Colloquium

The cell as a material

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Cells and tissues are dynamic but also need to withstand large mechanical loads. This paradoxical mechanical behavior is governed by fibrous protein scaffolds known as the cytoskeleton and the extracellular matrix. It is still poorly understood how these biopolymer networks can combine mechanical strength with the ability to dynamically adapt their structure and mechanics. I will summarize our recent findings obtained via quantitative measurements on synthetic cells reconstituted from purified biological constituents. I will focus on the role of mechanical crosstalk between the four cytoskeletal networks in the cell: actin filaments, microtubules, intermediate filaments and septins. These four filamentous systems contribute different structural and dynamical properties, enabling specific cellular functions. I will highlight our recent efforts to biochemically reconstitute their interplay, which allows us to connect the collective mechanical properties of cytoskeletal networks to the underlying molecular interactions, which involve cytoskeletal crosslinkers, motors, and the plasma membrane. Our findings may eventually be interesting to guide the search for selective anticancer drugs, since cancer cells often overexpress specific septins, intermediate filaments, and cytoskeletal crosslinker proteins leading to abnormal mechanical behaviors.

Monday, October 23, 2023 11:30am - 12:30pm
Raiffeisen Lecture Hall

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