

From Neurons to Behavior

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Propositions

Accompanying the thesis

From Neurons to Behavior: Investigating Auditory Information Processing across Multiple Scales

1. To understand the human brain, the most complex biological system in the universe, we must study it from the cellular (micro) level to the behavioral (macro) level.
2. One of the greatest challenges facing neuroscience today is the meaningful integration of observations and results obtained across species, methods, and spatial and temporal resolutions.
3. Computational models of the auditory cortex that integrate experimental observations across scales enhance the study of neuronal dynamics in human sound perception.
4. “All models are wrong, but some are useful”. *George Box*
5. Models need “better” data to evolve, where “better” data are driven by experiments designed being mindful of the aspects of the models in need of improvement.
6. The multisensory influence of peripheral vision on audition depends on the fine-grained temporal structure of stimuli in both modalities. A cortical network involving auditory, visual, insular and prefrontal cortices of the brain drives these multisensory effects.
7. Multisensory enhancement of responses increases along the auditory cortical hierarchy and is modulated by attention in the deep layers of the auditory belt.
8. Extending the auditory cortex model to include multisensory influences may ultimately improve our understanding of diminished multisensory integration.

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The 9th of June 2021

