Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Motility analysis of the nematode C. elegans on wet soft media
JOSUE SZNITMAN, Technion - Israel Institute of Technology, XIAONING SHEN, PAULO ARRATIA, University of Pennsylvania — Undulatory locomotion is widely utilized by limbless organisms such as snakes, eels and worms. When moving on top of wet soft gels (e.g. agar), undulating organisms such as the nematode *Caenorhabditis elegans* display a motility gait that is characterized by crawling. Until present however, a detailed understanding of how *C. elegans*' crawling gait generates propulsion over soft gels is lacking. Namely, how much crawling force does *C. elegans* generate? Here, we propose a simple model based on lubrication theory to examine the biomechanics of crawling motion. In analogy to the well-known resistive-force theory (RFT) for low Reynolds number swimming, our model provides a mechanism for the linear relation between the sliding speeds and the drag forces, and sheds light on the role of grooves created by nematodes on agar. We further examine the kinematics of locomotion experimentally and compare muscle activity patterns between crawling and swimming gaits, emphasizing the inherent differences in nematode adaptability to different environments.

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Date submitted: 05 Aug 2011 Electronic form version 1.4