Lecture Series: Directed development of methods in cellular electron tomography to answer functional questions in cell biology of infection and disease

Event Type: IBBR Seminar Series  
Contact Person: S. Saif Hasan  
Event Info  
Date: Sep 23 2019 - 11:00am to 12:00pm  
Location: Auditorium  
Details  
Speaker/Presenter: Ranjan Sengupta  
Speaker Affiliation: Purdue University  
Event Description:  
In a eukaryotic cell, most membrane-bound organelles over their life time transition through multiple morphological states driven by functional cues. In addition to endogenous events, this morphological flux is also induced by various diseases and pathogenic invasions. Despite these recurrent examples of the nexus between form and function of organelles a visual understanding of these morphofunctional transitions is rudimentary. The lack of appropriate technology, its accessibility and optimization of the existing technologies for specific applications has played a big role in this paucity of knowledge on these processes. Majority of cellular organelles within the endomembrane system are large and complex structures whose ultrastructural dissection in its true subcellular context falls beyond the capabilities of traditional light as well as super resolution microscopy. Thus electron microscopy (EM) remains the mainstay in answering questions on ultrastructural details of the subcellular space. Traditional 2D EM of thin resin section although has provided critical insights on the subcellular ultrastructure over the decades, it fails to address questions on the 3-dimensional intricacies of complex 3-dimensional cellular entities. The technologies available for viewing these ultrastructural details in 3D, namely electron tomography (ET), is a fast
evolving field that has enabled detailed visualizations of subcellular entities at resolutions that best suit the questions. However the most critical application of 3D EM yet is the ability of localization of biomolecules (proteins, lipids etc) in 3D, over a large cellular volume at a resolution sufficient to answer mechanistic questions. It is that essential bridge that can potentially bring 3D EM technologies into the tool kit of a basic cell biologist.

My work on the development of electron microscopy associated methods so far have evolved in step with morpho-functional questions at the interface of host-pathogen relationship within the subcellular space. In the first half of my talk I will present our unpublished work on Venezuelan equine encephalitis virus (VEEV). Here we use serial-section electron tomography to morphologically dissect a pathogenic conversion of the Golgi apparatus into unconventional post Golgi vesicles that transport VEEV structural proteins to the site of budding at the plasma membrane. This work not only fills a gap in understanding of a pathological phenomenology associated with alphavirus infection that had existed for half a century now, but also opened up further questions that resulted in the development of yet another technology that features the second half of my talk. Here, I will talk about our recently published cryoAPEX tagging technology that enables the subcellular localization of membrane proteins in 3D. In this section I will give you a quick preview of our ongoing work using the cryo-APEX technology on Ebola virus VP40, trafficking of alphavirus glycoproteins and the perturbation of the cellular endomembrane by a bacterial toxin.

Setup

**IT Setup:** Projector
Laptop
Podium
Lavalier Microphone
Wireless PPT
Remote