Austin E. Soplata

Blue Brain Project
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Research group: epfl.ch/research/domains/bluebrain

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PROFESSIONAL APPOINTMENTS

2022 – present **Postdoctoral Research Fellow**
Advisor: Sean L. Hill
Blue Brain Project
École Polytechnique Fédérale de Lausanne, Geneva, Switzerland

2020 – 2022 **Postdoctoral Research Fellow**
Advisor: Emery N. Brown
Department of Anesthesia, Critical Care & Pain Medicine
Massachusetts General Hospital & Harvard Medical School, Boston, MA, USA

2019 – 2020 **Postdoctoral Research Fellow**
Advisor: Nancy Kopell
Department of Mathematics & Statistics
Boston University, Boston, MA, USA

EDUCATION

2011 – 2019 **PhD in Computational Neuroscience**, Boston University, USA
Dissertation: *A Thalamocortical Theory of Propofol Phase-amplitude Coupling*
Advisor: Nancy Kopell

2006 – 2010 **BS in Nuclear Engineering**, University of Tennessee, Knoxville, USA
Concentration: Radiological Engineering

PUBLICATIONS

PAPERS

2023 **Soplata, AE***, Adam, EM*, Brown, EN, Purdon, PL, and McCarthy, MM, and Kopell, N. Rapid thalamocortical network switching mediated by cortical synchronization underlies propofol-induced EEG signatures: a biophysical model. (*co-first authors)
Journal of Neurophysiology 130 (1): 86–103 (July, 2023). doi:10.1152/jn.00068.2022
- Code: asoplata/soplata-2023-thalcort-code
- ModelDB: 2015422

2018 Sherfey, J, **Soplata, AE**, Ardid, S, Roberts, EA, Stanley, DA, Pittman-Polletta, BR, and Kopell, N. DynaSim: A MATLAB Toolbox for Neural Modeling and Simulation. *Frontiers in Neuroinformatics* 12 (2018). doi:10.3389/fninf.2018.00010
- Code: dynasim/dynasim
- Code: asoplata/dynasim-benchmark-brette-2007

2017 **Soplata, AE**, McCarthy, MM, Sherfey, J, Lee, S, Purdon, PL, Brown, EN, and Kopell, N. Thalamocortical Control of Propofol Phase-Amplitude Coupling. *PLoS Computational Biology* 13, no. 12 (December 11, 2017): e1005879. doi:10.1371/journal.pcbi.1005879
- Code: asoplata/propofol-coupling-2017-full
- ModelDB: 260960

CONFERENCE POSTERS

2023 **Soplata, AE**, Iavarone, E, Litvak, P, Dictus, H, Muddapu, VR, Romani, A, Markram, H, Hill, SL. Multiscale data integration to generate atlas-based biophysical modeling of first- and higher-order mouse thalamic nuclei. Program No. PSTR576.03. *2023 Neuroscience Meeting Planner*. Washington, D.C.: Society for Neuroscience, 2023. Online.

2019 **Soplata, AE**, McCarthy, MM, Roberts, EA, Brown, EN, Purdon, PL, and Kopell, N. Cortical UP DOWN state synchrony drives propofol phase amplitude coupling in slow waves. Program No. 289.18. *Neuroscience 2019 Abstracts*. Chicago, IL: Society for Neuroscience, 2019. Online.
- Poster: doi.org/10.6084/m9.figshare.19364759

2016 **Soplata, AE**, Sherfey, J, Brown, EN, Purdon, PL, and Kopell, N. Thalamic generation of propofol phase amplitude coupling. Program No. 507.13. *Neuroscience 2016 Abstracts*. San Diego, CA: Society for Neuroscience, 2016. Online.
- Poster: doi.org/10.6084/m9.figshare.19364810

2014 **Soplata, AE**, Lee, S, Ching, S, Brown, EN, Purdon, PL, and Kopell, N. Mechanisms underlying thalamocortical phase-amplitude switches due to the anaesthetic propofol. Program No. 787.01 *Neuroscience 2014 Abstracts*. Washington, DC: Society for Neuroscience, 2014. Online.
- Poster: doi.org/10.6084/m9.figshare.19364849

PRESENTATIONS

2023 **Soplata, AE**. Slow Wave Oscillations and You: Biophysical Neuron Mechanisms. *Computational/Systems Neuroscience Journal Club, Boston University*, presented on November 21st, 2023.
- Slides: doi.org/10.6084/m9.figshare.24679248

2021 **Soplata, AE**. Dynamics of propofol anesthesia in the thalamocortical loop. *Thalamus Trainees Meeting Group*, presented on March 10th, 2021.
- Slides: doi.org/10.6084/m9.figshare.19364924

2018 **Soplata, AE**. Thalamic control of propofol phase-amplitude coupling. *Cognitive Rhythms Collaborative* Annual Retreat, presented on April 23rd, 2018.
- Slides: doi.org/10.6084/m9.figshare.19364954

2016 **Soplata, AE**. Interactive Git Tutorial. *Computational Neuroscience Students Group* at Boston University, presented on November 17th, 2017.
- Slides: asoplata.com/publications/talks/20171117-git-intro/slides.html

OPEN-SOURCE SOFTWARE

2022 – present **Blue Brain software**
User and contributor for 3D voxel-based Blue Brain circuit building and simulation software
- Contributor: BlueBrain/atlas-direction-vectors, BlueBrain/atlas-placement-hints

2016 – 2022 **DynaSim**
A MATLAB/GNU Octave toolbox for modeling dynamical systems, especially biophysical neural networks, with high-performance computing cluster support
- Role: Developer
- Code: dynasim/dynasim
- Paper: doi.org/10.3389/fninf.2018.00010
- Website: github.com/DynaSim/DynaSim/wiki

Implementation: Benita et al., 2012
Cortex model of *Benita, JM, et al. (2012). Synaptic depression and slow oscillatory activity in a biophysical network model of the cerebral cortex. Frontiers in Computational Neuroscience. doi:10.3389/fncom.2012.00064*
- Code: asoplata/dynasim-benita-2012-model

Implementation: Krishnan et al., 2016
Thalamocortical model of *Krishnan, GP, et al. (2016). Cellular and Neurochemical Basis of Sleep Stages in the Thalamocortical Network. ELife. doi:10.7554/eLife.18607.*
- Code: asoplata/dynasim-krishnan-2016-model

Implementation: Ching et al., 2012
Cortex model of *Ching, S, et al. (2012). A Neurophysiological-Metabolic Model for Burst Suppression. Proceedings of the National Academy of Sciences of the United States of America doi:10.1073/pnas.1121461109.*
- Code: asoplata/dynasim-ching-2012-model

Implementation: Bazhenov et al., 2002
Thalamocortical model of *Bazhenov, M, et al. (2002) Model of Thalamocortical Slow-Wave Sleep Oscillations and Transitions to Activated States. The Journal of Neuroscience doi:10.1523/JNEUROSCI.22-19-08691.2002.*
- Code: asoplata/dynasim-bazhenov-2002-model

RESOURCES

2018 – present **Soplata, AE**. Publicly-editable Open Computational Neuroscience Resources List, currently starred by 470 GitHub users
- Code: asoplata/open-computational-neuroscience-resources

ACADEMIC SERVICE

REVIEWER

- PLoS Computational Biology

SKILLS

COLLABORATIVE SKILLS

- Experience in biophysically realistic neural network development through collaboration with scientific modellers, electrophysiology experimentalists, informaticians, software developers, high performance computing experts, imaging scientists, cell morphology reconstructers, visualization experts, and project managers (Blue Brain Project, team size: 50+)
- Experience in hypothesis generation and experiment planning with rodent, non-human primate, and human data experimentalists (team size: 20)
  - Website: reporter.nih.gov/search/UAtRLsw1H0SOBKyGZ8lgJA/project-details/10093061
- Experience in development of scientific software (DynaSim, team size: 5, Blue Brain software, team size: 25+)

TECHNICAL SKILLS

- Significant experience in biophysical neural network modeling software (DynaSim, NEURON, NetPyNE, Brian2, and custom C++ and Python)
- Significant experience in biophysical neural network validation using literature
- Significant experience in scientific programming (Python, MATLAB, and C++)
- Significant experience with neural data analysis (the scientific Python suite (NumPy, SciPy, Pandas, Matplotlib, Plotly), MATLAB, Microsoft Excel)
- Experience with high-performance computing cluster use (Sun Grid Engine, Slurm Workload Manager)
- Experience with 3D mesh- and voxel-based morphometry analysis, manipulation, and visualization using the multidimensional NRRD file format (BlueBrain/voxcell, BlueBrain/Ultraliser, Blender, ITK-Snap, Paraview)
- Experience with the AllenInstitute/SONATA standard for network model description and simulation, including usage of the HDF5 file format
- Experience with professional software development tools (Git version control, the GNU/Linux operating system, and advanced code editors including PyCharm, Visual Studio Code, Emacs, and Vim)
- Experience with professional office and graphics editing software (the Microsoft Office suite, LaTeX publishing, Adobe Photoshop, GIMP, Inkscape, and Zotero / BibTeX reference management)
- Some experience with dynamical systems analysis using XPPAUT

LANGUAGES

English First language

CITIZENSHIP

United States of America

REFERENCES

Sean L. Hill, PhD (postdoctoral advisor)
Professor, Department of Psychiatry, Department of Physiology, University of Toronto, Canada
Director, Krembil Center for Neuroinformatics, Center for Addiction and Mental Health, Toronto, Canada
Co-Director, Blue Brain Project, École Polytechnique Fédérale de Lausanne
Contact: sean.hill@epfl.ch

Armando Romani, PhD (group leader)
Group Leader, Circuits team, Blue Brain Project, École Polytechnique Fédérale de Lausanne
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Emery N. Brown, MD, PhD (postdoctoral advisor)
Edward Hood Taplin Professor of Computational Neuroscience and Health Sciences & Technology, Department of Brain and Cognitive Science, Massachusetts Institute of Technology
Warren M. Zapol Professor of Anaesthesia, Massachusetts General Hospital & Harvard Medical School
Director, Harvard-MIT Health Sciences & Technology, Massachusetts Institute of Technology
Associate Director, Institute for Medical Engineering and Science, Massachusetts Institute of Technology
Contact: enb@neurostat.mit.edu

Nancy Kopell, PhD (PhD advisor and mentor)
Professor, Department of Mathematics & Statistics, Boston University
Director, Cognitive Rhythms Collaborative
Co-Director, CompNet
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Michelle M. McCarthy, PhD
Research Assistant Professor, Department of Mathematics & Statistics, Boston University
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Shane Lee, PhD
Assistant Professor of Neurosurgery (Research), Department of Neurosurgery, Brown University
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