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### **Modeling of Single Molecule Cytoplasmic Dynein<sup>1</sup>**

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A living cell has an infrastructure much like that of a city. We will describe the transportation system that consists of roads (filaments) and molecular motors (proteins) that haul cargo along these roads. Dynein is one type of motor protein that walks along microtubules towards the nucleus of the cell. Dynein is more complicated in its structure and function than other motors. Experiments have found that, unlike other motors, dynein can take different size steps along microtubules depending on load and ATP concentration. We use Monte Carlo simulations to model the molecular motor function of cytoplasmic dynein at the single molecule level. The theory relates dynein's enzymatic properties to its mechanical force production. Our simulations reproduce the main features of recent single molecule experiments. We make testable predictions that should guide future experiments related to dynein function.

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