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An *in vitro* approach to understanding intracellular motor-based cargo transport RAFAEL LONGORIA CASASA, University of Texas at Austin, Physics Department, HAYLEY MANNING, GEORGE SHUBEITA, University of Texas at Austin, Physics Department — Microtubule-based molecular motors are responsible for the long range transport of intracellular cargoes. Most cargoes move bidirectionally yet reach their destination in the cell. The mechanism by which the seemingly random bidirectional motion of cargoes is regulated by the cell to produce directed transport remains unclear. Two distinct models have been proposed: coordination via a tug-of-war, the dynamics of which depend only on the properties of the motors; and coordination via non-motor proteins. However, no direct evidence for either one has been found yet. We present an experimental method that can address the different predictions of these models. We reconstitute *in vitro* transport of endogenous motor-driven lipid droplets purified from *Drosophila* embryos. Global transport dynamics are observed under varied medium conditions by DIC microscopy. Combined with stall force measurements using an optical trap, these investigations relate the global dynamics to local changes in force production of the motors which give us a direct handle to differentiate between the different models of transport.

Rafael Longoria Casasa
Physics Dept., University of Texas at Austin

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