Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Properties of intracellular transport: the role of cytoskeleton topology NICKOLAY KORABEL, University of California Merced, KERWYN C. HUANG, Stanford University, AJAY GOPINATHAN, University of California Merced — The eukaryotic cytoskeleton is composed of polarized filaments forming a complex, intertwined network. Various motor proteins such as kinesins or myosins convert ATP into mechanical work and are able to walk processively or even diffuse along the cytoskeleton. Large organelles such as vesicles or mitochondria can randomly bind and unbind to one or several motors and their transport in the cell can be described as alternating phases of diffusion in the cytoplasm and phases of directed or diffusive transport along the cytoskeletal network. Intracellular transport has been the focus of extensive studies both experimentally and theoretically. However, the impact of the cytoskeleton network structure on transport properties, which is expected to be significant, is not fully understood. We develop a computational model of intracellular transport, and explore the impact of the cytoskeletal structure on transport properties. We show that transport can be enhanced even by diffusional motion along the cytoskeleton after memory effects due to cytoskeletal structure are taken into account. We also explore the influence of the network structure on the first passage time distributions for a cargo to reach the cell membrane after being exported from the nucleus and for transport from the membrane to the nucleus.

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Date submitted: 13 Nov 2012 Electronic form version 1.4