Inhibition of myosin II, which decreases traction forces, causes single cells to alter morphology, decrease their adherent area, and disassemble FA and actin stress fibers. In contrast, cells in contact with one another show no significant effect.
The spreading, shape and cytoskeletal morphology of single cells on soft HA-Fn substrates seems to be influenced by internal traction forces; however, this link between internal traction forces and cell spreading is eliminated when cells make cell-cell contact. These results suggest that traction forces within single cells on soft HA-Fn can be stimulated by HA as on stiffer PAA-Fn substrates which lead to similar cell spreading area and morphology response. Moreover, it is demonstrated that mechanical signaling is specific not only to substrate stiffness but also to substrate composition and cell state.

2438-Pos Board B457
Distinguishing Brownian Motion from Motor-Driven Transport within Organelle Trajectories by Bayesian Analysis
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Many organelles and vesicles move in an intermittent (start-stop) manner in live cells when observed by video microscopy. We propose that such vesicles travel in one of two states, a driven state in which they are being actively pulled along a cytoskeletal fiber by motor proteins, and a Brownian state in which they are detached from the fiber and obey the laws of diffusion in the cytoplasm. Using variational Bayesian analysis, we analyze the tracks of peroxisomes, lysosomes, and other organelles in PC12 and HME cells to reveal the probability that the vesicle is in the driven or the Brownian state at each time (frame). Instantaneous vesicle velocity and directional persistence are the input data for our hidden Markov, Gaussian mixture model Bayesian analysis. This analysis evaluates the most probable velocity as well the variance of the velocity of each state. It also determines the most probable times at which the state changes. Further analysis of the motions of the vesicles during the Brownian episodes may permit a cleaner assessment of the viscoelastic properties of cytoplasm. This research is supported by the National Science Foundation under Grant No. CMMI-1106105. AMS is supported by the NIGMS of the National Institutes of Health under award number T32GM095440.

2439-Pos Board B458
A Cell-Level Mechanobiological Model of Drosophila Dorsal Closure
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We report a model describing various stages of Drosophila dorsal closure. Inspired by experimental observations, we represent the amnioserosa by hexagonal cells that are coupled mechanically through the position of nodes and the elastic forces on the edges. Besides, each cell has radial spokes on which myosin motors can attach and exert contractile forces, the myosin dynamics itself being controlled by a signaling molecule. In the early phase, amnioserosa cells oscillate as a result of coupling among the chemical signaling, myosin activity and mechanical deformation of neighboring cells. Cross-correlation function of area variation of neighboring cells calculated based on our model predictions shows agreement with previous studies. In slow phase, we test two 'ratcheting mechanisms' suggested by experiments: an internal ratchet by the myosin condensates in the apical medial surface and an external one by the supracellular actin cables encircling the amnioserosa. Our model predictions suggest the former as the main contributor to cell and tissue reduction in this stage. In fast phase of dorsal closure, we gradually shrink the resting length of radial spokes to simulate the consistent tissue contraction.

2440-Pos Board B459
Role of Myosin II in Motility and in Force Generation of DRG Growth Cones
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Myosin II plays a vital role in many fundamental cellular and developmental processes such as cell-cell adhesion, cell migration and cytokinesis. Using immunocytochemistry, video imaging and optical tweezers we have determined myosin II function in motility and the force exerted by lamellipodia from growth cones (GCs) of isolated Dorsal Root Ganglia (DRG) neurons. In DRG GCs the concentration of NMIIA isoform of myosin II was approximately constant from the GC center to its leading edge while NMIIB isoform of myosin II was more confined in the central region of GCs. Video imaging shows that when the activity of myosin II was inhibited by Blebbistatin lamellipodia emerging from the soma and from GCs become ''filopodish'' with the clear appearance of structures reminiscent of filopodia. After treatment with 20μM Blebbistatin cycles of lamellipodia protrusion/retraction slowed down and lamellipodia did not lift up axially as in control conditions and lamellipodia motion was completely abolished by 50 μM Blebbistatin. Immunocytochemical analysis of filopodia emerging from GCs treated with Blebbistatin showed the presence of tubulin, in a proportion higher than in filopodia in control conditions. In the presence of 30 μM Blebbistatin lamellipodia exerted a force 30-50 % less than in control conditions, but surprisingly the force generated by filopodia, increased by 30-50 %. These results suggest that: i - Myosin II is an essential component of motility and force generation; ii - Myosin II plays a very important role in the orchestration of GC structural stability.

2441-Pos Board B460
Comparison of the Force Exerted by Hippocampal and Drg Growth Cones
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Using optical tweezers, we have compared the force exerted by lamellipodia and filopodia from developing growth cones of isolated hippocampal neurons and Dorsal Root Ganglia (DRG) neurons obtained from P1-P2 and P10-P12 rats. Lamellipodia of DRG neurons were usually larger than those from hippocampal neurons and the proportion of filopodia with microtubules in their interior was higher in hippocampal than in DRG neurons. Filopodia from hippocampal growth cones exerted a large force often in the order of 5 pN, while the force exerted by filopodia of DRG growth cones was in the order of 1-2 pN and never exceeded 5 pN. Lamellipodia of both hippocampal and DRG growth cones exerted lateral forces up to 20 pN, but lamellipodia from DRG neurons could exert a vertical force larger than lamellipodia from hippocampal neurons. Therefore, the lateral force exerted by lamellipodia from peripheral nervous system (PNS) and central nervous system (CNS) neurons at different developmental stages is broadly similar but hippocampal filopodia could exerted a force larger than that of DRG filopodia.

2442-Pos Board B461
Substrate Topography and Stiffness affect Cardiomyocyte Anchorage, Shortening and Shortening Velocity
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Substrate stiffness and topography that mimic healthy and unhealthy heart tissue were engineered for contractility and anchorage assessment of neonatal rat ventricular myocytes *in vitro*. Substrates were molded from PDMS with soft 10 kPa (normal) or rigid 1000 kPa (fibrotic) stiffness and either flat or topography with 15μm-high, 15μm-diameter posts, spaced 75μm apart. Data of living (line scans) and fixed (immunohistochemistry Z-stacks) cells was collected on a Zeiss 710 confocal microscope. Line scan data was analyzed with LSM Browser to determine cell shortening and shortening velocity; Z-stack images were analyzed with Volocity and MetaMorph to quantify distribution of the focal adhesion protein, paxillin and assess sarcomere remodeling. Shortening (displacement) was greater in the mid-region vs. the end of the cell, regardless of substrate topography or stiffness. Shortening in the mid-region was greater on rigid substrates, regardless of topography. Shortening velocity is fastest (~10μm/sec) on rigid post substrata and slowest (~5μm/sec) on soft substrates, regardless of topography. The majority of quantified paxillin was localized in the outer perimeter of the cell (over 50% on post and over 70% on flat substrates), regardless of stiffness. Paxillin was also localized on post topographies but in a smaller quantity (~30% on rigid and ~15% on soft substrates). This 3D-post environment, that permits paxillin distribution in the Z-axis, simultaneously reduces the cell surface area (x-y plane). The focal adhesion complex on the 3D post anchors and stabilizes deep layers of sarcomere formation, which extend to the cell perimeter. In conclusion, topography predominates in contractile shortening whereas the shortening velocity is more dependent on substrata stiffness. Thus, contractile dysfunction of cardiomyocytes in stiff diseased 3D tissue might affect velocity more than shortening. Funding: T32/HL07692, HL62426

2443-Pos Board B462
Sarcomere-Like Units Contract Cell Edges
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Extracellular matrix rigidity directs cell behavior and key processes in development and tumorigenesis. During spreading and migration, cells produce