Characterization of the sequential nature of neuronal dynamics: Experimental recordings, computational models and novel stimulation neurotechnologies

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Alicia Garrido Peña. PhD thesis Seminar
Thursday 11th July, 2024

UAM Universidad Autónoma de Madrid | Escuela Politécnica Superior

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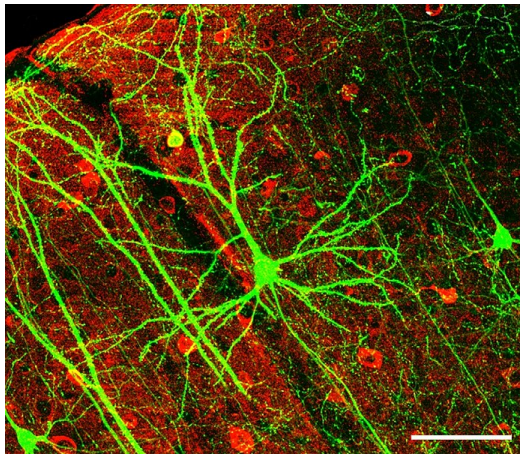
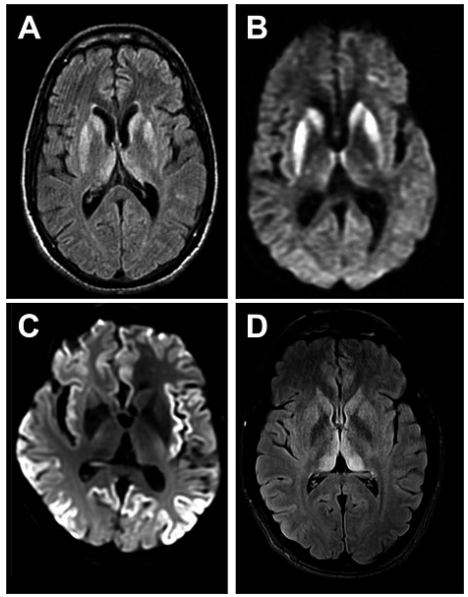
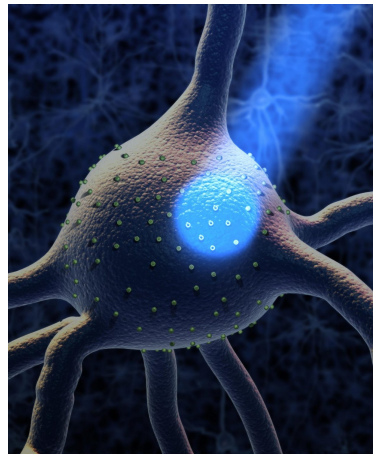
Neuroscience



Neurobiology



Clinical Neuroscience



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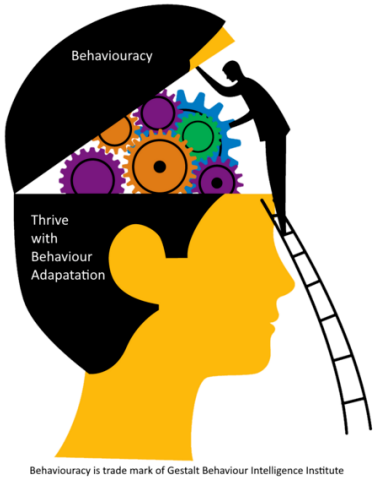
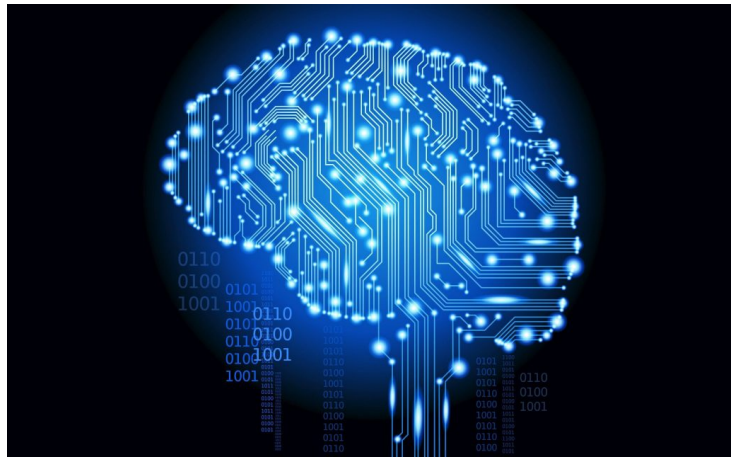
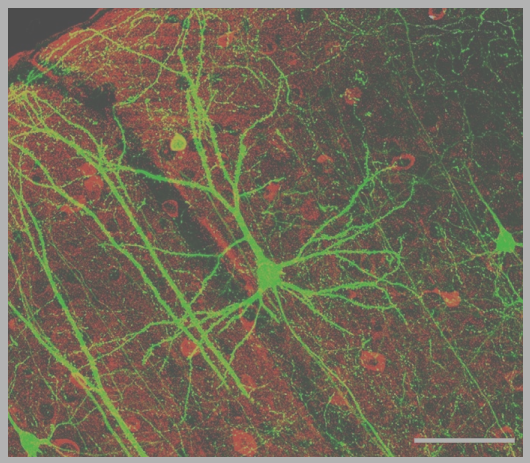


Cognitive Neurosience



Computational Neurosience

Neuroscience



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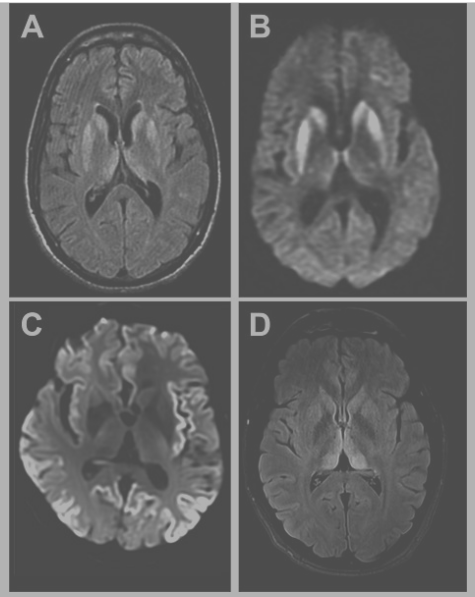

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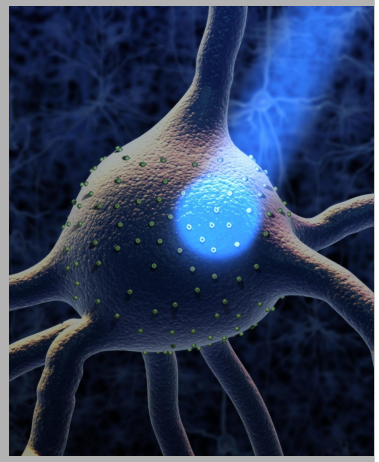

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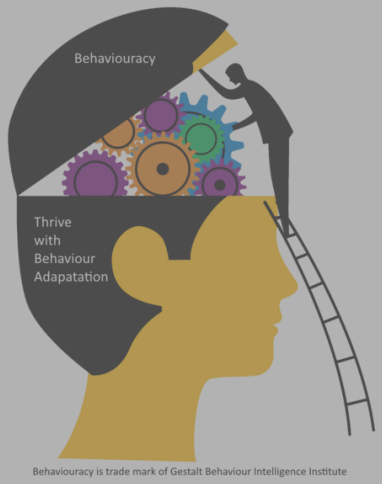

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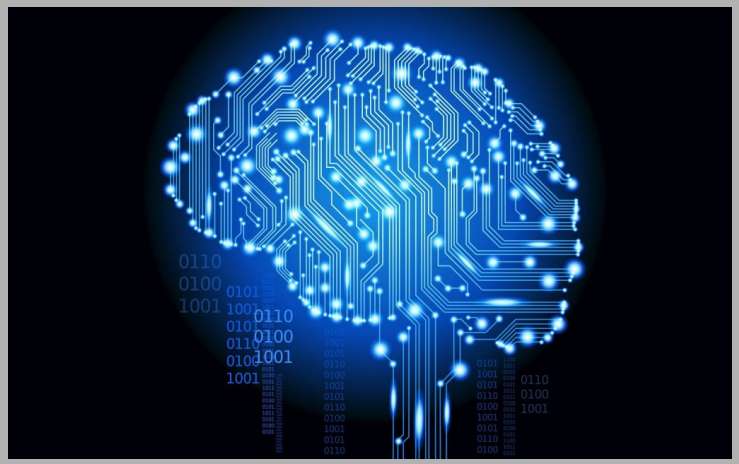


Computational Neurosience

Approach

- Neurocomputational Perspective

Approach

- Neurocomputational Perspective
- Bottom-up approach

Approach

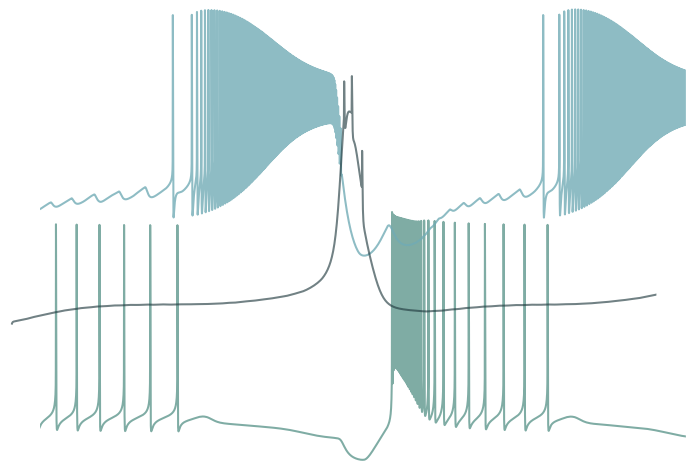
- Neurocomputational Perspective
- Bottom-up approach

From ionic channels

Approach

- Neurocomputational Perspective
- Bottom-up approach

From ionic channels



To minimal circuits

Approach

- Neurocomputational Perspective
- Bottom-up approach
- Combining electrophysiology

Approach

- Neurocomputational Perspective
- Bottom-up approach
- Combining electrophysiology and computational work

Neuronal and networks dynamics

Neuronal electrical activity is often described in terms of the evolution of membrane voltage caused by the flow of ionic channels between the inside and outside of the cell

Neuronal and networks dynamics

Depending on the channels that conform the neuron and the circuit it is immersed in, the activity is different

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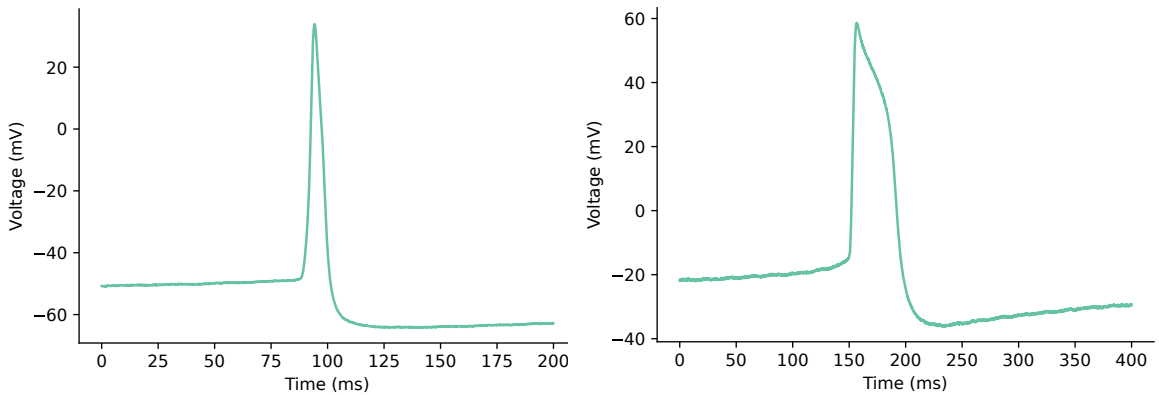
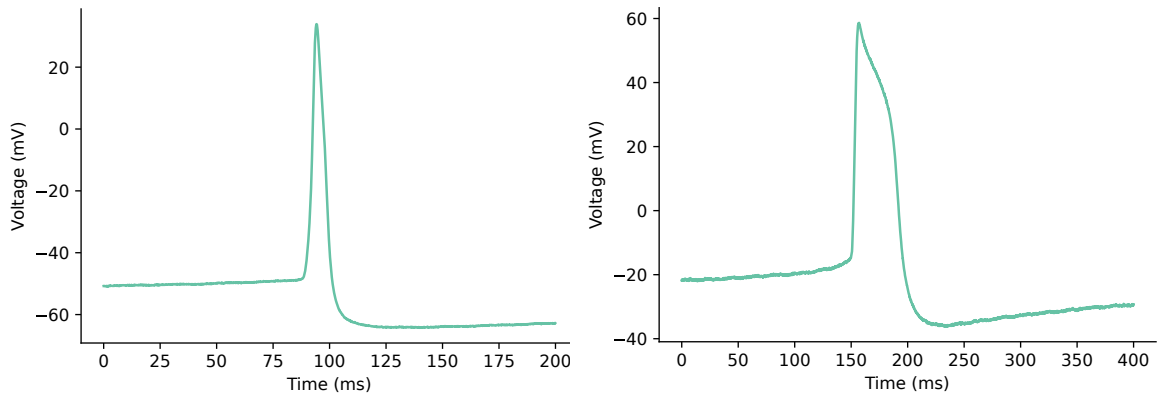


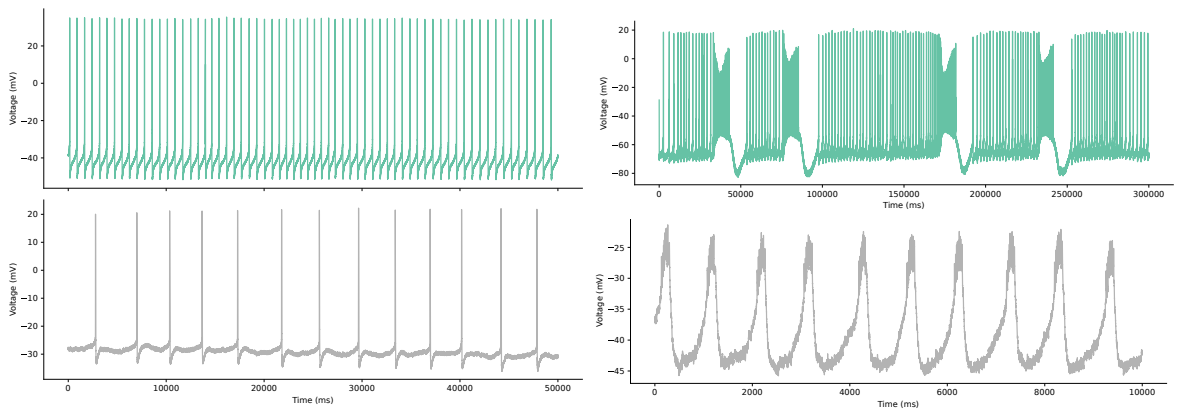
In terms of the spike waveform

Neuronal and networks dynamics

Depending on the channels that conform the neuron and the circuit it is immersed in, the activity is different



In terms of the spike waveform



and the type of spiking activity: tonic firing, bursting...

The sequential nature of neural dynamics

- There are sequential processes at different time-scales.

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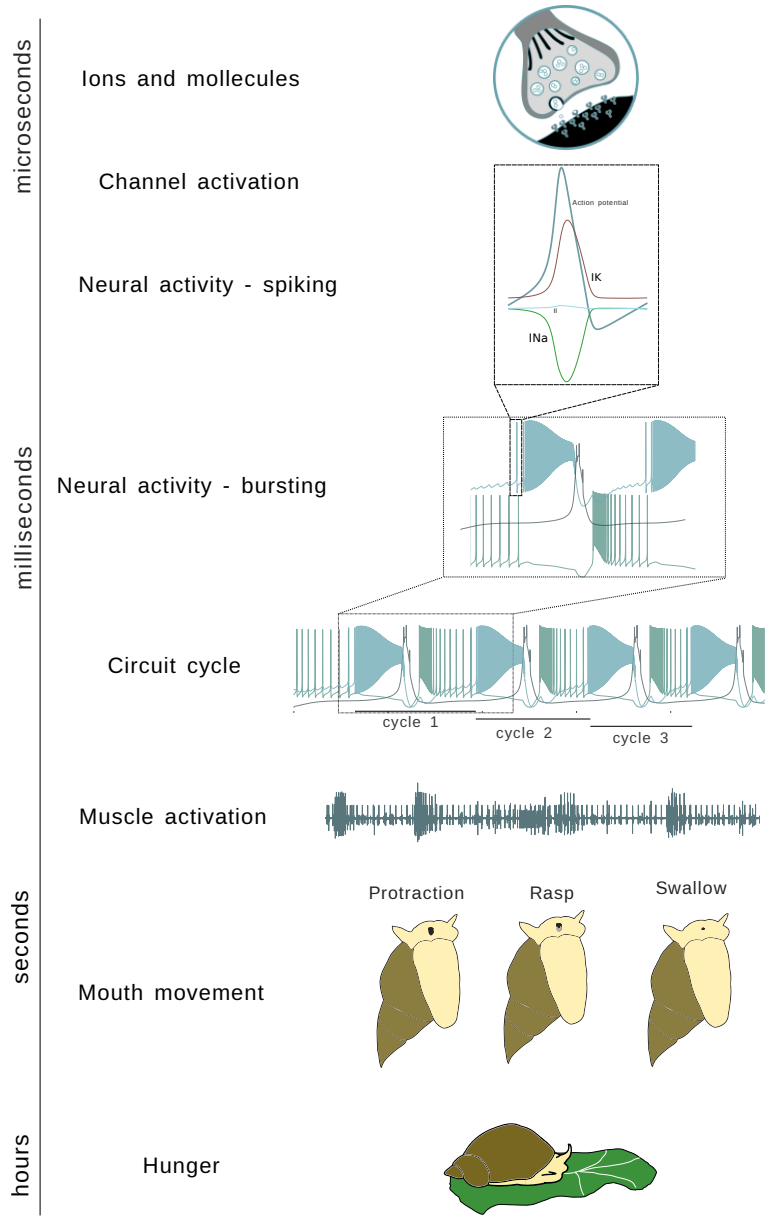
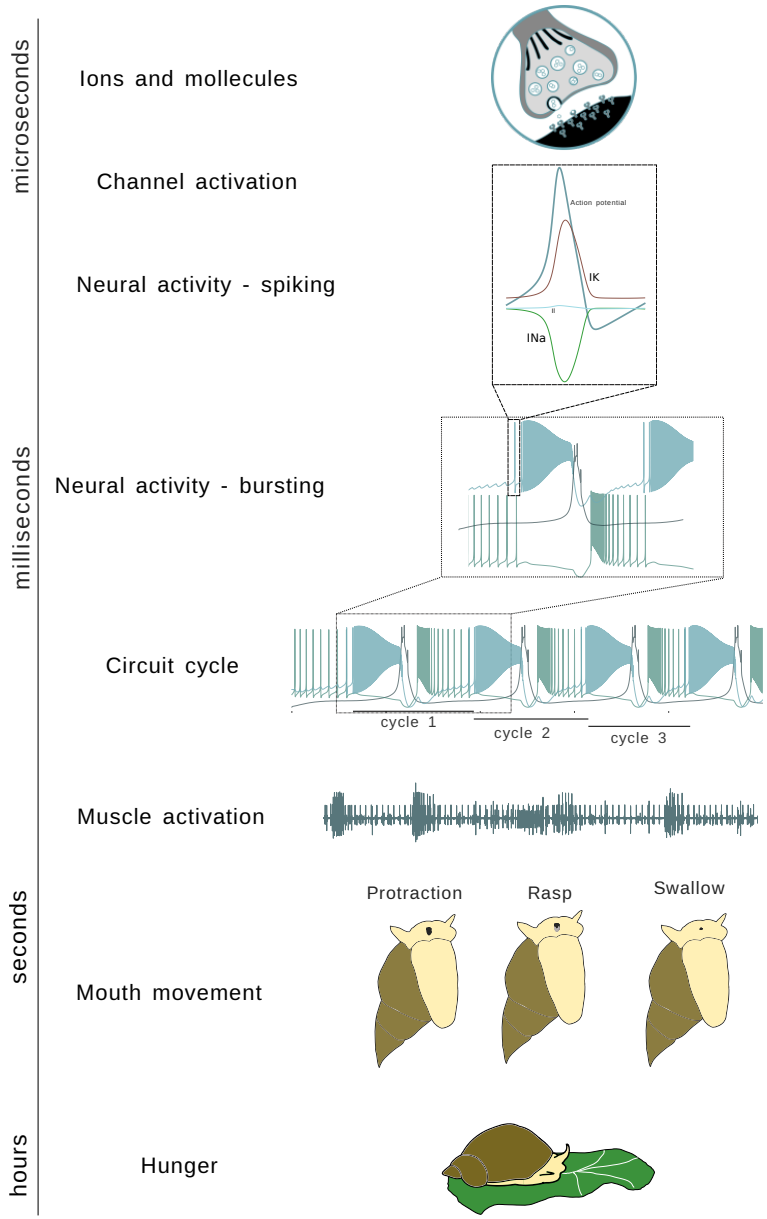


The sequential nature of neural dynamics

- There are sequential processes at different time-scales.
- Another bullet point.



The sequential nature of neural dynamics

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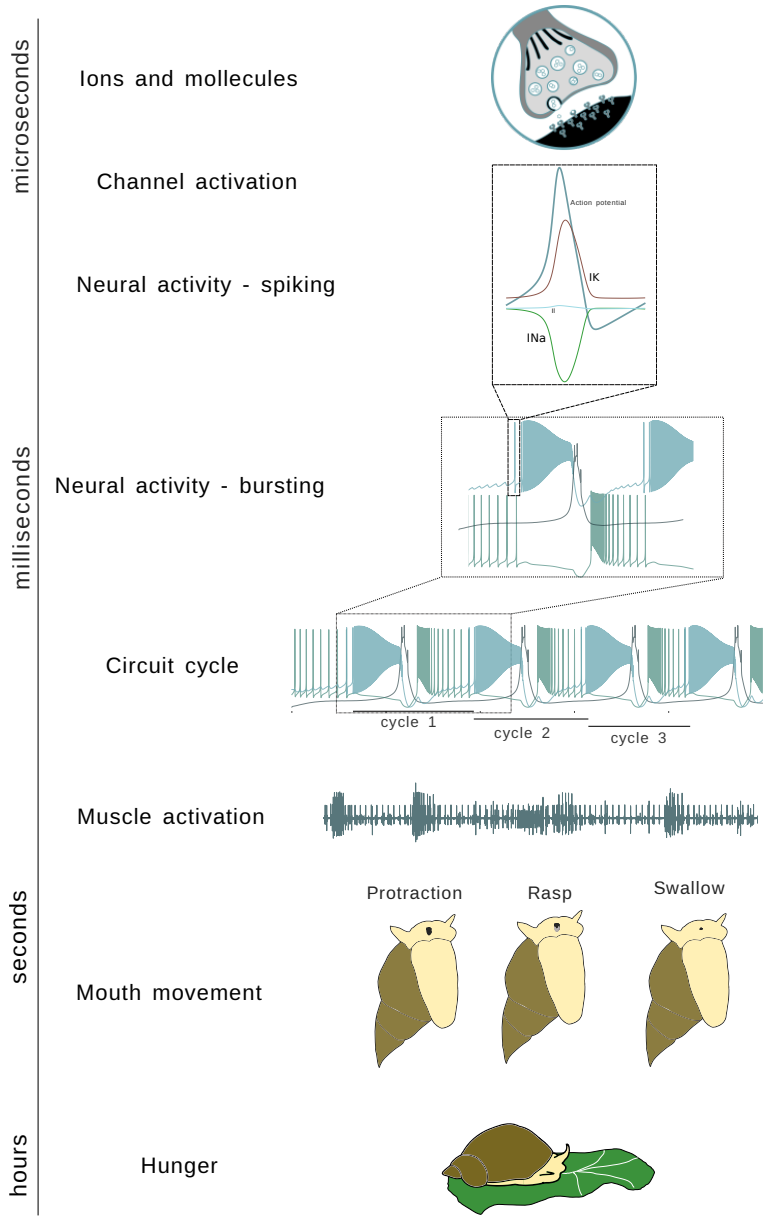
- And another one.

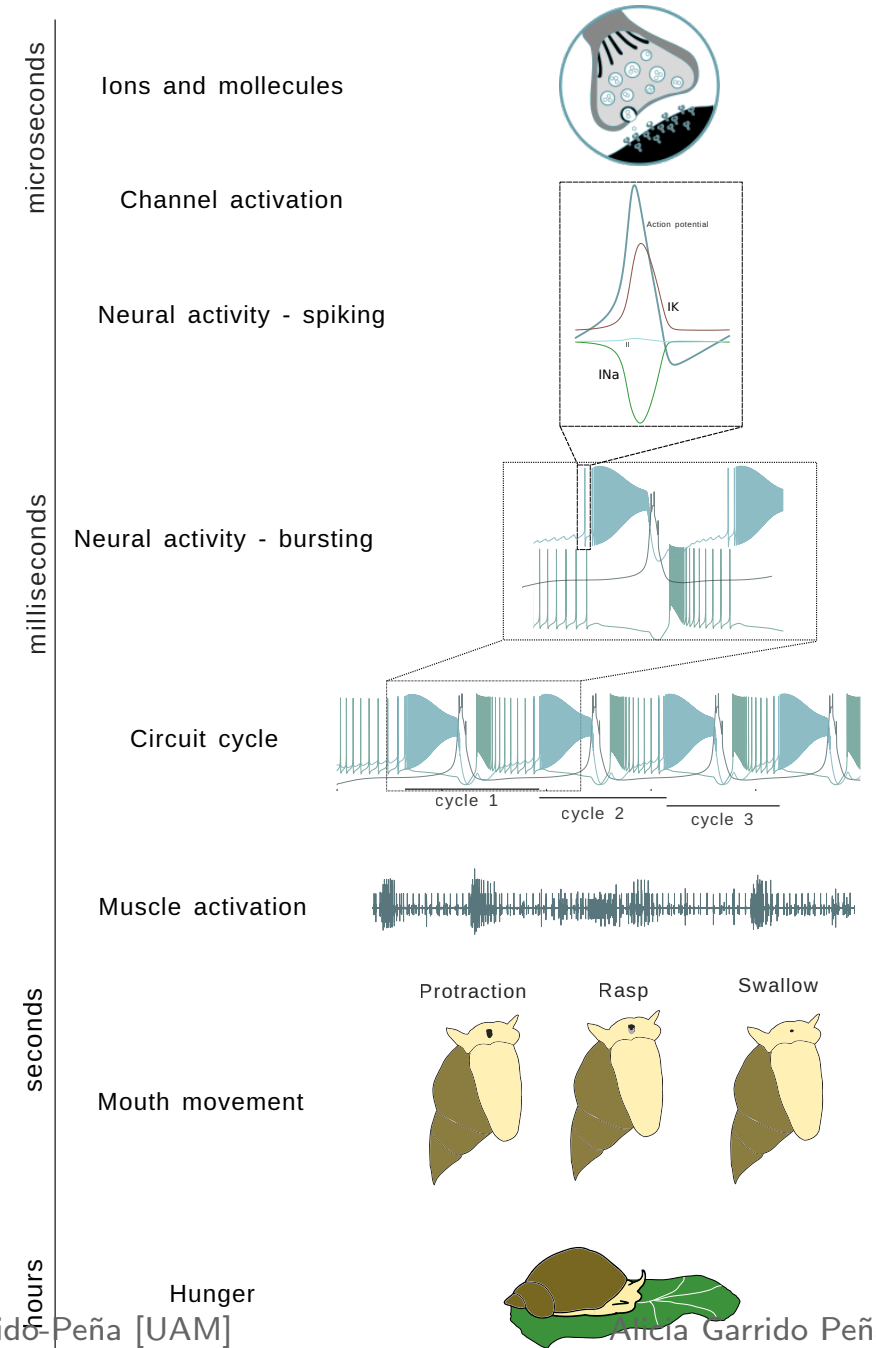


Studying neural dynamics in computational models

Vertebrate and invertebrate animal studies

Neural stimulation

Introduction



- There are sequential processes at different time-scales.

Conclusion

- $A + B = C$
- $p_T = 13$

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