NATURE | NEWS

Fly larvae brains filmed in action

Videos of neural activity in fruit-fly larva's brain and central nervous system mark a step up from zebrafish imaging.

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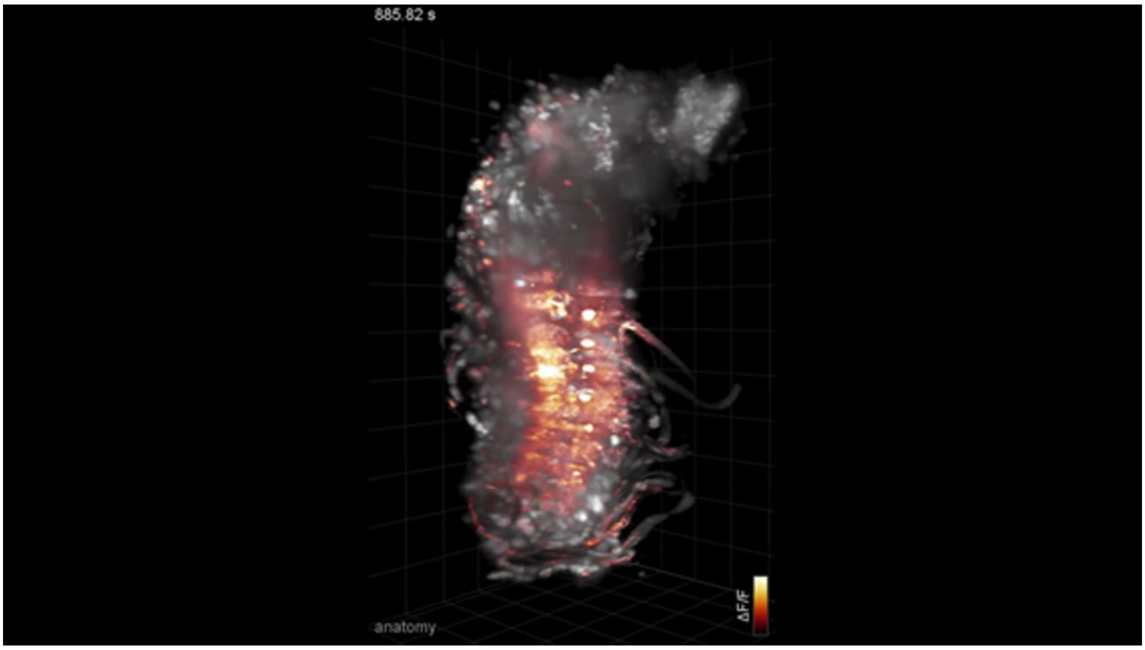


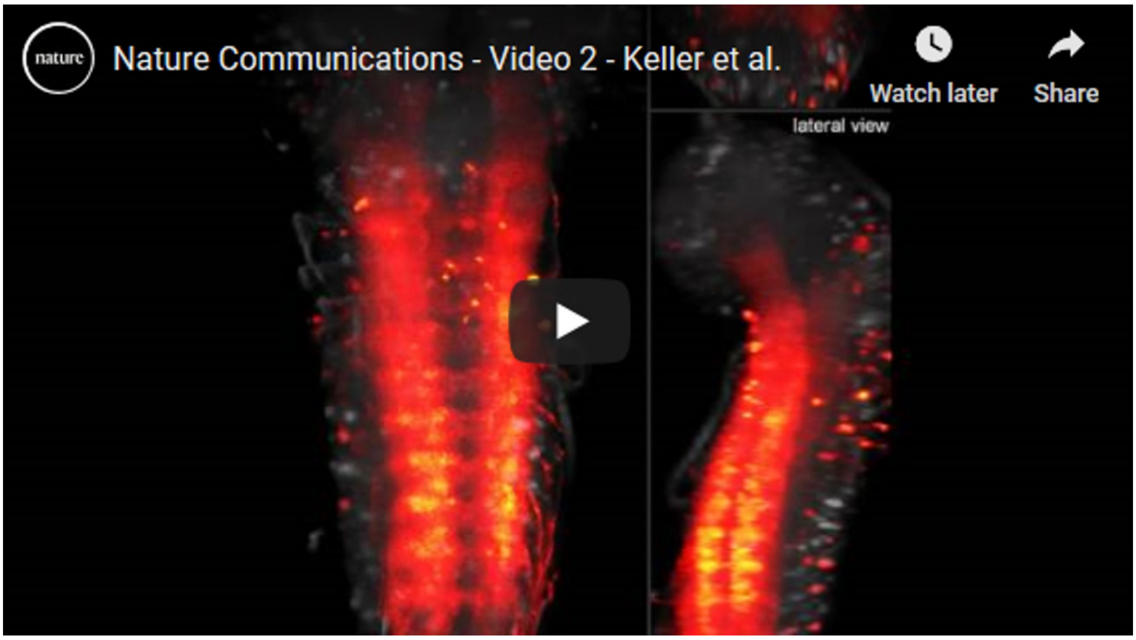
This is the crackle of neural activity that allows a fruit-fly (*Drosophila melanogaster*) larva to crawl backwards: a flash in the brain and a surge that undulates through the nervous system from the top of the larva's tiny body to the bottom. When the larva moves forwards, the surge flows the other way.

The video — captured almost at the resolution of single neurons — demonstrates the latest development in a technique to film neural activity throughout an entire organism. The original method was invented by Philipp Keller and Misha Ahrens at the Howard Hughes Medical Institute's Janelia Research Campus in Ashburn, Virginia. The researchers genetically modify neurons so that each cell fluoresces when it fires; they then use innovative microscopy that involves firing sheets of light into the brain to record that activity.

In 2013, the researchers produced a video of neural activity across the brain of a (transparent) zebrafish larva[1]. The fruit-fly larva that is mapped in the latest film, published in *Nature Communications* on 11 August[2], is more complicated. The video shows neural activity not just in the brain, but throughout the entire central nervous system (CNS), including the fruit-fly equivalent of a mammalian spinal cord. And unlike the zebrafish, the fruit fly's nervous system is not completely transparent, which makes it harder to image.

The researchers stripped the CNS from the larva's body to examine it. For up to an hour after removal, the CNS continues to spontaneously fire the coordinated patterns of activity that typically drive crawling (and other behaviours). To see the fluorescent wave of neurons firing, the researchers modified their microscope to view the specimen from two sides simultaneously; this allowed them to reconstruct most of the neural activity by combining weaker signals.

In order to produce the film, Keller says, the researchers had to increase their imaging rate 25-fold from their earlier work, and they used improvements in computing to process and analyse the terabytes of information from each experiment. Next up, the researchers are working on imaging mouse embryos.



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Corrections

Corrected: The headline of this article has been changed to make clear that the brains of fly larvae - rather than flies - were filmed in action.

References

1. Ahrens, M. *et al*. *Nature Meth.* **10**, 413–420 (2013).
2. Lemon, W. C. *et al*. *Nature Commun.* http://dx.doi.org/10.1038/ncomms8924 (2015).