Physics AT QUEENS COLLEGE

# Colloquium Notice


## Oleg Kogan

**California Polytechnic State University**


## *Tunable intracellular transport on converging microtubule morphologies*


Cargo inside cells is transported by molecular motors that move ballistically on cytoskeleton, interspersed with diffusive episodes when motor-cargo complexes detach from the cytoskeleton. A common type of cytoskeletal morphology involves multiple converging microbutubules with their minus ends collected at the microtubule organizing center (MTOC) in the interior of the cell. This arrangement enables MTOC to serve as a trap, enabling agglomeration of cargo. The general principles governing dynamics, efficiency, and tunability of transport and trapping ability of MTOC is not fully understood. To address this, we develop a one-dimensional model that includes advective transport towards an attractor (such as the MTOC), and diffusive transport that allows particles to reach absorbing boundaries (such as cellular membranes). We show that the mean first passage time (MFPT) to reach the boundaries experiences a dramatic growth in magnitude, transitioning from a low to high MFPT regime over a window of cargo attachment-detachment rates that is close to *in vivo* values. Furthermore, we find that increasing either the attachment or detachment rate can result in optimal dispersal away from MTOC when the attractor is placed asymmetrically. Finally, we also describe a regime of rare events where the MFPT scales exponentially with advective velocity towards the attractor and the escape location becomes exponentially sensitive to the attractor positioning. Taken together, our results suggest that structures such as the MTOC allow for the sensitive control of the spatial and temporal features of transport and corresponding function under physiological conditions.


Friday
**May 5, 2023**
Starts at **12:35 pm**
Physics Conference Room, SB B326
This talk is accessible via **Zoom** or use
**meeting ID 829 2687 2594** and **passcode 866995** to join