Light reception in rodent retinal ganglion cells and its role in the clockwork

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The melanopsin expressing retinal ganglion cells (mRGCs) constitute a photoreceptive meshwork in the rodent retina. They receive synaptic inputs from the rod/cone photoreceptors and constitute the principal conduit for transduction of light information to the master circadian oscillator resident in the hypothalamic suprachiasmatic nucleus and they also transmit light information to several other brain regions. The axons of the mRGCs maintain lateral segregation and traverse a precise spatial route to their targets with ipsi- and contra- lateral projections confined to specific portion of the optic tract. The axons extensively branch and innervate several regions of the hypothalamus, thalamus and the pretectum. In the hypothalamus, the mRGCs extensively innervate the SCN. The overall projection and function of the mRGCs are independent of melanopsin expression. In melanopsin deficient mice, acute expression of melanopsin in the retina restores normal circadian photosensitivity.