88st MSS-Seminar
Wednesday, March 2nd, 15:30
Nägelsbachstr. 49b

MSS

Viscoelasticity of reversibly crosslinked biopolymer networks

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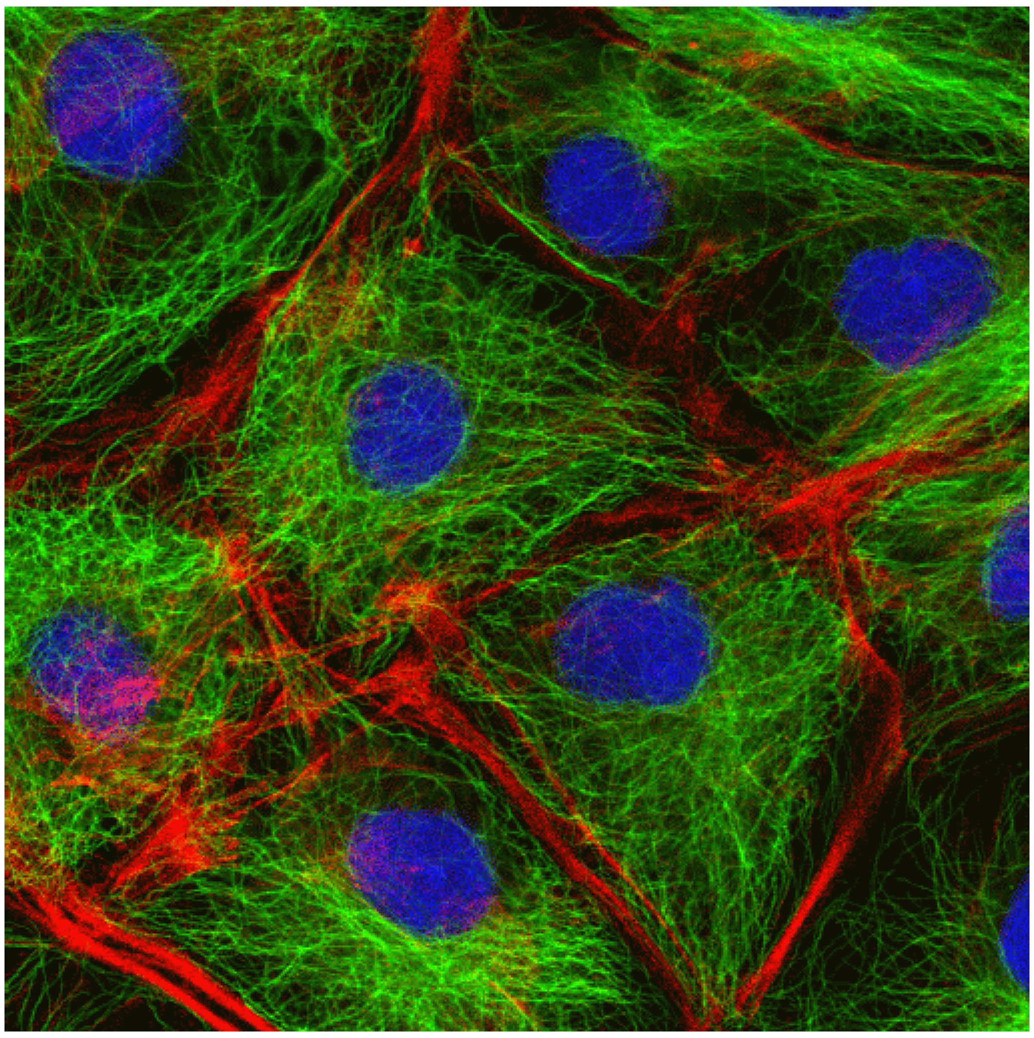

Fluorescence microscopy image of animal cells showing the nucleus (blue) and the cytoskeleton (green: microtubules, red: actin). [2]

The most prominent example for a network consisting of biopolymers is the cytoskeleton. It is a major constituent of biological cells, providing them with mechanical stability. At the same time, however, the cytoskeleton must have the ability to actively reorganize its structure to support complex tasks like cell migration or mitosis. These processes rely on the interplay of regulatory mechanisms and the material properties of the cytoskeleton. Thus, understanding the mechanical properties of single biopolymers and their networks is a prerequisite for understanding any of these biological processes.

A quantity that is often measured in rheological experiments on biopolymer networks is the shear modulus. A mean-field approach that allows the calculation of the elastic shear modulus of such networks, was introduced for example in [1]. But experiments show, that biopolymer networks are viscoelastic materials with a complex shear modulus depending crucially on the frequency of the applied (oscillating) strain. In this talk, I will present an extension of the elastic theory from [1] into a viscoelastic theory, which enables us to determine the complex shear modulus over the entire frequency range relevant for rheological measurements. In particular, I will highlight the impact of reversible crosslinks on the viscoelastic response.

References

[1] Claus Heussinger, Boris Schaefer, and Erwin Frey, Phys. Rev. E 76, 031906 (2007)
[2] Mark Shipman, James Blyth and Louise Cramer, Laboratory for Molecular Cell Biology, University College London, UK