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Active and passive properties of the microswimmer C. elegans

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Undulatory motion is utilized by crawlers and swimmers, such as snakes and sperm, at length scales ranging more than seven orders of magnitude. The understanding of this highly efficient form of locomotion requires an experimental characterization of the passive material properties of the crawler, as well as of its active force output on the surrounding medium. Here we present a novel experimental technique used to study the properties of the millmeter-sized worm *Caenorhabditis elegans*. By using the deflection of a force-calibrated micropipette, the viscoelastic material properties of the model organism were directly probed and characterised (Backholm, *et al.*, PNAS, 110 (2013)). The excellent force (pN) and time (ms) resolution provided by the micropipette deflection technique also enables measurements of the forces experienced by the worm as it swims through a liquid. This direct experimental characterization of *C. elegans* will provide guidance for theoretical treatments of undulatory motility in general.

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