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Abstract for an Invited Paper  
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**Anomalous dynamics in intracellular transport**

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This talk will describe quantitative analyses of particle tracking data for systems with cytoskeletally associated molecular motors to better understand the motions contributing to intracellular transport and, more generally, means for characterizing systems far from equilibrium. In particular, we have studied the motions of insulin-containing vesicles (granules) in a pancreatic beta cell line. We find subdiffusive behavior with correlations in both space and time. These data can be modeled by subordinating an ergodic random walk process to a non-ergodic one. We relate the dynamics to the underlying microtubule structure by imaging in the presence of the drug vinblastine. Our results provide a simple physical mechanism for how diverse pools of insulin granules and, in turn, biphasic secretion could arise. Time permitting, these dynamics will be compared with those of actomyosin assemblies.