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3-d Brownian dynamics simulations of the smallest units of an active biological material JUTTA LUETTMER-STRATHMANN, NABINA PAUDYAL, MARAL ADELI KOUDEHI, Department of Physics, The University of Akron — Motor proteins generate stress in a cytoskeletal network by walking on one strand of the network while being attached to another one. A protein walker in contact with two elements of the network may be considered the smallest unit of an active biological material. In vitro experiments, mathematical modeling and computer simulations have provided important insights into active matter on large and on very small length and time scales. However, it is still difficult to model the effects of local environment and interactions at intermediate scales. Recently, we developed a coarse-grained, three-dimensional model for a motor protein transporting cargo by walking on a substrate. In this work, we simulate a tethered motor protein pulling a substrate with elastic response. As the walker progresses, the retarding force due to the substrate tension increases until contact fails. We present simulation results for the effect of motor-protein activity on the tension in the substrate and the effect of the retarding force on the processivity of the molecular motor.

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