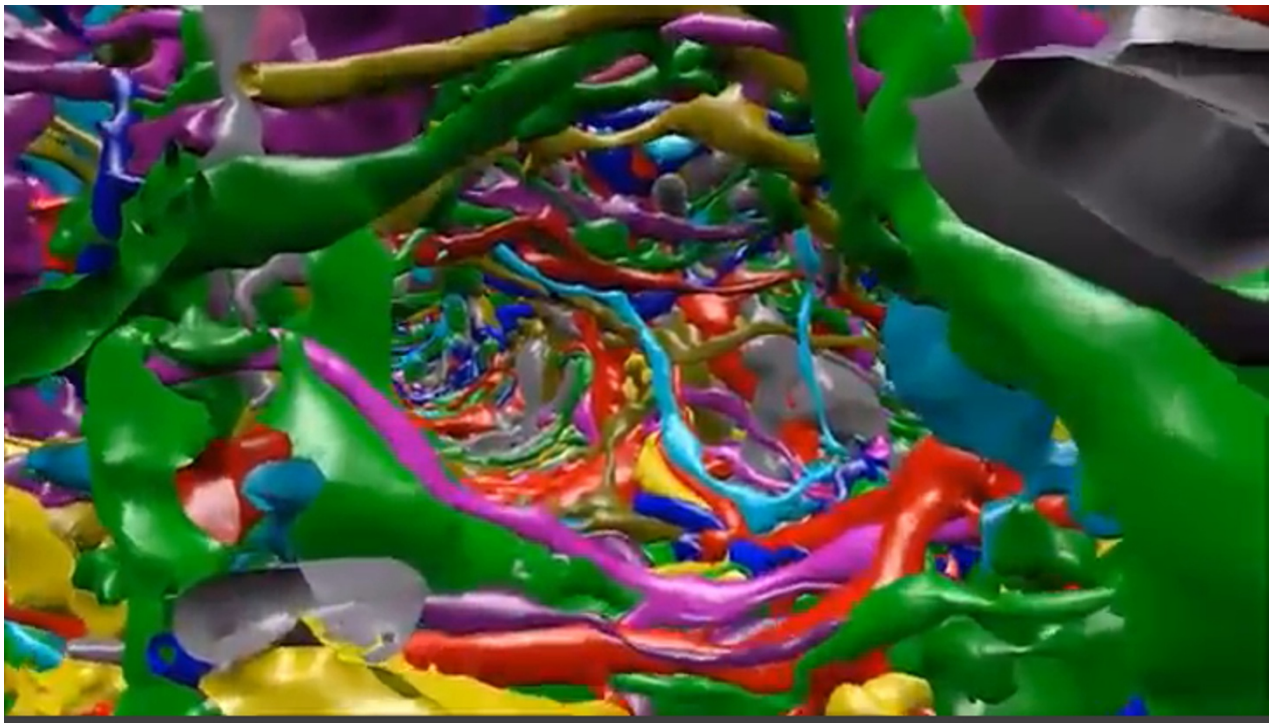
Visual neurons mapped in action

Researchers detail structure and workings of mouse and fruit fly retinal circuits.

Richard Johnston

07 August 2013



Retina connectomes

Nature Video explores the visual circuitry of a mouse and fruitfly.

Scientists have mapped the dense interconnections and neuronal activity of mouse and fruitfly visual networks. The research teams, whose work is published in three separate studies today in *Nature*[1–3], also created three-dimensional (3D) reconstructions, shown in the video above.

All three studies interrogate parts of the central nervous system located in the eyes. In one, Moritz Helmstaedter, a neurobiologist at the Max Planck Institute of Neurobiology in Martinsried, Germany, and his collaborators created a complete 3D map of a 950-cell section of a mouse retina, including the interconnections among those neuronal cells. To do so, the team tapped into the help of more than 200 students, who collectively spent more than 20,000 hours processing the images[1].

The two other studies investigated how the retinas of the fruitfly (*Drosophila melanogaster*) detect motion. Shin-ya Takemura, a neuroscientist at the Howard Hughes Medical Institute in Ashburn, Virginia, and his collaborators mapped four neuronal circuits associated with motion perception and found that each is wired for detecting motion in a particular direction — up, down, left or right[2].

In the third study, Matthew Maisak, a computational biologist at the Max Planck Institute of Neurobiology, and his colleagues mapped the same four cellular networks and tagged the cells of each with protein markers that fluoresce in red, green, blue or yellow in response to stimulation with light[3].

Although the three studies looked at tiny bits of neuronal networks in animal retinas, researchers hope that by improving the techniques they will be able some day to map the full sets of connections, or 'connectomes', of entire brains — including human ones.

Nature | doi:10.1038/nature.2013.13520

References

1. Helmstaedter, M. *et al*. *Nature* **500**, 168–174 (2013).

2. Takemura, S. *et al*. *Nature* **500**, 175–181 (2013).

3. Maisak, M. S. *et al*. *Nature* **500**, 212–216 (2013).