From: **PLOS Computational Biology** em@editorialmanager.com
Subject: Reminder: Reminder: Invitation to review PCOMPBIOL-D-22-00311R1 for PLOS Computational Biology - [EMID:0e9393be001271e2]
Date: 12 December 2022 at 01:22
To: Alexander Bates alexander_bates@hms.harvard.edu

Dear Dr Bates,

We would be very grateful if you could let us know whether you can review The Functional Logic of Odor Information Processing in the Drosophila Antennal Lobe" (PCOMPBIOL-D-22-00311R1) by Dr. Aurel A. Lazar and colleagues for PLOS Computational Biology.

In the interest of returning timely decisions to the authors, please contact us as soon as possible via reply e-mail. We very much hope that you will be able to advise us on this manuscript. Ideally we would like to receive your report within 10 days of receiving the paper, but please let us know if an extension of this time, within reason, would allow you to help us with this review.

If you have any questions, you can see our reviewer guidelines here: https://journals.plos.org/ploscompbiol/s/reviewer-guidelines

If you have any conflicts of interest that preclude an objective evaluation (see our policy here: https://journals.plos.org/ploscompbiol/s/competing-interests) or are otherwise unable to review this manuscript at this time, we would be grateful for suggestions of other potential reviewers who would be qualified to assess this manuscript.

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Please don't hesitate to contact us if you have any questions or if we can be of any assistance.

Kind regards,

PLOS Computational Biology Staff
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Manuscript Title:
The Functional Logic of Odor Information Processing in the Drosophila Antennal Lobe
Article Type:
Research Article
Authors:
Aurel A. Lazar; Tingkai Liu; Chung-Heng Yeh
Abstract:
Recent advances in molecular transduction of odorants in the Olfactory Sensory Neurons (OSNs) of the Drosophila Antenna have shown that the odorant object identity is multiplicatively coupled with the odorant concentration waveform. The resulting combinatorial neural code is a confounding representation of odorant semantic information (identity) and syntactic information (concentration). To distill the functional logic of odor information processing in the Antennal Lobe (AL) a number of challenges need to be addressed including 1) how is the odorant semantic information decoupled from the syntactic information at the level of the AL, 2) how are these two information streams processed by the diverse AL Local Neurons (LNs) and 3) what is the end-to-end functional logic of the AL?
By analyzing single-channel physiology recordings at the output of the AL, we found that the Projection Neuron responses can be decomposed into a concentration-invariant component, and two transient components boosting the positive/negative concentration contrast that indicate odorant onset/offset. We hypothesized that the concentration-invariant component, in the multi-channel context, is the recovered odorant identity vector.
We developed a model of LN pathways in the Antennal Lobe termed the differential Divisive Normalization Processors (DNPs), which robustly extract odorant identity (semantic information) and ON/OFF odorant event-timing (syntactic information). For real-time processing with spiking PN models, we showed that the PN neuron model phase-space offers an intuit perspective for the representations of recovered odorant semantics and computed odorant syntactics. Finally, we provide theoretical and computational evidence for the robustness of the functional logic of the AL as an ON-OFF odorant object identity recovery processor across odorant identities, concentration amplitudes and waveform profiles.