Towards an Algorithm of Cerebellar Control of Movement

September 16

Tuesday, 12:30 pm

Billings Building—Rosedale Room

SPEAKER:

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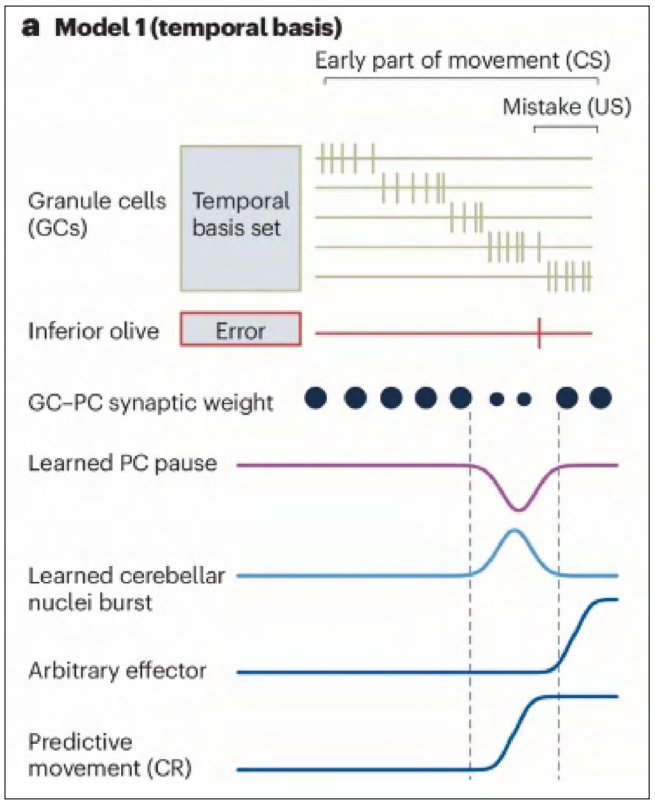
Abstract

What does the cerebellum do? Here I will discuss my lab's work identifying computations that achieve anticipatory and rapid feedback control of reaching movements through learning. Our experiments use electrophysiology, optogenetics and quantitative kinematics in mice to dissect a layer-by-layer algorithm that enhances movement precision. We have discovered signatures of predictive motor commands in cerebellar output neurons and evidence that such signals are under plastic control by upstream cerebellar circuits that reweight inputs associated with errors. We propose that these computations explain specific deficits that emerge with cerebellar damage, namely dysmetria, and that the cerebellum overcomes inherent instability of sensory delays by computing predictive control policies. This idea can be extended beyond the motor domain to accommodate hypotheses about cerebellar involvement in cognition and social behaviors.



Publications

1. Cerebellar circuit computations for predictive motor control. Nguyen KP, Person AL. Nat Rev Neurosci. 2025 Jun 16. doi: 10.1038/s41583-025-00936-z. Online ahead of print. PMID: 40523942

2. Cerebellar associative learning underlies skilled reach adaptation.Calame DJ, Becker MI, Person AL. Nat Neurosci. 2023 Jun;26(6): 1068-1079. doi: 10.1038/s41593-023-01347-y. Epub 2023 May 29. PMID: 37248339

3. Cerebellar Control of Reach Kinematics for Endpoint Precision Becker MI, Person AL. Neuron. 2019 Jul 17;103(2):335-348.e5. doi: 10.1016/j.neuron.2019.05.007. Epub 2019 Jun 4. PMID: 31174960