

MCB Student Seminar

Prof. Oren Schuldiner's lab



Tuesday, January 4th, 2022 at 11:00

The seminar will start with an introduction by the PI.

Please follow the zoom link to enter:

<https://weizmann.zoom.us/j/91562016946?pwd=NU9SZU9PVHA0eEltUXVpSzdBcXp4dz09>



Dr. Sumita Chakraborty

Will lecture about:

Critical role of bioenergetics
in neuronal remodeling

Neuronal remodelling is an evolutionary conserved process that is essential for development and maturation of both vertebrate and invertebrate nervous systems. Remodelling of neuronal connections includes degeneration of synapses and pruning of neurites, often followed by regeneration of axons and dendrites. Defects in neuronal remodelling are implicated in a host of neuropsychiatric disorders such as autism, dementia, schizophrenia and post-traumatic brain injuries, compounding a global challenge at all age groups. A unique system to understand cellular and molecular mechanism of neuronal remodelling is the stereotypic remodelling of *Drosophila* mushroom body (MB) γ neurons. During metamorphosis (pupa stage), the dendrites are pruned completely and the axons are pruned up to the branch point. Subsequently, MB γ neurons regrow their axons and dendrites to form adult-specific connections. Despite the fact that remodelling is crucial in neurodevelopment, and its emerging contribution in neuronal plasticity (learning and memory) and neuropsychiatric disorders, the molecular mechanisms that drive remodelling are largely unknown. We have uncovered a critical role of ER-mitochondrial calcium transfer in γ neuron pruning. Knockdown of endoplasmic reticulum ER- Ca^{2+} release channel IP3R and mitochondrial Ca^{2+} uniporter (MCU) both cause pruning defects in *Drosophila* MB γ neurons. Communication between the ER and mitochondria plays a crucial role in intra-cellular signalling and metabolic homeostasis in neurons. Disruption of mitochondrial ATP synthesis as well as extracellular uptake of pyruvate and lactate result in severe pruning defect. Knockdown of AMPK α also results in pruning defects. Combined, these data suggest an essential role of ATP in MB γ neuron pruning. We are presently investigating whether ATP is required for a housekeeping role or it mediates pruning through a distinct signaling cascade and its interaction with the supporting glia in the mushroom body.