they undergo with the atoms of Gulliver's body?

With these questions the stories falter.

—Gerard 't Hooft, in *In Search of the Ultimate Building Blocks* (Cambridge University Press)

The straightforward definitions and theorems of Euclidean geometry, conceived initially as exercises in thought, the mind companionably addressing itself, have a direct and thus an uncanny interpretation in the voluptuous and confusing world of the senses. A straight line is the shortest distance between two points. That the structure of the physical universe seems to have been composed with Fitzwater and Blufford's high-school textbook, *Welcome to Geometry*, firmly in mind is evidence that in general things are stranger than they seem.

—David Berlinski, in *A Tour of the Calculus* (Pantheon)

filament theory for muscle shortening proposed by A. F. Huxley, Hanson, and H. E. Huxley. Success in understanding the molecular mechanism of skeletal muscle contraction has largely been due to its unique characteristics. Its large cell size, as well as its highly ordered myofibril structure, has facilitated physiological and biophysical study, and the large quantity of protein involved in muscle contraction has facilitated functional analysis of protein components by biochemists. Smooth muscle has been studied for an equally long time, owing in part to its clinical importance, but the majority of the work has focused on the tissue level, and not until recently has there been molecular insight into the contractile mechanism. In the late 1970s, several research groups reported that in smooth muscle, unlike skeletal or cardiac muscle, actomyosin adenosine triphosphatase as well as contractility is strongly activated by myosin phosphorylation and that this reaction is catalyzed by Ca^{2+} and calmodulin-dependent protein kinase. This finding moved smooth muscle research into a new stage, focused on contraction at a molecular level. The phosphorylation theory for the activation of smooth muscle contraction is now established, and the role of Ca^{2+} as a primary intracellular messenger in the process is widely accepted. At the same time it is clear that the contractile response of smooth muscle is quite complex and that a number of other factors participate in its regulation. There remain some key unre-

solved issues. (i) Various protein kinases such as protein kinase C, calmodulin-dependent multifunctional protein kinases, MAP kinase, and tyrosine kinases might play roles in the signaling cascade, and their physiological function needs to be clarified. (ii) Thin-filament binding proteins such as caldesmon and calponin were found in the 1980s, but their physiological function is not yet understood. The regulatory or structural roles of these proteins need to be established. (iii) The phosphorylation theory predicts that smooth muscle contractile activity is determined by the extent of myosin phosphorylation. Therefore, the regulation of myosin light-chain kinase and phosphatase activities directly dictates the contractile activity. Although Ca^{2+} is the major factor that determines the myosin phosphorylation level, other factors also have an influence, presumably via modulation of the kinase and phosphatase. Understanding of the regulation of these enzymes will be critical. (iv) Intracellular Ca^{2+} concentration is regulated by numerous systems, including surface membrane as well as endoplasmic reticulum Ca^{2+} channels, Na/Ca exchanger, Ca^{2+} pumps, and mitochondria. Since Ca^{2+} is the primary second messenger for smooth muscle contraction, the homeostasis and regulation of intracellular Ca^{2+} have to be understood.

Biochemistry of Smooth Muscle Contraction addresses most of these questions in its 30 chapters. In the first section, current knowledge of several key contractile and

regulatory proteins of smooth muscle is set forth in detail (13 proteins are selected and discussed). Two techniques (in vitro motility assay and cell permeabilization) that have contributed to recent progress in smooth muscle research are then introduced. This section is followed by chapters describing intracellular Ca^{2+} regulation and signal transduction. The coverage includes the nitric oxide–cyclic guanosine 5'-phosphate signaling system, one of the recent noteworthy topics in vascular smooth muscle physiology. In the last section, mechanics and energetics of smooth muscle contraction are described.

Each chapter contains up-to-date information, and perspective sections deal with key unanswered questions. The book provides comprehensive information on most of the important topics in this area. It is unfortunate that there is no treatment of small G proteins that may play a role in the regulation of myosin phosphorylation level in cells and no section on smooth muscle proliferation and differentiation, which would be interesting for clinically oriented researchers. However, the book makes a significant contribution to the field and will serve as a valuable reference both for investigators who have been working with smooth muscle and for those about to enter the field.

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Books Received

Ancient Egyptian Medicine. John F. Nunn. University of Oklahoma Press, Norman, 1996. 240 pp., illus. \$39.95.

Brain Mapping. The Methods. Arthur W. Toga and John C. Mazziotta, Eds. Academic Press, San Diego, 1996. xiv, 471 pp., illus. \$145.

Carnivore Behavior, Ecology, and Evolution. Vol. 2. John L. Gittleman, Ed. Comstock (Cornell University Press), Ithaca, NY, 1996. xii, 644 pp., illus. \$85; paper, \$37.50.

Dinosaurs of the East Coast. David B. Weishampel and Luther Young. Johns Hopkins University Press, Baltimore, 1996. xvi, 275 pp., illus. \$35.95.

Encyclopedia of Earth Sciences. E. Julius Dasch, Ed. Macmillan, New York, 1996. Vol. 1, xvi pp. + pp. 1–564, illus., + plates. Vol. 2, xii pp. + pp. 565–1273, illus., + plates. The set, \$190; \$165 until 31 Dec 1996.

Geology and Seismic Stratigraphy of the Antarctic Margin. Alan K. Cooper, Peter F. Barker, and Giuliano Brancolini, Eds. American Geophysical Union, Washington, DC, 1995. xiv, 303 pp., illus. + maps + CD-ROMs. \$65; to AGU members, \$45.50. Antarctic Research, vol. 68. Based on a symposium, Siena, Italy, Aug. 1994.

Introduction to Theoretical Organic Chemistry and Molecular Modeling. William B. Smith. VCH, New York, 1996. xii, 192 pp., illus. \$59.95.

Low-Dimensional Semiconductors. Materials, Physics, Technology, Devices. M. J. Kelly. Oxford University Press, New York, 1995. xviii, 546 pp., illus. \$120; paper, \$60. Series on Semiconductor Science and Technology, 3.