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"Building the cell's skeleton to understand how cells change shape, move, and divide"

A look inside of every living cell reveals a world of dynamic intracellular structures. One of the core cellular building blocks are microtubule polymers, vital for processes such as cell division, intracellular transport and neuronal development. Not surprisingly, misregulation of the microtubule network causes human disease, including many types of cancers, as well as neurological disorders.

Our research aims to discover the molecular mechanisms that drive dynamic remodeling of the microtubule network architecture, essential for its proper cellular function. What are the molecular rules that govern whether a microtubule grows or shrinks at any given moment in time? What are the mechanisms used by the microtubule-associated proteins that regulate microtubule behavior? How does this complex network of regulators collectively orchestrate dynamic remodeling of the microtubule cytoskeleton in vastly diverse cellular contexts? To address these questions we take an interdisciplinary approach, combining molecular and cell biology, biochemistry, engineering and physics.

Uniting the tools of many disciplines, our work aims to provide a fundamental understanding of how cells engineer large-scale, dynamic structures essential for life. Understanding of the underlying mechanisms will allow us to manipulate dynamic intracellular architectures, ultimately facilitating new, better strategies to fight human disease.