

Close R I. Dynamic properties of mammalian skeletal muscles.
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Two main classes of myofilament system were identified in mammalian skeletal muscles, differing principally in the intrinsic speed of movement of thick and thin filaments. The possible functional relationship between myosin ATPase activity and shortening speed was reviewed. [The SC7® indicates that this paper has been cited in over 890 publications.]

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Ladd Prosser invited me to spend the summer of 1958 at the Marine Biological Laboratory in Woods Hole, Massachusetts, as part of my graduate education. While there, I learned from Rosamond Eccles about their discovery that neural influences are involved in the differentiation of mammalian muscles into fast-twitch and slow-twitch types: the plasticity of these neuromuscular systems was then under neurophysiological investigation by the Eccles group at the Australian National University. Prosser's wonderful teaching had introduced me to the results of comparative studies, which gave the first indication that the wide range of muscle speeds in different animals might be related functionally to myosin ATPase activity. The news of the Canberra experiments brought the prospect that mammalian muscles might be ideal for investigating the dynamic properties of myofilaments in relation to the kinetics of myosin ATPase.

The opportunity to become involved in this work came two years later when I took up a postdoctoral position in physiology at the John Curtin School of

Medical Research. The first problem was to find out whether the traditional measures of speed reflected differences in the myofilaments or in the extrinsic mechanisms that control contractile activity. The method I developed for characterising the force:velocity properties at the sarcomere level involved laborious counting of the number of striations in isolated single fibres, but the results did provide the first evidence of the twofold difference in intrinsic speed of sliding of the myofilament arrays in the two kinds of muscle fibre.¹

Around the same time, biochemists working with Michael Bárány and John Gergely were beginning to find comparable ratios for specific activities of myosin ATPase in similar fast and slow muscles. The relationship between these physical and chemical properties of myofilaments was established through measurements on other muscles² and was the subject of Bárány's paper that later became a *Citation Classic*.³

Bárány and I were invited by Ade Milhorat to participate in the 1966 conference at Arden House, Harrington, New York, sponsored by the Muscular Dystrophy Associations of America. This meeting provided the opportunity to plan our investigation; we decided to test the association between dynamic and enzymic properties using experimental procedures that I had found to alter the force:velocity properties. The results were consistent with the view that myosin ATPase limits the speed of contraction, and by then it was clear that mammalian skeletal muscles contained two classes of myofilament system that were kinetically distinct at the molecular level.⁴

When Douglas Wilkie invited me to write the review, I took the opportunity to integrate our findings with those from ultrastructural, biophysical, and biochemical studies. The picture that emerged seems to have been of interest to investigators in a fairly wide range of research activities, perhaps because it helped establish some order in our knowledge about functionally different classes of muscle fibre. In focusing on specialisation at the myofilament level, the review may have helped to contribute another aspect to studies on the mechanochemistry of contraction, now the subject of detailed investigation,⁵ and to promote further interest in the control of myosin isoenzyme transitions during development.⁶

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