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Worms on a plane: simulation studies of an active nematic phase of flexible chains[1] MICHAEL VARGA, MOHAMMAD NAJAFI, ROBIN SELINGER, Kent State Univ - Kent — We present simulation studies of flexible nematogen "worms" composed of soft spheres assembled into flexible polymer-like chains. These elongated, flexible chains are confined to a planar substrate with periodic boundary conditions or else confined within bounding walls. We consider a variety of driving mechanisms including unidirectional gliding and gliding with random reversals. We also model actuation via kinesin motor clusters which attach and travel along a pair of neighboring chains of opposite polarity, producing inter-chain sliding forces and driving the chains in opposite directions. We examine resulting nematic order, defect nucleation, motion, and annihilation, and density fluctuations as a function of chain length, flexibility, density, and driving mechanism. In a geometry where the chains are constrained to move in tandem with tight spacing, we observe spontaneous formation of organized beating. We compare our results to experimental and theoretical studies of gliding bacteria [1] and kinesin-driven microtubules [2]. [1] Peruani et al. PRL 108, 098102 (2012), [2] Sanchez et al, Nature 491,431 (2012).

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