Sarah Goethals

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PhD Thesis

Title	*Impact of axon initial segment geometry on the electrical properties of neurons*
Supervisor	Dr. Romain Brette
Institutions	Institut de la Vision, Sorbonne Université
Description	This thesis investigates theoretically and experimentally the impact of neuron's morphology on the generation of electrical signals in neurons.
Key skills	Mathematical and biophysical modelling, programming in Python, signal processing, image processing
Funding	École des Neurosciences de Paris, graduate program student from September 2015 to September 2020
Dates	October 2016 - September 2020

Professional experience in research

05 – 07/2016 **Internship in neuroscience**, *Neural Algorithms group, Institut de Biologie, École Normale Supérieure*, Paris.
Supervisor : Boris Barbour

02 – 04/2016 **Internship in computational neuroscience**, *Group for Neural Theory, École Normale Supérieure*, Paris.
Supervisor : Srdjan Ostojic

09 – 12/2015 **Internship in computational neuroscience**, *The Computational Neuroscience of Sensory Systems group, Institut de la Vision, Sorbonne Université*, Paris.
Supervisor : Romain Brette

03–04/2015 **Research assistant in applied mathematics**, *Institute of Information and Communication Technologies, Electronics and Applied Mathematics, Université Catholique de Louvain*, Belgium.
Researched and implemented a method for the estimation of the heartbeat instantaneous frequency with Matlab.

Education

2012 – 2014 **MSc Physics**, *Université Libre de Bruxelles*, Brussels, Belgium.
Dissertation : *Mean-field principles applied to the study of neurons population activity in the cerebral cortex*
Supervisors : Alain Destexhe (CNRS, Gif-sur-Yvette) and Thomas Gilbert (Université Libre de Bruxelles)

2009 – 2012 **BSc Physics**, *Université Libre de Bruxelles*, Brussels, Belgium.

Publications

2021 S. Goethals, M.C. Sierksma, et al. *Electrical match between initial segment and somatodendritic compartment for action potential backpropagation in retinal ganglion cells*. **Journal of Neurophysiology**.

→ link to Github repository

2020 S. Goethals and R. Brette. *Theoretical relation between axon initial segment geometry and excitability*. **Elife**.

→ link to Github repository

2016 M. S. Hamada, S. Goethals, et al. *Covariation of axon initial segment location and dendritic tree normalizes the somatic action potential*. **Proceedings of the National Academy of Sciences**.

Presentations

Oral at conferences and workshops

2020 **Workshop on Neural Excitability : theory and experiments**, Paris, France, 31 January.

2019 **Annual Bernstein Conference**, Berlin, Germany, 17-20 September.

2019 **International meeting NeuroFrance 2019**, Marseille, France, 22-24 May.

2018 **NeuroComp Symposium**, Sorbonne Université, Paris, France, 15 May.

2017 **26th Annual meeting of the Organization for Computational Neuroscience**, Antwerp, Belgium, 15-20 July.

Seminars

2017 **Invited seminar at the *Ion Channel and Synaptic Neurobiology Laboratory, Aix-Marseille University***, Marseille, France, 23 November.

2017 **Invited seminar at the *Department of Biosystems Science and Engineering, ETH Zurich***, Basel, Switzerland, 2 October.

2017 **Invited seminar at *Institut de la Vision***, Paris, France, 29 May.

Formations

09/2017 **34th Microelectrode techniques for cell physiology workshop**, *Marine Biology Association*, Plymouth, UK.

Teaching and outreach

2017-2018 **Science outreach**, *Cité de Sciences et de l'Industrie*, Paris.

2017 **Lecturer at the *Semaine du Cerveau***, Paris, France, 16 March.

2010–2014 **Private tuitions in physics**.

Skills

Languages

French (native), English (fluent), Dutch (advanced)

Programming

Python, Matlab, LaTeX, C++

Experimental biology

In vitro patch electrode recording, immunohistochemistry, confocal microscopy

Data analysis

Signal processing, 3D image processing (with ImageJ and Vaa3D)

Interests

Rock climbing, music (play the trombone), ski touring, hiking, reading about climate and environmental challenges.

Volunteer experience

Since 2020 **Volunteer and lecturer about carbon footprint**, *The Shifters (The Shift Project)*, Paris.

05–08/2015 **Volunteer**, *NGO L'Homme et l'Environnement* (protection of biodiversity), Antananarivo, Madagascar. Field work in Antananarivo and the Vohimana forest to ease relationships between the NGO and its stakeholders.

1998 – 2014 **Youth movements and youths movements leader**, *Guides catholiques de Belgique*, Bruxelles.

References

Dr. Romain Brette.
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