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Winner 2017
Tom Baden
United Kingdom

Tom Baden, Eppendorf Young Investigator 2017

»I am humbled and delighted by this award, which recognises a long-standing team effort that involved the hard work of several talented colleagues, most notably Katrin Franke, Philipp Berens and Thomas Euler.

We are excited to provide a functional roadmap of how light entering the eye and impinging on millions of photoreceptor neurons ultimately results in a highly processed and parallelised representation of the visual world to be sent to the brain.«

Tom Baden

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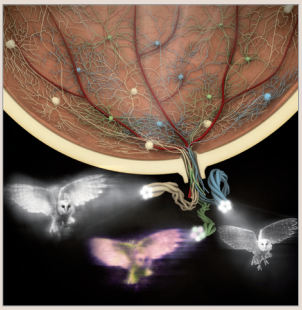
Award-Winning Research



An artist's impression of the retina's output nerve cells as they collect visual information from across the retina and send parallel representations of the viewed scene to the brain.
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The retina is our window to the world, but only ~1% of the information that hits the photoreceptors is transmitted to the brain. This 1% is sent via the axons of retinal ganglion cells which collectively form the optic nerve. How many types of ganglion cells there are, and what they all do, has been a major focus of vision science for decades. For mouse, previous studies reported between 10-20 types, suggesting an equal number of representations available to the brain to form the mouse's sense of vision. To tackle this question a new, we tried an optical approach. The cell bodies of ganglion cells form a mono-layer on the retinal surface, which each type arranged in a neat mosaic. Accordingly, reliably sampling the function of each cell in a sufficiently large area of retina would yield a dataset that included at least one member of each type. We loaded cells with a calcium biosensor and monitored their visual responses to a battery of stimuli under a 2-photon microscope. We then clustered the results and verified clusters based on anatomical and genetic markers. This revealed minimum of 32 retinal ganglion cells in the mouse, and perhaps as many as 50. Next, we adjusted our protocols to also survey other retinal cell types, including photoreceptors and bipolar cells. Here, sampling from bipolar cells in addition allowed us to infer the functional contribution of amacrine cells, the retina's most numerous class of inhibitory neuron. Taken together, we present a broad functional survey of the majority of retinal neurons of the mouse. In the future, we will use this information to study how function emerges in the inner retina, how this relates to the mouse's visual ecology, and how these processes compare with those of other species.

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