CHAPTER III

Physiological Properties of Passive Muscle Spindles

CLASSIFICATION OF STRETCH RECEPTORS

General Remarks

Changes of length (extension) and tension, produced by stretch and contraction, are the main properties which would recommend muscles as tools for measurement and for this task the measuring instruments (or problems) are the muscle spindles and the tendon organs. Stretch produces extension and a decrease of tension; contraction produces tension and a decrease of length or may only be accompanied by a change of length (isometric or isotonic). Actually the tension or extension is usually used by experimenters as their tool, is provided by a stimulus, or by the transient phase of stimulation (Ch. IV). Thus, when a slight shortening always occurs owing to some compliance in the classical tendon shortening contraction.

It was natural and by Barnes & Pickslay (1932-38) that the spindles are "in parallel", the tension upon the entire muscle is therefore shared more unevenly than the fibres would be "unlinked" and the latter pulled upon by a purely series connection. Nevertheless, the distinction of muscular afferents B. Matthews (1933) showed that one type of end organ, his Annulus, "responds to unloaded by a contraction (isometric or isotonic) while another one, his Rosettes, seem fires in response to an increase of mechanical tension. Both types respond to stretch, albeit with slightly different thresholds, and are therefore commonly known as stretch receptors.

It is convenient to begin with a model, (Fig. 20) of the end of parallel muscle and a similar model in which series elements are the only elements of a muscle dead end. This model also shows how it was types of coding are differentiated from one another. The specific energy and the tender organs fires during the use of contractile tension. Nowadays most experiments are based on the recording of single fibres, traditionally indirect in dorsal roots, and lab, of course, with means of determining

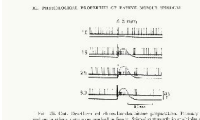

Fig. 20. Diagrammatic representation of the muscle spindle. Primary afferent fibres are represented by the thick lines, secondary afferents by the thin lines. Intrafusal fibres are shown in the middle of spindle. Note the absence of motor fibres to the intrafusal muscle fibres. (After Matthews, Cold Spring Harbor Symp. Quant. Biol., 1952.)

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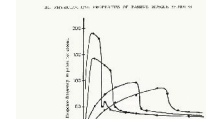

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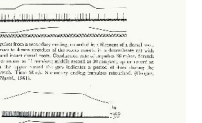

Fig. 28. Diagrammatic representation of the muscle spindle. Primary afferent fibres are represented by the thick lines, secondary afferents by the thin lines. Intrafusal fibres are shown in the middle of spindle. Note the presence of motor fibres to the intrafusal muscle fibres. (After Matthews, Cold Spring Harbor Symp. Quant. Biol., 1952.)

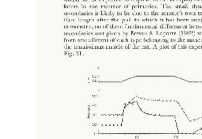

Fig. 29. Diagrammatic representation of the muscle spindle. Primary afferent fibres are represented by the thick lines, secondary afferents by the thin lines. Intrafusal fibres are shown in the middle of spindle. Note the presence of motor fibres to the intrafusal muscle fibres. (After Matthews, Cold Spring Harbor Symp. Quant. Biol., 1952.)

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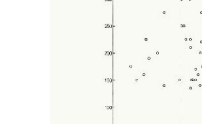

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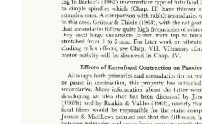

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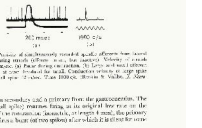

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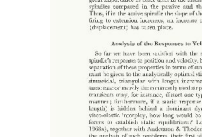

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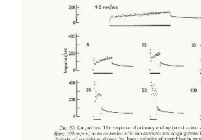

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