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Mechanical Properties of Primary Cilia CHRISTOPHER BATTLE, CHRISTOPH F. SCHMIDT, University of Goettingen — Recent studies have shown that the primary cilium, long thought to be a vestigial cellular appendage with no function, is involved in a multitude of sensory functions. One example, interesting from both a biophysical and medical standpoint, is the primary cilium of kidney epithelial cells, which acts as a mechanosensitive flow sensor. Genetic defects in ciliary function can cause, e.g., polycystic kidney disease (PKD). The material properties of these non-motile, microtubule-based 9+0 cilia, and the way they are anchored to the cell cytoskeleton, are important to know if one wants to understand the mechano-electrochemical response of these cells, which is mediated by their cilia. We have probed the mechanical properties, boundary conditions, and dynamics of the cilia of MDCK cells using optical traps and DIC/fluorescence microscopy. We found evidence for both elastic relaxation of the cilia themselves after bending and for compliance in the intracellular anchoring structures. Angular and positional fluctuations of the cilia reflect both thermal excitations and cellular driving forces.

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