



Der Vorsitzende des Promotionsausschusses

EINLADUNG

Hiermit lade ich ein zum öffentlichen Promotionskolloquium von

Frau M.Tech. Shweta Nandakumar

Molekulare Zellbiophysik
(Prof. Dr. Laura Aradilla Zapata)

am

Mittwoch, 25. Februar 2026, 9:30 Uhr s.t.

per Videokonferenz: Link für MS Teams: <https://msteams.link/V829>

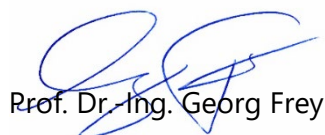
Raum für die Prüfung: Geb. B2.1, Hörsaal 0.02

Thema der Dissertation:

Metastable Microtubules: Dynamic Instability, Lattice Plasticity and Mechanosensing

Microtubules are highly dynamic cytoskeletal filaments essential for cellular function. Their metastable nature is reflected in dynamic growth and shrinkage at the ends and in continual tubulin turnover within the lattice. While this metastability enables rapid adaptation to external cues, how microtubule integrity is maintained under stress is unclear. Here, I develop *in vitro* assays that impose defined mechanical challenges and show that mechanical stress induces lattice damage exceeding intrinsic microtubule self-repair capacity, leading to filament failure. Importantly, intracellular factors and tubulin post-translational modifications enhance microtubule resilience and prolong filament survival under load. I further investigate how chemical perturbations acting at microtubule ends alter microtubule function. Together, these results show how microtubule metastability enables both adaptability and robustness, and how this balance is tuned by mechanical force, associated proteins, and chemical perturbations.

Saarbrücken, 11. Februar 2026



Prof. Dr.-Ing. Georg Frey