# Some Mathematical Questions in Biology: Muscle Physiology (Lectures on Mathematics in the Life Sciences)

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Currently the outstanding problem in muscle contraction is determining the mechanism for the sliding of actin and myosin filaments. This volume contains papers based on lectures presented at the Seventeenth Annual Symposium on Some Mathematical Questions in Biology which was held in conjunction with the Annual Meeting of the AAAS. The six papers deal with overlapping areas of muscle physiology: cross-bridge dynamics (the mechanism currently receiving most attention), as well as distinctions between striated and cardiac muscles and the control of muscular contractions by action potentials.Focusing on both experimental techniques and theoretical underpinnings, the authors present the recent technological advances that provide an improved database for obtaining a better understanding of the biochemical mechanics and developing better mathematical models. In the first article Dr. Hugh E. Huxley reviews current studies of muscle systems which use X-ray diffraction and electron-microscopic analysis.Dr. Even Eisenberg describes how ATP hydrolysis drives muscle contraction via the action of myosin cross-bridges. The next two papers contain mathematical studies of muscle contraction. Dr. Michael Propp uses a thermodynamic formalism to predict the physiological properties of muscle. Drs. H. Michael Lacker and Charles S. Peskin develop a mathematical method for working backwards to determine uniquely microscopic properties of the cross-bridges. Drs. John W. Krueger and Katsuhiko Tsujioka use light diffraction observations to develop a quantitative understanding of cardiac function from properties of the myofibril and elements of the cross-bridge cycle. In the concluding paper, Dr. Robert S. Eisenberg reviews the current work on the electrical control mechanisms in excitation-contraction coupling which lead to muscle contraction.

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