



Octopamine affects the timing of retinal responses in *Limulus* as well as their amplitudes

G. S. Wasserman*, A. R. Bolbecker, J. Li and C. C. M. Lim-Kessler

Sensory Coding Laboratory, Department of Psychological Sciences, Purdue University, Lafayette, IN, USA

*Correspondence: codelab@purdue.edu

A commentary on

Octopaminergic modulation of temporal frequency coding in an identified optic flow-processing interneuron

by Longden, K. D., and Krapp, H. G. (2010). *Front. Syst. Neurosci.* 4:153. doi: 10.3389/fnsys.2010.00153

This magisterial article is concerned with the effects of octopamine modulation on the *quantity* of activity that occurs in a variety of well-studied model nervous systems. It particularly notes the effects of such neuromodulation on the *magnitude* of the responses found in the visual system of *Limulus*, the horseshoe crab.

We here wish to note that such neuromodulation also affects the *latencies* and *timing* of neural responses in this same crab's visual system. Specifically, we (Lim et al., 2008) found that octopamine delays

and prolongs the intracellular receptor potentials (RPs) recorded from excised *Limulus* photoreceptors while substance P accelerates such RPs. Further electroretinographic studies in intact crabs (Bolbecker et al., 2009) confirmed that such alterations in RP latencies are fully natural effects of these neuromodulators because they can also be produced by physiologic efference that varies with time-of-day.

Finally, we note that such effects have properties that make efferent neuromodulation a candidate for the mediation of human visual attention (cf. Wasserman et al., 2011). If that candidacy is confirmed, new methods of diagnosing and treating attention disorders will become feasible.

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