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Transformation of stimulus correlations by the retina JASON PRENTICE, Princeton University, KRISTINA SIMMONS, University of Pennsylvania, GASPER TKACIK, IST Austria, JAN HOMANN, University of Pennsylvania, HEATHER YEE, STEPHANIE PALMER, University of Chicago, PHILLIP NELSON, VIJAY BALASUBRAMANIAN, University of Pennsylvania — Correlations in the responses of sensory neurons seem to waste neural resources, but can carry cues about structured stimuli and help the brain correct for response errors. To assess how the retina negotiates this tradeoff, we measured simultaneous responses from many retinal ganglion cells presented with natural and artificial stimuli that varied in correlation structure. Responding to spatio-temporally structured stimuli such as natural movies, pairs of ganglion cells were more correlated than in response to white noise checkerboards, but were much less correlated than predicted by a non-adapting functional model of retinal response. Meanwhile, responding to stimuli with purely spatial correlations, pairs of ganglion cells showed increased correlations consistent with a static, non-adapting receptive field and nonlinearity. We found that in response to spatio- temporally correlated stimuli, ganglion cells had faster temporal kernels and tended to have stronger surrounds. These properties of individual cells, along with gain changes that opposed changes in effective contrast at the ganglion cell input, largely explained the pattern of correlations across stimuli.

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