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**A Treadmill to Localize, Exercise, and Measure the Propulsive Power of Nematodes** JINZHOU YUAN, HAN-SHENG CHUAN, MICHAEL GNATT, DAVID RAIZEN, HAIM BAU, University of Pennsylvania — The nematode *C. elegans* is often used as model biological system to study the genetic basis of behavior, disease-progression, and aging, as well as to develop new therapies and screen drugs. On occasion, it is desirable to quantify the nematode's muscle power. Here, we present a kind of nematode treadmill. The device consists of a tapered conduit filled with aqueous solution. The conduit is subjected to a DC electric field and to pressure-driven flow directed from the narrow end. The nematode is inserted at the conduit's wide end. Directed by the electric field (through electrotaxis), the nematode swims deliberately upstream toward the negative pole. As the conduit narrows, the average fluid velocity and the drag force on the nematode increase. Eventually, the nematode arrives at an equilibrium position, at which its propulsive power balances the viscous drag force. The nematode's propulsive power is estimated with direct numerical simulations of the flow field around the nematode. The calculations utilize the experimentally imaged gait as a boundary condition. The device is useful to retain the nematode at a nearly fixed position for prolonged observations under a microscope, to keep the nematode exercising, and to estimate the nematode's power based on the conduit's width at the equilibrium position.

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