Abstract Submitted
for the SES13 Meeting of
The American Physical Society

Finite Element Modeling of Heat Shock-Induced Mechanical Failure in Drosophila Amnioserosa W. TYLER MCCLEERY, SARAH M. CREWS, DAVID N. MASHBURN, Vanderbilt University, JIM VELDHUIS, G. WAYNE BRODLAND, University of Waterloo, M. SHANE HUTSON, Vanderbilt University, HUTSON/BRODLAND COLLABORATION — Embryonic development is a complex process that is both regulated genetically and constrained mechanically. Normal development can be disturbed by environmental perturbations, leading to a range of developmental defects. For example, application of heat shock to fruit fly (*Drosophila melanogaster*) embryos leads to the much later opening of holes in the dorsal region of a specific epithelial tissue, the amnioserosa. Embryos exhibiting such holes fail to appropriately complete subsequent developmental processes like germ band retraction and dorsal closure. We hypothesize that holes appear in the dorsal amnioserosa, as opposed to other epithelial tissues, due to the localized concentration of tensile stress. To test this hypothesis, we are developing cell-level finite element models of early Drosophila embryos to analyze the morphogenetic stress fields. We will also use these models to test whether holes in the amnioserosa are sufficient to cause subsequent failures in germ band retraction.

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Date submitted: 20 Sep 2013 Electronic form version 1.4