SUBMITTING ILLUMINATIONS FOR REVIEW

As educators we are continually designing new methods and procedures to enhance learning. During this process good ideas are frequently generated and tested, but the extent of such activities may not be adequate for a full manuscript. Nonetheless, the ideas may be quite beneficial in improving the teaching and learning of physiology. Illuminations is a column designed to facilitate the sharing of these ideas (illuminations). The format of the column is quite simple: a succinct description of about one double-spaced page (less title and authorship), without figures or references, of something you have worked up for the classroom, teaching lab, conference room, etc. Submit your column entry directly to Daniel Richardson, Illuminations Column Editor, Department of Physiology, University of Kentucky, College of Medicine, Lexington, KY 40536-0298.

Isotonic contractions: no change in tone?

If the force developed by the contractile component of a muscle is continuously changing due to the varying degrees of cross-bridge overlap, how can a muscle ever produce an isotonic contraction? This was the question put up by a group of our first year students of undergraduate medical physiology. After giving it thought, we explained to them that the tone of the muscle is indexed in the tension in its series elastic component (SEC). During “isotonic” contraction, the tension in the SEC depends on the magnitude of load pulled rather than on the force with which it is pulled. We gave the example of a crane lifting a load: the tension on its cord is determined by the load it lifts and not by the power of its motor.

On second thought, however, we felt that what we had said was only partially true. If the crane lifts the load with an acceleration, then the power of the motor would definitely make a difference in the cord tension. The motor power becomes immaterial only when there is no acceleration or deceleration, or when the load comes to a rest. Muscle contraction also goes through phases of acceleration and deceleration, which can be demonstrated by recording an isotonic muscle twitch. Hence, a muscle contracting “isotonically” goes through brief phases when its tone (or tension in the SEC) would fluctuate. However, at the end of the contraction period, the tone would be the same as before the contraction. In both cases the load is at rest, and therefore the tone is determined by the load and not by the active tension generated at the cross bridges. Thus the name “isotonic” can be justified.

SHARMILA SANYAL
Department of Physiology
Maulana Azad Medical College
Delhi 110 002, India

SABYASACHI SIRCAR
Department of Physiology
University College of Medical Sciences
Delhi 110 095, India