Asymptotic Analysis of Intracellular Transport by Processive Molecular Motors

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Abstract:
Transport in neurons is intrinsically bidirectional, with each movement modality carried out by molecular motors in either the kinesin (anterograde) or the dynein (retrograde) families. Because all motors are present at a given time there must be competition and/or cooperation among motors that simultaneously bind a single vesicle to nearby microtubules. It has been assumed for much of the last decade that the competition must resolve itself though some kind of tug-of-war; but recent evidence shows that this is often not the case in vivo. In this talk, we will survey some of the mathematical tools that have been brought to bear on these systems (particularly stochastic averaging and homogenization) along with identifying a few new research directions that could lead to realigning theory with these new experimental observations. Joint work with Will Hancock (Penn State), John Fricks (Penn State), and Pete Kramer (RPI).