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Upregulation of Tissue Dynamics in Response to UV Laser Perturbations XOMALIN G. PERALTA, Y. TOYAMA, Department of Physics, S. VENAKIDES, Department of Mathematics, D. P. KIEHART, Department of Biology, G. S. EDWARDS, Department of Physics, Duke University — We investigate tissue dynamics *in vivo* using a steerable UV-laser microbeam coupled to a scanning laser confocal microscope. We follow a stage in the morphogenesis of the fruit fly known as dorsal closure, which largely occurs in 2D. Dorsal closure is a consequence of four biological processes that are coordinated in space and are synchronized in time. During dorsal closure, two advancing flanks of epidermal tissue demarcate an eye-shaped opening on the dorsal side of the embryo, exposing the underlying amnioserosa tissue. As closure progresses, the two flanks of epidermal tissue approach each other and, via an adhesion mediated process, "zip" to form seams at the two canthi, i.e. the corners of the opening. In our studies, we target the microbeam to selectively remove specific tissues and track the resulting dynamics. We account for the results with a quantitative model. When we inhibit zipping by repeatedly targeting the microbeam to one canthus, we find evidence for an increase in the zipping rate of the seam at the other, unperturbed canthus. The upregulation occurs in a region remote from the tissue targeted by the microbeam and involves many cells. This upregulation of zipping is an example of a compensatory mechanism that ensures successful closure and highlights the resiliency of dorsal closure to perturbations. Supported by the NIH (GM33830 and GM61240).

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