Note on the Mesenteric Nerve Net of the Anemone *Metridium canum* (Stuckey)

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Abstract

THE mesenteries of the New Zealand anemone *Metridium canum* differ functionally from those of the northern hemisphere *Metridium senile* in showing a faster and greater quick-contraction response. The associated nerve net shows a development of much larger neurones, which are predominantly orientated parallel with the muscle fibres, and chiefly confined to the vicinity of the retractor muscle.

ALLIED to *Metridium senile* (L.), whose neuromuscular system and behaviour have been the subject of an extensive study (Pantin, 1952), is a New Zealand species, *Metridium canum* (Stuckey) 1914. This when seen in an aquarium is in general of similar appearance to the khaki colour race of *M. senile,* except for a considerably longer column. Its habitat, however, is strikingly different. Instead of growing on rock or wharf piles it lives half-buried in sandy mud, its pedal disc attached to a shell or pebble some cms below the surface. Mechanical stimulation, or electrical stimulation at a frequency of about 1 shock per second, causes in each species quick, facilitated contractions of the retractor muscles of the mesenteries. Although strictly comparable records for the two species have not yet been made, it appears that these contractions of *M. canum* differ from those of *M. senile* in three respects: they are faster; they are of considerably greater extent; and the total contraction of *M. canum* is somewhat asymmetrical, because the enormous retractor shortening is not immediately accompanied by shortening of the rest of each mesentery.

The question arises as to whether there is any difference in the mesenteric nerve nets of the two species that might be associated with these differences in the fast response. The nerve net of *M. canum* has not yet been intensively examined following silver impregnation. However, a preliminary examination following vital staining with Rongalit-Methylene blue (Pantin, 1946) reveals striking differences.

Over the retractor muscles of *M. canum* mesenteries there occurs a system of bipolar neurones of surprisingly large size (Figs. 1, 2). Nerve fibre diameters near the cell bodies are chiefly in the region of 5–8μ, with some as great as 13μ. In *M. senile*, on the other hand, such axons near their cell bodies are chiefly between 1 and 2μ in diameter, 5μ being exceptionally stout (cf. Fig. 3, *M. senile* and Fig. 4, *M. canum* nerve nets over retractor muscles, photographed on same scale)

Not only does the *size* of these mesenteric neurones differ from those of *M. senile*. Their *orientation* and *distribution* also show marked dissimilarity. The stout neurones just described in *M. canum* show a strong tendency to run parallel with the retractor muscles (Figs. 1, 5), a feature but slightly apparent in *M. senile*. Further, these large neurones on the endocoelic mesentery face of *M. canum* are almost entirely confined to the retractor muscle. Over the rest of the face of the mesentery the nerve net consists chiefly of more slender neurones which take much longer to stain with methylene blue. They are of a completely different order of size from the much stouter neurones overlying the retractors. In *M. senile,* on the other hand, the neurones

over the retractor muscles are no larger than those lying between these and the attachment of the mesentery to the body wall.

Metridium canum mesenteries thus differ functionally from those of *M. senile* in showing a much faster and greater quick-contraction response, which is more especially confined to the retractor muscle region of the mesenteries. The associated nerve net shows a development of larger neurones, with strong orientation along the line of the muscle fibres, chiefly confined to the vicinity of the retractor muscles.

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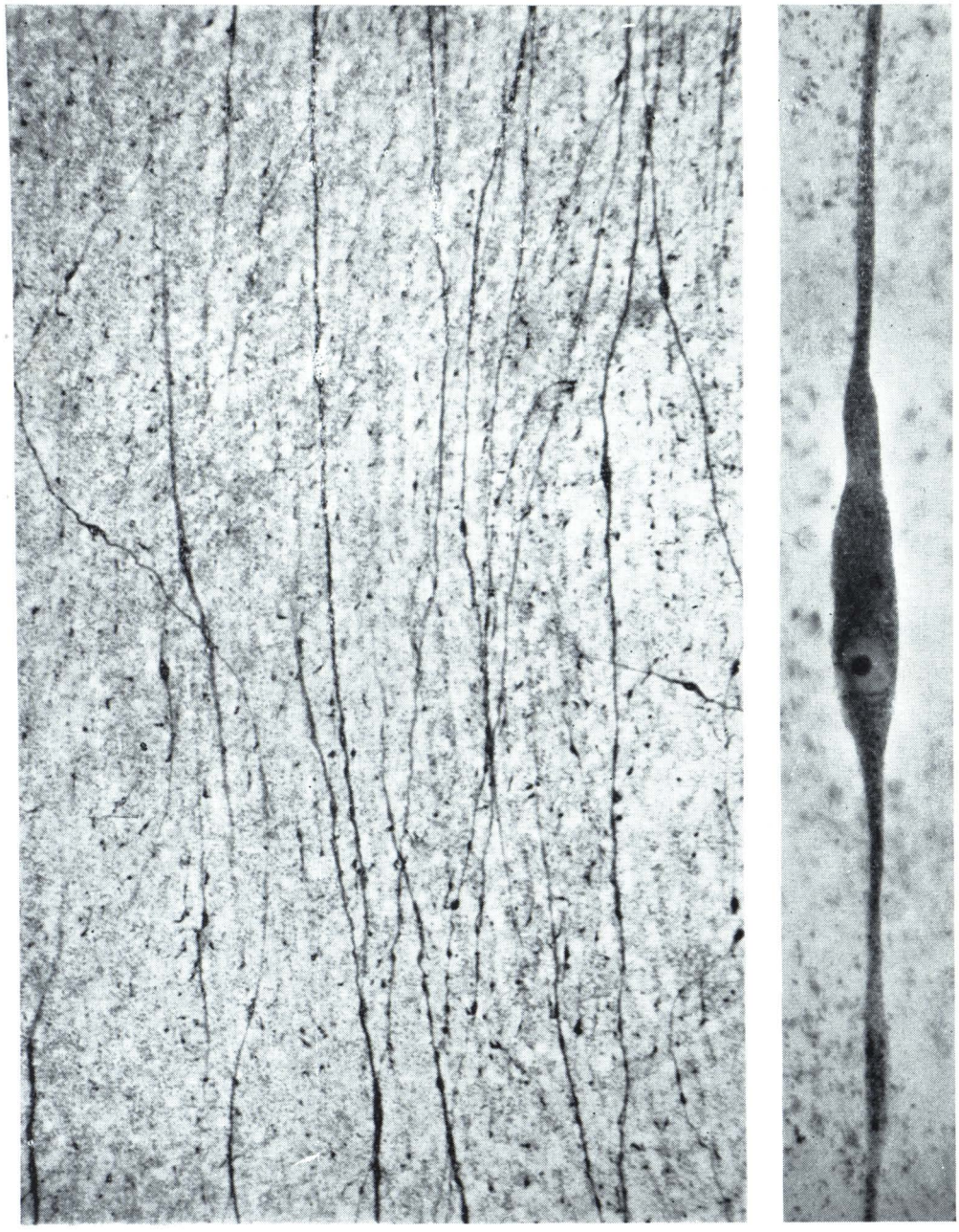

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FIG. 1.—General view of nerve net overlying mesenteric retractor muscles, *M. canum*. Whole mount, fresh Methylene blue preparation, × 84.

FIG. 2.—Single neurone, showing nerve cell body with characteristic nucleus and nucleolus, and parts of stout nerve fibres, *M. canum* mesentery, fresh Methylene blue preparation, × 500.

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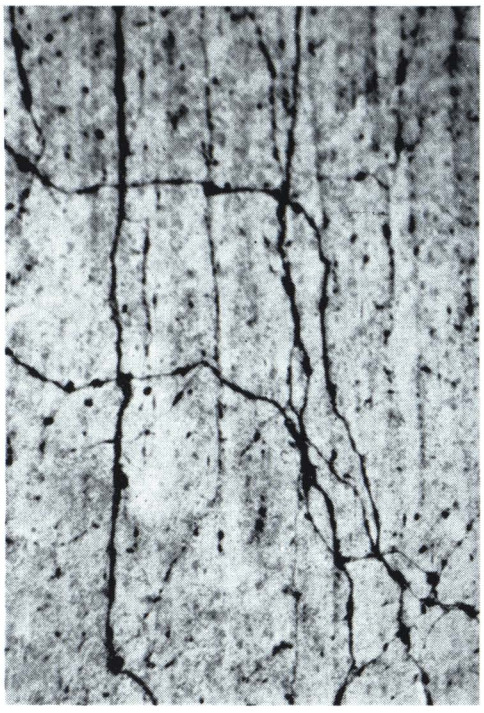

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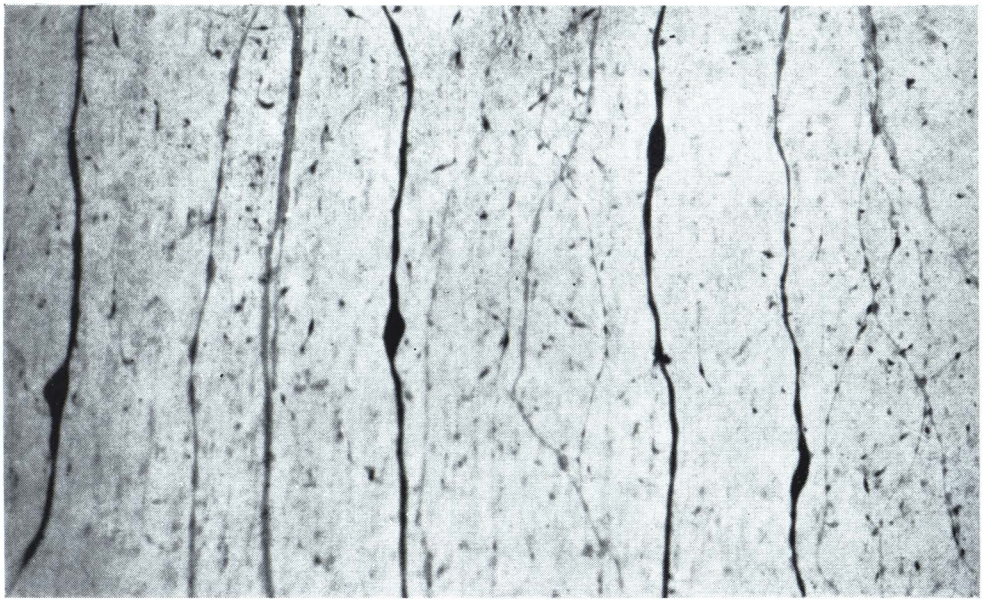

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FIG. 3.—*M. senile* nerve net overlying retractor muscle (fixed Methylene blue preparation).

FIG. 4.—*M. canum* nerve net overlying retractor muscle (fresh Methylene blue preparation). Both figures × 95. Note much stouter fibres, with tendency to parallel orientation, in *M. canum*.

FIG. 5.—*M. canum*, portion of nerve net overlying retractor muscles, showing strong tendency of neurones to run parallel. Cell bodies of 4 neurones in field. Fresh Methylene blue preparation, × 116.