Comprehensive analysis of the central projections of melanopsin-expressing ganglion cells in mice

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Adaptation of behavior and physiology to the ambient light is crucial to life. Most animals have photoreceptor systems to detect ambient irradiance level and adjust their behavior and physiology accordingly. In mammals, the melanopsin expressing retinal ganglion cells (mRGCs) serve both as photoreceptors and principal conduit for light signal transduction to several brain regions.

Identifying the full complement of mRGCs and their central projection is critical to understanding the cellular basis of melanopsin function. We have used Cre-dependent system to differentially mark the mRGCs of each retina, monitor their development, and trace their central projections in the mouse. mRGCs from each retina follow a specific spatial route within the optic track. They extensively branch and innervate their target brain regions. The overall projections and morphometry of the mRGCs are independent of melanopsin expression.