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Adaptive processing of natural signals in the fly peripheral visual system LIMING ZHOU, Indiana University Dept. of Physics, ROB DE RUYTER VAN STEVENINCK, Indiana University Bloomington Dept. of Physics — For modest light intensity variations, fly photoreceptors and their postsynaptic targets, the Large Monopolar Cells (LMCs) behave approximately linearly. In this linear and stationary regime, signal transmission is described by a combination of impulse response and noise autocorrelation function. But natural visual signals often show fast and large intensity variations, and cells adapt to cope with such strong variations. As a result, responses to small contrast perturbations are still linear, but the system is no longer stationary. We study signal transfer under these conditions by measuring responses to small pseudorandom contrast perturbations that ride on large cyclically repeated intensity fluctuations. Those measurements allow us to describe signal transmission by matrices representing nonstationary analogs of the impulse response and the noise autocorrelation function. This description makes it possible to quantify information transmission as the system is continuously adapting to large intensity fluctuations, and to study trade off in adaptation and reliable information transmission in a natural context.

Liming Zhou
Indiana University Dept. of Physics

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