

Readings in Neuroinformatics

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Enroth-Cugell, Christina & John G Robson. 1966. The contrast sensitivity of retinal ganglion cells of the cat. *The Journal of physiology* 187(3). 517–552.

Abstract

Retinal ganglion cells have been found to be involved in contrast discrimination by spatial summation of their functionally distinct central and peripheral receptive field regions. The influence of inhibitory retinal interactions cannot be determined with the techniques from previous animal retina examinations when applied to the human visual system. To fill this gap, we applied a recently introduced technique with grating patterns of luminance varying sinusoidally about its mean level along the axis perpendicular to the bars, to measure cat retinal ganglion cell responses. In a stereotaxic surgery setting under light anesthesia, electrodes were entered into the optic tract. The mean frequency of the nerve discharges during a stimulus was determined using an electronic counter. From response patterns to stationary stimuli, two types of cells could be distinguished: Where summation over the receptive fields of X-cells was found to be approximately linear, it clearly wasn't for Y-cells. According to those types, further measurements with moving stimuli were conducted. Y-cells showed a great increase in their mean discharge frequency for the drifting patterns. The response of the X-cells showed that the contrast sensitivity function can be satisfactorily described by the difference of two Gaussian functions of the distance from the field centre. Further measurements applying reduced retinal illumination suggest that under this condition, the diameters of the summing receptive field regions increased while the surround region became relatively ineffective. Our results can be used to refine the understanding of human vision by comparison to results from past and future psychophysical experiments.

250 words.