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Audrey Denizot

RESEARCH EXPERIENCE

June. 2021-now **JSPS postdoctoral fellow: What are the geometrical factors that regulate the propagation of calcium signals in astrocytes at the whole-cell level?**

Laboratory: Computational Neuroscience Unit, Okinawa Institute of Science and Technology, Japan

Supervisor: Pr. Erik De Schutter

Description: I investigate how astrocytes, non-neuronal cells of the brain, process information. Astrocytes modulate neuronal communication via Ca^{2+} signals, which encryption, the "Ca^{2+} code", remains to be decoded. I aim at improving our understanding of this code by investigating the geometrical factors that regulate the propagation of Ca^{2+} signals in a whole astrocyte. https://bit.ly/3n2UsVa

Skills: Modeling, Python, reaction-diffusion simulations, creation, manipulation & meshing of 3D geometries, collaborative work, supervision, peer support

Jan. 2020-May 2021 **Postdoctoral Scholar: Simulating Ca^{2+} activity in complex perisynaptic astrocytic process meshes extracted from electron microscopy to shed light on the mechanisms regulating signal transmission at tripartite synapses.**

Laboratory: Computational Neuroscience Unit, Okinawa Institute of Science and Technology, Japan

Supervisor: Pr. E. De Schutter

Skills: Modeling, Python, reaction-diffusion simulations, creation, manipulation & meshing of 3D geometries, collaborative work, supervision, peer support

2019-2020 **Postdoctoral scholar: Simulating calcium signaling in fine astrocytic processes**

Laboratory: Beagle team, INRIA, LIRIS UMR CNRS 5205, Villeurbanne, France

Supervisors: Dr. H. Berry & Pr. H. Soula

Skills: Modeling, C & Python, Monte Carlo simulations, collaborative work

2016-2019 **PhD: Simulating calcium signaling in fine astrocytic processes** (38 months)

Laboratory: Beagle team, INRIA, LIRIS UMR CNRS 5205, Villeurbanne, France
including a 4-month visit to E. De Schutter's unit in OIST, Japan

Supervisors: Dr. H. Berry & Pr. H. Soula

Skills: Modeling, C & Python, ODEs, Monte Carlo simulations, collaborative work, teaching

Research internships in experimental & computational neuroscience

2016 **Impact of astrocyte reactivity on neuronal communication in the brain** (4 months)

Laboratory: INSERM U1215, Neurocentre Magendie, Glia-Neuron Interactions group, Bordeaux

Supervisor: Dr. A. Panatier

Skills: Electrophysiology, Input/Output experiments, LTP induction

2015 **Simulations of calcium dynamics in fine astrocytic processes** (4 months)

Laboratory: Beagle team, INRIA, LIRIS UMR CNRS 5205, Villeurbanne, France

Supervisors: Dr. H. Berry & Pr. H. Soula

Skills Modeling, programming in C & Python, Monte Carlo simulations

2013 **Study of the effect of tianeptine on oligodendrocyte precursor cells in the central nervous system** (4 months)

Laboratory Department of Veterinary Medicine, University of Cambridge, England

Supervisors Dr. R. T. Káradóttir & Dr. H. Gautier

Skills Electrophysiology, Patch Clamp, Immuno-histochemistry

2012 **Identification and biochemical characterization of a new antigenic target of autoimmune limbic encephalitis** (2 months)

Laboratory ONCOFLAM team, INSERM 1028 laboratory, Neuroscience research centre of Lyon, France

Supervisors Dr. E. Sotirakis & Pr. J. Honnorat

Skills HPLC, Western blotting

EDUCATION & DIPLOMAS

2016-2019 **PhD in computer sciences**, Laboratoire d'Informatique en Image et Systèmes d'information (LIRIS, computer science laboratory) and Computer Sciences & Maths doctoral school (ED 512 Infomaths), INSA Lyon, France.

Defense: November, 8^{th} 2019

2016 **Master Biosciences (M.Sc. degree in Biology)**, Ecole Normale Supérieure de Lyon, France (rank 6/54)

2014-2015 **Préparation à l'agrégation** (teaching diploma which is obtained based on a competitive examination), Ecole Normale Supérieure de Lyon, France. Agrégation obtained (rank 35/1308)

2012 License Biosciences (B.Sc. degree in Biology), Ecole Normale Supérieure de Lyon, France

2009-2011 Classe préparatoire scientifique (intensive course preparing for the competitive entrance examinations to French Grandes Ecoles), Lycée Carnot, Dijon, France

2009 Highschool diploma, lycée Alain Colas, Nevers, France, highest honours

PRESENTATIONS

Code: †: Poster, ¶: talk, ★: **invited talk**

A. Denizot, M. F. Veloz Castillo, P. Puchenkov, C. Cali, E. De Schutter. The endoplasmic reticulum in fine astrocytic processes: presence, shape, distribution and effect on calcium activity, Federation of European Neuroscience Societies Forum 2022, Paris, France, submitted. †

A. Denizot, M. F. Veloz Castillo, C. Cali, E. De Schutter. Endoplasmic reticulum-plasma membrane contact sites inperisynaptic astrocytic processes: properties and effects, Neuro2022, The 45th Annual Meeting of the Japan Neuroscience Society, Okinawa, Japan, submitted. †

○ A. Denizot. "Decoding the astrocytic calcium code with computational approaches.", 99th Annual Meeting of the Physiological Society of Japan, Sendai, March 2022. ★

○ A. Denizot. 8th ACM International Conference on Nanoscale Computing and Communication Virtual Conference, "Spatially-Extended Simulations Predict the Effect of ER Distribution on Astrocytic Microdomain Ca2+ Activity". Sept 2021. https://bit.ly/2YXwMKq ★

○ A. Denizot, M. Arizono, V. U. Nägerl, E. De Schutter, H. Berry. The nanoscale morphology of astrocyte branchlets governs local calcium activity. The 44th Annual Meeting of the Japan Neuroscience Society, Kobe Convention Center. July 2021. ¶

- A. Denizot, C. Cali, H. Berry, E. De Schutter. Probing the localization of the endoplasmic reticulum in the gliapil and its effect on astrocytic calcium signals. XV European Meeting on Glial Cells in Health and Disease, GLIA 2021, July 2021, †
- A. Denizot. Disentangling astrocytic calcium signals: insights from spatially-extended models. *Annual Computational Neuroscience Meeting*, online meeting, July 2021. https://bit.ly/3luuDO1 ★
- A. Denizot. Computational approaches for simulating calcium signals in astrocytes: insights, limitations, challenges and perspectives. 1^{st} Virtual Conference of the European Society for Neurochemistry "Future perspectives for European neurochemistry – a young scientist's conference", May 2021, ¶
- A. Denizot, C. Cali, H. Berry, E. De Schutter. Elucidating the morphology of the endoplasmic reticulum in fine astrocyte branchlets and its effect on calcium signals. 1^{st} Virtual Conference of the European Society for Neurochemistry "Future perspectives for European neurochemistry – a young scientist's conference", May 2021, †
- A. Denizot, C. Cali, H. Berry, E. De Schutter. Elucidating the morphology of the endoplasmic reticulum in fine astrocyte branchlets and its effect on calcium signals. 2021 Virtual Glia Trainee Symposium, March 2021, †
- A. Denizot, C. Cali, H. Berry, E. De Schutter. Effect of the geometry of the endoplasmic reticulum on astrocytic Ca2+ signals at tripartite synapses: insights from simulations in realistic 3D geometries, *SfN Global Connectome: A Virtual Event*, January 2021, †
- A. Denizot, C. Cali, W. Chen, I. Hepburn, H. Berry, E. De Schutter. Reaction-diffusion simulations of astrocytic Ca^{2+} signaling in realistic geometries, *Annual Computational Neuroscience Meeting*, July 2020, online meeting, https://bit.ly/3i1bqzD https://bit.ly/367A27E †
- A. Denizot, M. Arizono, W. Chen, I. Hepburn, H. Soula, V. U. Nägerl, E. De Schutter, H. Berry. Investigating the effect of the nanoscale architecture of astrocytic processes on the propagation of calcium signals, *Annual Computational Neuroscience Meeting*, July 2019, Barcelona, Spain †
- A. Denizot, H. Soula, and H. Berry, Simulation of calcium signaling in fine astrocytic processes, *OIST Computational Neuroscience Course*, Okinawa, Japan, July 2018 †
- A. Denizot, H. Soula, and H. Berry, Simulation of calcium signaling in fine astrocytic processes: effect of spatial properties on spontaneous activity, *LyonSysBio*, Lyon, France, Nov. 2017 †¶
- A. Denizot, H. Soula, and H. Berry, Simulation of calcium signaling in fine astrocytic processes, *OIST Computational Neuroscience Course*, Okinawa, Japan, July 2017 †
- A. Denizot, Towards simulation of calcium signaling in fine astrocytic processes, *International Astrocyte School*, Bertinoro, Italy, March 2017 ¶
- A. Denizot, H. Soula, and H. Berry, Simulation of calcium signaling in fine astrocytic processes, *CompSysbio*, Aussois, France, March 2017 †

CONFERENCE ORGANIZATION

July 2021 Co-organization of a Workshop at the **Annual Computational Neuroscience Meeting, online meeting**, entitled: **"Computational approaches fr studying astrocyte dynamics and astrocyte-neuron communication"**. Organizers: B. Genocchi, A. Denizot, K. Lenk, S. Nadkarni, M. Taheri. Speakers: Y. Goda, A. Borisyuk, J. Shih, A. Scimemi, G. Yu, L. Heja, A. Pillai, R. Jolivet, M. Collard, A. Denizot, R. Refaeli, K. Lenk.

The goal of this workshop was to bring together theorists and experimentalists working on astrocyte-neuron signaling to initiate a working dialogue between them, providing exciting perspectives to address brain function.

https://astrocytenet.org/cns2021-online-workshop/

May 2021 Organization of a Workshop at the 1^{st} **Virtual Conference of the European Society for Neurochemistry "Future perspectives for European neurochemistry – a young scientist's conference", May 2021**, entitled: **"Let's join forces - Bridging the gap between experimental, computational and data sciences to disentangle astrocyte calcium activity"**. Speakers: A. Covelo, A. Badoual and A. Denizot.

The goal of this workshop was to bring together PhD students and early-career scientists from the different fields working on astrocytes: data acquisition, analysis and modeling. Each of the 3 speakers presented the recent advances and challenges in their field. This workshop was highly interactive, encouraging researchers to share their expertise and various strategies to to crack the astrocytic "Calcium Code", thus favoring the emergence of creative approaches and novel interdisciplinary collaborations. Following the workshop, I initiated and supervised the writing of a review article with the speakers (https://bit.ly/3sYhGzw).

PUBLICATIONS

Peer-Reviewed Journals

○ A. Denizot, M. Arizono, U. V. Nägerl, H. Soula, and H. Berry, "Simulation of calcium signaling in fine astrocytic processes: Effect of spatial properties on spontaneous activity," PLOS Computational Biology, vol. 15, p. e1006795, Aug. 2019.

○ K. Ceyzériat, L. Ben Haim, A. Denizot, D. Pommier, M. Matos, O. Guillemaud, M.-A. Palomares, L. Abjean, F. Petit, P. Gipchtein, M.-C. Gaillard, M. Guillermier, S. Bernier, M. Gaudin, G. Aurégan, C. Joséphine, N. Déchamps, J. Veran, V. Langlais, K. Cambon, A. P. Bemelmans, J. Baijer, G. Bonvento, M. Dhenain, J.-F. Deleuze, S. H. R. Oliet, E. Brouillet, P. Hantraye, M.-A. Carrillo-de Sauvage, R. Olaso, A. Panatier, and C. Escartin, "Modulation of astrocyte reactivity improves functional deficits in mouse models of Alzheimer's disease," Acta Neuropathologica Communications, vol. 6, p. 104, Oct. 2018.

Preprints

A. Denizot, M. F. Veloz Castillo, P. Puchenkov, C. Cali, E. De Schutter. The endoplasmic reticulum in perisynaptic astrocytic processes: shape, distribution and effect on calcium activity, bioRxiv, 2022, https://www.biorxiv.org/content/10.1101/2022.02.28.482292v1, submitted to Science Advances.

A. Badoual, A. Covelo, A. Denizot. Advocating for interdisciplinary collaborations to unravel the astrocyte "Calcium Code", preprints, 2022, https://doi.org/10.20944/preprints202201.0460.v1

A. Denizot, M. Arizono, U. V. Nägerl, H. Berry, & E. De Schutter. Control of Ca2+ signals by astrocyte nanoscale morphology at tripartite synapses, bioRxiv, 2021, https://doi.org/10.1101/2021.02.24.432635, submitted to the Journal of Neuroscience.

Book chapters

○ A. Denizot, H. Berry, and S. Venugopal, "Intracellular Calcium Signals in Astrocytes, Computational Modeling of," in Encyclopedia of Computational Neuroscience(D. Jaeger and R. Jung, eds.), pp. 1–12, New York, NY: Springer, 2020

Peer-reviewed International Conference Proceedings

- A. Denizot, C. Cali, H. Berry, E. De Schutter. Stochastic Spatially-Extended Simulations Predict the Effect of ER Distribution on Astrocytic Microdomain Ca2+ Activity. Stochastic Spatially-Extended Simulations Predict the Effect of ER Distribution on Astrocytic Microdomain Ca2+ Activity, in: Proceedings of the Eight Annual ACM International Conference on Nanoscale Computing and Communication, NANOCOM '21. Association for Computing Machinery, New York, NY, USA, pp. 1–5, 2021
- A.Badoual, M.Arizono, A.Denizot, M.Ducros, H.Berry, U.V.Nägerl, C.Kervrann. Simulation of Astrocytic Calcium Dynamics in Lattice Light Sheet Microscopy Images. In 2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI) (pp. 135-139). IEEE, April 2021

Review activity

Reviewed one article for Psychoneuroendocrinology

Reviewed two articles for PLOS Computational Biology

AWARDS & GRANTS

2021 Best Poster Award, 1^{st} Virtual Conference of the European Society for Neurochemistry "Future perspectives for European neurochemistry – a young scientist's conference"

2021-2023 Recipient of the **Grants-in-Aid for JSPS Research Fellow** (JSPS International Research Fellow) grant; Duration: 2 years; Amount: ≈ €12k €

2021-2023 Recipient of the **Postdoctoral Standard Long-term Postdoctoral grant from the Japanese Society for the Promotion of Science** (JSPS, Standard, 21F21733); Duration: 2 years; Amount: ≈ 68k €

2020 2020 Trainee Professional Development Award (TPDA), Society for Neuroscience; Amount: $100

2019 Travel award for the annual Computational Neuroscience (CNS) meeting 2019; Amount: $200

2018 Laboratoire d'Informatique en Image et Systèmes d'information International Mobility Grant; Amount: 1000 €

2016-2019 **Three year PhD funding by the French Ministry of Superior Education** ("contrat doctoral spécifique pour normalien", CDSN); Amount: ≈ 59k €

2011-2016 **State Agent-Student position for excellence** at the Ecole Normale Supérieure de Lyon ("Normalien" grade); Employer: French Ministry of Superior Education; Amount: ≈ 64k €

TEACHING

2016-2019 **Teaching assistant**: 64h/year to Master students at INSA Lyon & ENS Lyon. Main Subjects: Enzymology (M1), Cellular Biology (M2) & Neurobiology (M2)

2017 Private lessons for students preparing competitive exams to enter French Grandes Ecoles

2008-2011 Private lessons for high-school students in maths, physics and biology

SUPERVISION

Sept-Dec 2021 **Ryo Nakatani**, 1^{st} year PhD student at the Okinawa Institute of Science and Technology, Japan. **100%**

Ryo is willing to continue working on this project during his PhD.

Project Reaction-diffusion modeling of tripartite synapses to study the modulation of glutamatergic communication by astrocytes.

Oct-Dec 2020 **Haruki Shigeta**, 3^{rd} year student at the Tohoku University, Japan. **100%**

Haruki continues working on this project remotely, in parallel to his studies in medicine.

Project Modeling the effect of astrocyte-synapse proximity on glutamate concentration in the synaptic cleft at tripartite synapses.

Mar-Jul 2017 **Carlos Vivar Rios**, Erasmus+ Master student. **50%** with Hugues Berry.

Carlos is currently a PhD student in Pr. A. Volterra's laboratory, Université de Lausanne, Switzerland, co-supervised by Dr. M. De Pitta.

Project Analyzing the effect of spatial constraints within realistic 3D meshes of astrocytic processes on calcium signals

PROFESSIONAL NETWORKS

Society for Neuroscience

Organization for Computational Neuroscience (OCNS)

Japan Neuroscience Society

Federation of European Neuroscience Societies

Société des Neurosciences

CAREER DEVELOPMENT

2021 **Neuromatch Academy: Deep Learning Course**. Intensive 3-weeks long online summer school on deep learning. https://bit.ly/3hqUWU0

Led a team project entitled "Transfer learning: a promising avenue for improved patient-specific prediction in epilepsy?"

2020 **Leadership and Management Skills Course for Postdocs**, hfp consulting. 21h-long training on transferable skills in the areas of communication, (self-)organisation, management and interpersonal relationships.

2017 **Okinawa Computational Neuroscience Course**. Highly selective 3-weeks long computational neuroscience course (https://bit.ly/2YPWv7w). Project: "Stochastic simulations of Ca^{2+} nanodomains using STEPS".

ADMINISTRATION

Ap. 2022-now Member of the OIST Researcher Community advisory board

2020-2022 **Elected Researcher Representative** of the OIST Researcher Community, Japan. https://bit.ly/33XuPMH

The ORC is the organization of the researchers of the Okinawa Institute of Science and Technology. The role of the ORC officers is to provide researchers with information about current matters of the university, collect their opinions and suggestions, and provide feedback to the executives. We organize scientific and social events, notably during the Researcher Appreciation Month https://bit.ly/2WLhl6N.

Skills Organization of scientific talks, poster sessions, art contest, peer support, elaborating a survey, analysing and reporting the main results, collaborative work, working in an intercultural and international context

2017 Member of the organizational committee of the European Conference on Artificial Life (ECAL). https://bit.ly/33Z3vxO

SCIENCE COMMUNICATION

2019-Present **"Papier-Mâché Sciences"**

Funding member of the association "Papier-Mâché", member of the editorial committee and Board of Directors. The main goal of the association is to develop a website (**https://papiermachesciences.org**) that provides articles explaining the content of scientific publications to the greatest number of people, in French. It also presents the scientific method and the publication system.

https://bit.ly/3cPnToB, https://bit.ly/38KYoBu, https://bit.ly/2W4vBp1

Responsibilities Author, reviewer, translator, editor, head of external communication

My article https://bit.ly/3rQNmFe

2017-2020 **"DéMesures" project**

https://bit.ly/2QssoN1, https://bit.ly/2qZx4j1, https://bit.ly/2OmC7C6

Member of the French scientific outreach and communication association "DéMesures", former junior laboratory hosted by the ENS Lyon university. The association aims to raise public awareness of the importance of scales in science and humanities and to awaken critical thinking among the young and general public. https://bit.ly/2KyLg9w

Responsibilities & actions

- Head of collaborations and communication
- Recruitment manager
- Founder and co-manager of the "Instant Recherche" project, that aims at presenting the daily life of researchers to the general public. https://bit.ly/2TRYekz
- Founder and manager of a collaboration with the French radio "Radio Brume" & "Science pour tous", that resulted in 3 podcasts on Science and Society topics. https://bit.ly/2YJRn03
- Co-manager of the "ArtScience" project, that combined the work of scientists and artists and resulted in an art exhibition. https://bit.ly/2OldNR3
- Led interactive scientific animations at science events & festivals: "Fête de la Science" 2017, 2018 & 2019, "GeekTouch" 2017 & 2018, "A Nous de Voir" 2018.
- Photo panel presenting the similarities between science & art. https://bit.ly/2XqjaCz
- Co-creation of the "Cosmograff" project, which presented the Solar System and its scales to the general public via a guided walk in the streets of Lyon, in collaboration with the Musée des Confluences (Lyon Natural History Museum) and a street artist collective https://bit.ly/35gtYpI.
- Creation of audio-guides, EWASS annual meeting (astronomy) https://bit.ly/2rQIB5y
- Co-organization & animation of "Dans la blouse d'un chercheur", Feb. 2018. This project aims at presenting research to children. https://bit.ly/2CQpEkS
- Interview to "Sème ta Science" 2018 to present DéMesures activities. https://bit.ly/2I5PuFb

LANGUAGES & MOBILITY

French	Mother tongue	English	Full professional proficiency
German	Intermediate	Spanish	Basic
Japanese	Intermediate	Italian	Basic

SKILLS

Biology	Neuroscience, Biochemistry, Electrophysiology, Molecular biology, Cellular Biology
Modeling	Python, C, ODEs, Monte Carlo
Software/tools	Git, LaTeX, Libreoffice, Zotero, Inkscape, GIMP, STEPS, Trelis, Blender
OS	Linux, Windows

INTERESTS

Sports	Climbing, diving, running, hiking, skiing, yoga
Recreation	Music, cooking, photography, traveling