

FEMTOSECOND LASER PULSE-INDUCED ABLATION COMBINED WITH NONLINEAR MICROSCOPY TO STUDY EMBRYO MORPHOGENESIS

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An embryo is shaped by a complex choreography of cell movements that are highly regulated both in time and space. We have recently pointed out the influence of mechanical factors in the control of embryo morphogenesis [1,2]. Investigating these dynamical processes is technically challenging and requires novel *in vivo* experimental approaches. In this context, the combination of femtosecond laser pulse-induced ablation with nonlinear microscopies appears as a powerful tool for modulating, visualizing and quantifying morphogenetic movements in *Drosophila* embryos [3]. First, we show that femtosecond pulse-induced ablation makes it possible to perform 3D-confined micro-dissections within developing embryos. Such localized ablations can be used for disrupting the structural integrity of tissues inside embryos and subsequently modulating specific morphogenetic movements. Then, the same laser source can be used to quantitatively analyze native and disrupted morphogenetic movements *in vivo* in GFP-labeled embryos using two-photon (2PEF) microscopy. Furthermore, this approach can be extended to unlabelled embryo using third harmonic generation (THG) microscopy [4].

This all-optical methodology brings novel insight into the issue of mechanical regulation of morphogenesis by providing a correlation of cell movements with the pattern of gene expression. More generally, it should lend itself to a wealth of additional applications in developmental biology.

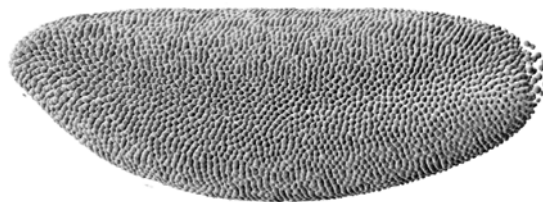


Figure 1: 3D distribution of GFP-labeled nuclei at early developmental stage of *Drosophila* embryo (2PEF microscopy)

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