Every Neuron in a Brain Recorded in 3D on a Millisecond Timescale (http://gizmodo.com/every-neuron-in-a-brain-recorded-in-3d-on-a-millisecond-1578578049)

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To learn how the whole brain works, it doesn't do to just record from one neuron—you want to know what every single neuron is doing every millisecond. Now scientists have invented a technique that can actually capture the 3D activity of an entire brain milliseconds at the time—possibly the most complete picture of brain activity we've ever had.

This new technique has been tried in the brains of larval zebrafish and the nematode C. elegans, both animals with transparent heads that are common in neuroscience labs. Scientists already use specially engineered proteins that fluorescence when calcium rushes into a neuron as it fires. These momentarily flashes are how we record the neuronal activity.

But recording these flashes on a millisecond scale, over an entire brain, and in three dimensions presents a whole different challenge. To solve this, the team used a technology called light-field imaging for the first time in recording brain activity. In light-field imaging, the angles of incoming rays of light are measured to generate 3D images. The team built a novel light-field microscope that could create their 3D neural activity movies, as MIT's news office (http://science.mit.edu/news/illuminating-neuron-activity-3-d) explains:

> With this kind of microscope, the light emitted by the sample being imaged is sent through an array of lenses that refracts the light in different directions. Each point of the sample generates about 400 different points of light, which can then be recombined using a computer algorithm to recreate the 3-D structure.

The research team has even bigger hopes for their technique—improving the resolution to capture the activity in parts of a neuron instead of whole neurons and combining it with optogenetics (http://gizmodo.com/tag/optogenetics). Developing new techniques is all the rage in neuroscience these days, and we'll certainly need them to understand more complex brains like our own. [Nature Communications (http://dx.doi.org/10.1038/nmeth.2964) via MIT (http://science.mit.edu/news/illuminating-neuron-activity-3-d)]

2 ★ 12 Reply

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TimF101 (http://timf101.kinja.com) ▸ Sarah Zhang
5/19/14 4:56pm (http://gizmodo.com/hah-a-lytro-microscope-i-was-just-looking-at-light-1578672497)
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Hah! A Lytro microscope. I was just looking at light sheet scopes like the Zeiss Z.1; if this ever gets commercialized it would be worth checking out.

3 ★ Reply

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