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Three dimensional microtubule-based motility assays

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Microtubule-based motility in cells is a complex process. Cargos often traverse filament intersections. Such microtubule-microtubule sites may have filaments positioned at various angles and various displacement to each other. The microtubule cytoskeleton and the transport along microtubules are inherently not reducible to a 1D or 2D model. However, to date most in vitro modeling of microtubule-based transport has been in simplified surface-bound assays which are not faithful to the intracellular constraints. I will demonstrate our novel 3D microtubule motility assay in which many microtubules can be independently held and manipulated in 3D. I will also show how we quantify forces exerted by cargos on microtubules during each crossing event and discuss the opportunities this mode of measurement presents for complete modeling of cargo transport. I will discuss progress to date achieved with our in vitro approach. In particular I will show that geometry of the intersection does substantially affect cargo navigation across an individual intersection.