**Physics** & **Astronomy**

Colloquium

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**Dr. Konstantin Doubrovinski**

Department of Biophysics

UT Southwestern Medical Center

**3:30 - 4:30 p.m. | Tuesday, Feb. 11**

**Science Building 234**

Broadly, my work focuses on mechanical aspects of animal development. During embryonic development, a metazoan embryo undergoes a concerted sequence of shape changes that culminates in the final shape of the organism. At this stage, organs and tissues have assumed shapes and sizes that are required for their specific functions. How this shape is established and maintained is a fundamental question in biology. Despite a long-standing effort in trying to determine physical mechanisms that underlie morphogenesis, these mechanisms remain largely elusive. I tackle this problem from a systems standpoint. In particular, basic considerations from continuum mechanics suggest that in order to determine the mechanism of a shape change (in a living system or otherwise), it is necessary to know both the forces that drive the deformation as well as the material properties of the object that is being deformed. Currently, the methods to directly measure these physical properties in living tissues are largely lacking. My work is devoted to establishing experimental and theoretical methods that allow the determination of material properties and active forces responsible for tissue dynamics. In particular, my lab seeks to exploit a broad repertoire of experimental approaches such as e.g. optogenetics, laser ablations and molecular tools to assess and perturb active stresses in developing tissues; rheological methods and microscopy for measuring tissue properties; and modeling to comprehensively integrate and interpret the data. Together, the

combination of our approaches has already provided a comprehensive physical model of early *Drosophila* development. We anticipate that extending our approach to other systems will provide a mechanistic insight into animal morphogenesis more broadly.

**Refreshments at 3 p.m. | SC 103**