Biophysics Seminars
May 3, 2016, 9.15 am, Humboldtstr. 50/III, room 0045.030194 (aka EDV-Raum)

Novel insights into endoplasmic reticulum – plasma membrane (ER-PM) communication by TIRM-based 3-D reconstruction of junctional nanoarchitecture

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Nanometer spaced appositions between endoplasmic reticulum and plasma membrane (ER-PM junctions) formed and stabilized by membrane-joining protein complexes are critically involved in cellular Ca^{2+}-handling and lipid trafficking. ER-PM junctional architecture and its dynamics associated with inter-membrane communication are as yet barely understood. We have recently developed a method to precisely characterize ER-PM contact morphology by fluorescence microscopy with high temporal resolution and minimal disturbance of junctional communication. Expression of soluble cytosolic fluorophores in combination with TIRFM enables to monitor the distance between ER structures and PM in the range of 5–200 nm. Such fluorescence density mapping (FDM) of sub-plasmalemmal structures in RBL-2H3 mast cells provided unexpected evidence for a profound remodeling of stromal interaction molecule 1 (STIM1)-containing contact sites in response to store-depletion. Our experiments revealed the existence of a Ca^{2+}-dependent and highly dynamic process that expands the junctional ER to enlarge its contact surface with the PM, thereby promoting STIM1-mediated Ca^{2+} signaling and PM phosphoinositide metabolism.