General Physics Seminar
Rijnhuizen Seminar Room

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Self-assembling biopolymers: dynamics and force generation

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In living cells, piconewton forces need to be generated to drive intracellular motility processes such as the motion of chromosomes during cell division. On a molecular level these forces are generated by so-called motor proteins and the assembly of linear protein aggregates. In recent years quantitative techniques have become available to study the mechanisms of force generation in simplified model systems. We focus on the study of force generation by the self-assembly of microtubules. Microtubules are tubular protein structures with a diameter of 25 nanometer that can be individually visualised using conventional video light microscopy. We use lithography techniques to create artificial barriers for microtubule growth and measure the forces generated by individual microtubules on these barriers, either by analysing the elastic response of the microtubule itself, or, more recently, by using optical trapping techniques. The response of the assembly process to the presence of force can be modelled using Brownian ratchet ideas. Comparison to experimental data reveals information about the molecular details of the assembly process.