Lehrstuhl für Physik

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Chair of Physics

S E M I N A R
on
Semiconductor Physics and Nanotechnology

Do, 18.09.2025, 11:15 Uhr,

Seminar in
person in the Electrical engineering lecture hall *or* via Zoom

"Elucidating the interfacial properties of biomolecular condensates"

Johannes Vincent Tromm

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Accumulating experimental data suggests that cells represent a multiphase system where classical membrane-bound organelles coexist with biomolecular condensates. Yet, only very little is known about the interfacial properties of these membrane-less organelles. Here, we employ bottom-up reconstitution assays, graphene-based biosensors and live-cell fluorescent microscopy to understand the mechanisms governing the condensate interface, focussing on two biological examples. First, we turned to synapsin-1, a highly abundant neuronal protein, shown to form synaptic vesicle condensates at the presynapse, and found that synapsin-1 condensates readily wet lipid membranes in a charge-dependent manner. Furthermore, using newly established graphene-based sensors, we discovered the accumulation of an electric potential at the interface of synapsin-1 condensates, suggesting they act as biological mesoscale capacitors able to store electric charge. Additionally, we investigated the driving forces of synapsin-1 condensation and found evolutionarily conserved sequence-encoded molecular grammar that allow synapsin-1 to form biomolecular condensates. Second, we focussed on stress granules – ribonucleoprotein granules in the cytoplasm that form upon cellular stress – and in particular the central Ras GTPase-activating protein-binding proteins (G3BPs). We found that homotypic G3BP condensates can interact with neutrally and negatively charged lipid membranes, while heterotypic protein-RNA coacervates repel from the membrane surfaces regardless of their charge, suggesting a difference in their interfacial properties. Together, these data indicate that the interfaces between condensates and membranes play a crucial role in intracellular signaling.

Zoom – Link:
https://zoom.us/j/96375934537?pwd=RTlKTWhSdzRHU211YTY1bGFxTUtpZz09
Meeting-ID: 963 7593 4537
Kenncode: =r=4YQ