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Supplementary Materials for

Imaging Morphogenesis: Technological Advances and Biological Insights

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Published 7 June 2013, *Science* **340**, 1234168 (2013)
DOI: 10.1126/science.1234168

This PDF file includes:

Captions for movies S1 to S16
References (50, 51)

Other Supplementary Material for this manuscript includes the following:
(available at www.sciencemag.org/content/340/6137/1234168/suppl/DC1)

Movies S1 to S16

Movie S1. Imaging mesoderm spreading in the *Drosophila* embryo with point-scanning two-photon microscopy. Dorsal (part 1) and posterior (part 2) views of a H2A-GFP expressing embryo are shown. This movie was published previously (1). [Credit: McMahon *et al.* 2008 (1)]

Movie S2. Multiview imaging of zebrafish embryonic development with digital scanned laser light-sheet microscopy (DSLM). The H2B-eGFP mRNA injected zebrafish embryo was imaged from the 64-cell stage for 25 hours in intervals of 90 s (453,620 high-resolution images, 3.5 TB). This movie was published previously (2). [Credit: Keller *et al.* 2008 (2)]

Movie S3. Third-harmonic generation (THG) imaging of the early zebrafish embryo. THG imaging (1200 nm excitation wavelength) started in the one-cell stage. A sagittal thick slice is displayed. Scale bar: 100 μ m. This movie was published previously (50). [Credit: Olivier *et al.* 2010 (50)]

Movie S4. Imaging *Drosophila* embryogenesis with two-photon light-sheet microscopy (2p-SPIM). 3D-rendered views of a fly embryo with GFP-labeled nuclei are shown over a period of 18 hours. Scale bar: 100 μ m. This movie was published previously (24). [Credit: Truong *et al.* 2011 (24)]

Movie S5. Imaging a stage 16 *Drosophila* embryo with simultaneous multiview two-photon light-sheet microscopy (2p-SiMView). The volume of a nuclei-labeled *Drosophila* embryo is shown slice by slice. This movie was published previously (25). [Credit: Tomer *et al.* 2012 (25)]

Movie S6. Imaging *Drosophila* embryogenesis with simultaneous multiview light-sheet microscopy (SiMView). The fly embryo with GFP-labeled nuclei was imaged for 17 hours in intervals of 30 s (1,066,520 high-resolution images, 11 TB). This movie was published previously (25). [Credit: Tomer *et al.* 2012 (25)]

Movie S7. Imaging *C. elegans* embryogenesis with spinning-disk confocal microscopy. An embryo of the BV24 GFP-histone strain was imaged at 1 volume/min. This movie was published previously (3). [Credit: Wu *et al.* 2011 (3)]

Movie S8. Imaging *C. elegans* embryogenesis with inverted selective plane illumination microscopy (iSPIM). An embryo of the BV24 GFP-histone strain was imaged at 30 volumes/min from the two-cell stage until hatching. This movie was published previously (3). [Credit: Wu *et al.* 2011 (3)]

Movie S9. Imaging epithelium morphogenesis in the *Drosophila* dorsal thorax with spinning disk confocal microscopy. Dorsal thorax tissue expressing E-Cad:GFP was imaged between 11 and 35 hAPF in 5 min intervals. The positions of macrochaetae and midline are indicated by white circles and by a black dotted line, respectively. This movie was published previously (36). [Credit: Bosveld *et al.* 2012 (36)]

Movie S10. Imaging early *C. elegans* embryogenesis with Bessel beam super-resolution structured plane illumination microscopy (SR-SIM). Membrane dynamics during early embryonic development (part 1) and relationship between membrane morphology and myosin expression (part 2) are shown. This movie was published previously (22). [Credit: Gao *et al.* 2012 (22)]

Movie S11. Imaging zebrafish epiboly with confocal fluorescence microscopy. *Tg(actb1:GFP-utrCH)* labeling F-Actin was imaged throughout the course of epiboly (40 to 90% epiboly). Left: Lateral view. Right: Orthogonal view. Scale bar: 100 μm . This movie was published previously (37). [Credit: Behrndt *et al.* 2012 (37)]

Movie S12. Imaging actomyosin flows in zebrafish epiboly with spinning-disk confocal fluorescence microscopy. *Tg(actb1:myl12.1-eGFP)* labeling Myosin-2 (left), injected with lifeact-RFP mRNA labeling F-Actin (middle), was imaged at 60 to 70% epiboly. Right: Dual-color merge. White rectangle indicates region of magnified view (bottom). Scale bars: 10 μm . This movie was published previously (37). [Credit: Behrndt *et al.* 2012 (37)]

Movie S13. Imaging neural tube closure in the mouse embryo with confocal fluorescence microscopy. Movie shows dorsal side of a 13-somite wild-type embryo expressing Ven^{Myr} highlighting cell membranes. Scale bar: 100 μm . This movie was published previously (51). [Credit: Massarwa and Niswander 2013 (51)]

Movie S14. Imaging the dynamics of adherens junctions during *Drosophila* dorsal fold formation with point-scanning two-photon microscopy. An optical mid-sagittal section of the

dorsal epithelium expressing E-Cadherin-GFP was imaged every 5 s from late cellularization to early gastrulation. This movie was published previously (39). [Credit: Wang *et al.* 2012 (39)]

Movie S15. Imaging mouse development with confocal fluorescence microscopy. Time-lapse movie shows rosettes forming in the visceral endoderm during anterior visceral endoderm (AVE) migration. AVE cells are marked by Hex-GFP fluorescence (green). DIC images were acquired with the confocal's transmitted light PMT. Scale bar: 50 μm . This movie was published previously (42). [Credit: Trichas *et al.* 2012 (42)]

Movie S16. Reconstructing zebrafish embryonic development from DSLM image data. Orthographic rendering of the computational reconstruction of the data set shown in movie S2. Color-code indicates movement speed of each nucleus (cyan to orange: 0 to 1.2 $\mu\text{m}/\text{min}$). This movie was published previously (2). [Credit: Keller *et al.* 2008 (2)]

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