“Microtubule buckling, the mechanics of a biological structure”

Microtubules are dynamic protein polymers that continuously switch between elongation and rapid shrinkage. They have an exceptional bending stiffness that contributes significantly to the mechanical properties of eukaryotic cells, and are important components of cytoskeletal structures, which in conjunction with actin and intermediate filaments provide both the framework that maintains cell structure. Microtubules resist various internal/external forces to maintain cell shape and they support motor proteins to generate the force required for cell movement and changes in shape. Given the fundamental contribution of microtubules to cellular architecture, it is interesting to quantify microtubule deformation in response to an external force.

Flexural rigidity is one of the parameters used to quantities microtubule deformation. The mechanical principle is analogous to Hooke’s law for a spring and represents the deforming force required under the assumption that the microtubule as a homogenous thin rod.

I will try to estimate Microtubule rigidity by using the well known buckling concept in Mechanics. The method will be analytical, but the data will be obtained from various experiments. Finally the results will be compared to available experimental estimation.