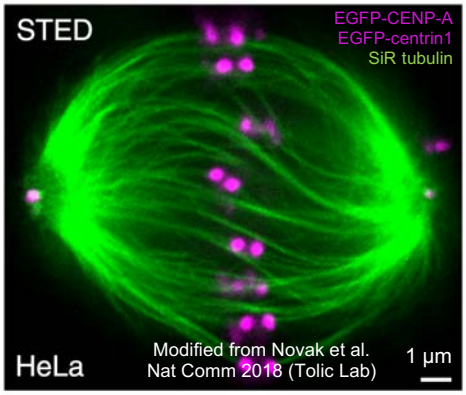
PhD/Postdoc Position in Biophysics of the Cytoskeleton

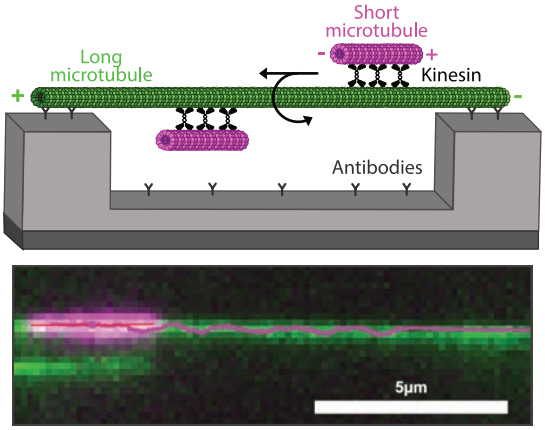
Diez Lab @ B CUBE, Technische Universität (TU) Dresden

The advertised project aims to elucidate, how molecular motors generate torque and twist in the mitotic spindle.



During mitosis, the cell is using the spindle apparatus to distribute the duplicated chromosomes to the emerging daughter cells. Errors in this process can lead to chromosome instability and various diseases. The spindle self-assembles from microtubules, microtubule-associated proteins and motor proteins. Motors translocate along the microtubules, with the polarity of the microtubule orchestrating the direction of the motors. Some motors, such as kinesin-5, kinesin-14 and dynein, can bind to two microtubules simultaneously, and in this way cross-link and slide them apart. Intriguingly, these motors not only walk straight along the microtubule, but also display a sidewards stepping component. This likely leads to the twisting of microtubule bundles in the spindle, but the underlying molecular mechanisms have so far remained elusive.

To study how antagonistic motors slide microtubules and produce rotational forces you will use *in vitro* 3D sliding motility assays. This setup allows to detect the helical motion of microtubules around each other and to characterize the motility parameters of the motors. To quantify the rotational forces (i.e. the torque) you will apply optical tweezers for direct measurements and microtubule bending shapes as indirect method. By providing insights into the 3D behavior of kinesin-5, kinesin-14 and dynein, the project will contribute to our understanding of the biological functions of motor proteins, especially the generation of the spindle twist.



The following **Methods and Techniques** will be employed in the project: fluorescence microscopy, statistical data analysis and programming, cloning, gene expression, protein purification, optical tweezers, and nano-imprint lithography.

Get in touch (stefan.diez@tu-dresden.de) and (provided you are a prospective PhD student) apply via the website of the Dresden International Graduate School of Biomedicine and Bioengineering (DIGS-BB, https://www.digs-bb.de) if you are a curious and motivated, enjoy microscopy and have a background in molecular biology, biochemistry, biotechnology or (bio-)physics.

B CUBE – Center for Molecular Bioengineering at TU Dresden focuses on the investigation of living structures on a molecular level and translating the ensuing knowledge into innovative materials and technologies. The **Diez Lab** develops and uses methods of single-molecule biophysics, in vitro reconstruction, advanced microscopic imaging and quantitative data analysis to study cooperative effects in motor-driven intracellular transport and cell motility. Moreover, the lab aims to utilize molecular motors in nanotechnological applications like the synthesis of hybrid bionanomaterials, molecular diagnostics, surface imaging and parallel biocomputation. See also: https://tu-dresden.de/cmcb/bcube/diez