cells in dead mice. To achieve high sensitivity in mice, however, a slice thickness of less than 250 um was necessary, which leads to whole-body scans with physiologically unacceptable duration (> 4h).

BP 32.44 Thu 17:15 Poster B1

Nonlinear Cell Mechanics Is Plastic Mechanics — Lars Wolff, •Andrea Kramer, and Klaus Kroy — Institut f. Theoretische Physik, Universität Leipzig

Recent investigations of the dynamical linear and nonlinear mechanical properties of single living cells have identified (at least) three major universal patterns of cell rheology: (i) power-law rheology, (ii) viscoelastic stiffening, and (iii) inelastic softening or "fluidization". We present a polymer-physics based minimal model that robustly reproduces all of these features and suggests their close mutual interdependence. In particular, the supposedly antagonistic effects of viscoelastic stiffening and fluidization are predicted to actually reinforce each other and the structural damping. The highly redundant nonlinear dynamical shear response of living cells is traced back to inanimate material properties shared by much simpler in vitro models of the cytoskeleton, notably by pure F-actin solutions, which has so far been experimentally validated only for (i) & (ii). According to the model, the core mechanism responsible for the mechanics of living cells and tissues is comprised by a small set of equations coupling semiflexible polymer dynamics as described by the glassy wormlike chain model with "bond"-kinetics in the highly degenerate free energy landscape of an "Arrhenius gel". The good quantitative agreement of model predictions for viscoelastic and inelastic protocols with experimental data from both in vitro model systems and living cells suggests intriguing new directions for future experiments aiming to relate microscopic structural parameters with the mechanical response.

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Mechanisms of Parasitic Cell Motility in Blood Flow and Possible Impact on Host Infection — •Sravanti Uppaluri[1], Eric Stellamanns[1], Niko Heddergott[2], Stephan Herminghaus[1], Markus Engstler[2], and Thomas Pfohl[1,3] — [1]Max Planck Institute for Dynamics and Self Organization, Göttingen — [2]Biocenter, University of Würzburg — [3]Chemistry Department, University of Basel

African trypanosomes, parasites responsible for devastating disease in sub-Saharan Africa, are found in the mammalian bloodstream and penetrate the central nervous system during late stages of African Sleeping Sickness. Trypanosomes are able to make their way past the tightly protected blood brain barrier despite significantly high blood flow velocities in vessels around the brain. We find that the parasite is able to swim closer to vessel walls with increasing blood flow velocities. Typical vessels have a cell free layer near the channel walls, we mimic this phenomenon using microfluidic techniques and investigate the trypanosome's ability to make turns at relatively high flow velocities and invade through confining gaps. Gradient based microfluidics is exploited to test if the turning frequency is enhanced by chemical attractants. Lastly, we find that cell orientation is velocity dependent. Together our results point to strong hydrodynamical effects on swimming behavior of trypanosomes which may play an important role in different stages of infection.

BP 32.46 Thu 17:15 Poster B1

Quantitative temperature analysis by micro-thermo capillaries for biological systems — •Michael Stührenberg[1], Rene Heimbuch[1], Miriam Giesguth[2], Karl-Josef Dietz[2], Simone Herth[1], and Günter Reiss[1] — [1]Fakultät für Physik, Universität Bielefeld — [2]Fakultät für Biologie, Universität Bielefeld

Thermocouples based on the Seebeck effect between two metals are widely used for various applications. However, these thermocouples usually consist of wires of hundreds of nanometer thickness measuring the temperature in large objects and voluminous bulk phases. In a new setup, the two metals for the thermocouple are sputtered onto a glass micro capillary with an outer diameter of about 450 nm leading to very small contact and measurement areas. These thermo capillaries can be used in a micro manipulation system to measure the temperature in small tissues, single cells, or other biological objects, e.g. leaf epidermis and trichomes. This poster reports the fabrication of micro-thermo capillaries and demonstrates its calibration and use for quantitative measurements.

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Local quantitative temperature measurements on silicon nitride membranes for biological applications — •Maksym Koch[1], Nadine Ewers[1], Carsten Budke[2], Britta Riechers[2], Thomas Koop[2], Simone Herth[1], and Günter Reiss[1] — [1]Fakultät für Physik, Universität Bielefeld — [2]Fakultät für Chemie, Universität Bielefeld

Thermocouples based on the Seebeck effect between two metals are widely used for various applications. However, these thermocouples usually consist of wires hundreds of nanometer thick measuring the temperature in large objects and voluminous bulk phases. In order to determine local temperatures, e.g., in single cells, thermocouples can be sputtered through special masks on top of a silicon nitride membrane. These membranes are only 50 or 100 nm thick and avoid extensive heat dissipation necessary for a quantitative analysis. Local quantitative temperature measurements were performed with Pd/Cr and Pd/NiCr with Seebeck coefficients of 27 uV/K and 35 uV/K, respectively, using various types of heating processes.

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Dynamics of cell shape on micropatterned substrates — •Jerome Soine[1], Achim Besser[1,2], and Ulrich Schwarz[1,3] — [1]Karlsruhe Institute of Technology, Theoretical Biophysics Group — [2]Harvard Medical School, MA, USA — [3]University of Heidelberg, Institute for Theoretical Physics

Free edges of adherent cells often adopt the shape of inward directed circular arcs. Combining experiments with cells on micropatterned substrates, quantitative image processing and modeling, recently it has been shown that the values for the arc radii can be explained by the interplay between tension in the cell envelope and elastic strain along the cell periphery (Bischofs et al., Biophysical Journal 95: 3488, 2008). Here we extend this model to predict the dynamics of shape changes on micropatterned substrates. The free edge of a cell between two adhesion sites is modeled as a actively contracting visco-elastic beam. Intrinsic isotropic surface tension pulls in the edge and leads to the circular arc shape. Inhibition of actin polymerization or myosin II motor activity leads to changes in arc radius which can be predicted by our model. Special focus is given to the effect of positive feedback loops involving signaling through the small Rho-GTPases.

BP 32.49 Thu 17:15 Poster B1

Cells on different substrates. An investigation with AFM and optical microsopy. — •Daniele Martini[1], Michael Beil[2], Othmar Marti[1], and Thomas Schimmel[3,4] — [1]Institute of exp. physics, Ulm University — [2]Institute of internal medicine I, Ulm University Hospital — [3]Forschungszentrum Karlsruhe — [4]Karlsruhe University

The main task of epithelial cells is to form a physical barrier, which is characterized by the properties of the cytoskeleton and cell-cell contacts. The principal aim of the first part of this project is to modulate the structure of these macromolecular complexes, optimizing the mechanical properties of the cells by a spatially hierarchically ordered and t-variable nanostructured culture substrate . Thus, at first, we have to investigate and control the growing and arrangement of these cells on different surfaces and, later, to define and influence the subcellular structure with chemically nanostructured culture substrates. In this poster we show AFM and optical microscopy experiments on adherent cells on different substrates. We discuss the influence of the substrate on cell morphology and on AFM images.