Athanasia Papoutsi, PhD

Research Scientist, Institute of Molecular Biology and Biotechnology (IMBB), Foundation for Research and Technology Hellas (FORTH).
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Professional and Research Experience

Principal Staff Scientist, IMBB/FORTH ***February 2020-***

Einstein Visiting Scientist, Larkum Lab, Humboldt University ***March 2020-April 2022***
Inhibitory circuits *in vivo*

H.F.R.I. Research Associate, IMBB, FORTH ***November 2018-January 2020***
Spine dynamics *in vivo*

NeuroCure Visiting Postdoctoral Fellow, Larkum Lab, Humboldt University ***October 2018-December 2018***
In vivo calcium imaging

NeuroCure Visiting Postdoctoral Fellow, Larkum Lab, Humboldt University ***February 2018-May 2018***
In vivo patch clamp recordings */ In vivo* calcium imaging

Postdoctoral Fellow, Poirazi Lab, IMBB, FORTH ***February 2017–October 2018***
Neuronal modelling

NeuroCure Postdoctoral Fellow, Larkum Lab, Humboldt University ***May 2016-December 2016***
In vivo patch clamp recordings

Postdoctoral Fellow, Poirazi Lab, IMBB, FORTH ***January 2014–April 2016***
Neuronal modelling / patch clamp recordings

EMBL Course on Laboratory Animal Science ***13-24 April 2015***
FELASA Category C accredited

Research Assistant, Poirazi Lab, IMBB, FORTH ***September 2008-March 2009***
Neuronal modelling

Education

PhD in Computational Neuroscience ***March 2009 – January 2014***
Modeling approaches for analyzing the properties of persistent activity in the prefrontal cortex.
Poirazi Lab, IMBB, FORTH and the Department of Biology, University of Crete (UoC)
Advisory committee: Dr. Poirazi (Supervisor, IMBB), Prof. Chalepakis (UoC), Prof. Segev (Hebrew University)

Masters in the Brain and Mind Sciences ***December 2006 – December 2008***
Interdepartmental Graduate Programme, Faculty of Medicine, UOC.
Grade: 9.06/10 (Excellent, with distinction)

Ptychion (BSc) in Biology ***September 2000 - July 2005***
Faculty of Biology, National and Kapodistrian University of Athens (UoA).
Grade: 6.82/10 (Very Good)

Research Support

FORTH Synergy Grant **2022-2024**
Role: PI

NARSAD Young Investigator Award ***2019-2022***
Brain and Behavior Foundation (Role: PI)

H.F.R.I. Research Projects for Postdoctoral Researchers ***2018-2022***
Synaptic Engram of Flexible Behavior (Role: PI)

Publications

Local changes in potassium ions modulate dendritic integration Nordentoft M.S., Papoutsi A., Takahashi N., Heltberg M. S., Jensen M. H., Rasmussen R. N. *bioRxiv*, May 2023.

Editorial: Subcellular computations and information processing Ishikawa, T., Ishikawa, A. W., Papoutsi, A., Tanimura, A. & Yonehara, K. *Front. Synaptic Neuroscience,* March 2023.

A Tale of Two Trees: Modeling Apical and Basal Tree Contribution to L2/3 V1 Pyramidal Cell Orientation Selectivity, Petousakis, K.-E., Park, J., Papoutsi, A., Smirnakis, S. & Poirazi, P., *bioRxiv*, August 2022.

Illuminating dendritic function with computational models Poirazi P., Papoutsi A., *Nature Reviews Neuroscience*, May 2020.

Novel dendritic action potentials shape the computational properties of human layer 2/3 cortical neurons Gidon A., Zolnik T.A., Fidzinski P., Bolduan F., Papoutsi A., Poirazi P., Holtkamp M., Vida I., Larkum M.E. *Science,* January 2020.

Structured connectivity exploits NMDA non-linearitites to induce dimensionally diverse responses in a PFC circuit Stamatiadis S.S., Papoutsi A., Poirazi P. *bioRxiv*, August 2019.

Contribution of Apical and Basal Dendrites of L2/3 Pyramidal Neurons to Orientation Encoding in Mouse V1 Park J.*, Papoutsi A.*, Ash R.T., Marin M.A., Poirazi P.**, Smirnakis S.M.**. *Nature Communications*, November 2019. *equal first, ** equal last

Optically Induced Calcium-Dependent Gene Activation and Labeling of Active Neurons Using CaMPARI and Cal-Light Christian Ebner C., Ledderose J., Zolnik T.A., Dominiak S.E., Turko P., Papoutsi A., Poirazi P., Britta J.E., Vida I., Larkum M.E., Sachdev R.N.S. *Frontiers in Synaptic Neuroscience*, May 2019.

Basal tree complexity shapes functional pathways in the prefrontal cortex Papoutsi A., Kastellakis G., Poirazi P. *Journal of Neurophysiology*, October 2017.

Introduction to the Computational Neuroscience Special Section Remy S., Poirazi P., Papoutsi A. *European Journal of Neuroscience*, March 2017.

A Simulation Study on the Effects of Dendritic Morphology on Layer V PFC Pyramidal Cell Firing Behavior Psarrou M., Stefanou S. S., Papoutsi A., Tzivilaki A., Cutsuridis V., Poirazi P. *Frontiers in Cellular Neuroscience*, September 2014.

Dendritic nonlinearities reduce size requirements and mediate ON and OFF states of persistent activity in a PFC microcircuit model Papoutsi A., Sidiropoulou K., Poirazi P. *Plos Comp. Biology*, July 2014.

Modulatory effects of inhibition on persistent activity in a cortical microcircuit model Konstantoudaki X., Papoutsi A., Chalkiadaki K., Poirazi P., Sidiropoulou K. *Frontiers in Neural Circuits*, January 2014.

Induction and modulation of persistent activity in a layer V PFC microcircuit model Papoutsi A., Sidiropoulou K., Cutsuridis V., Poirazi P. *Frontiers in Neural Circuits*, October 2013.

Coding and Decoding with Dendrites Papoutsi A., Kastellakis G., Psarrou M., Anastasakis S., Poirazi P. *Journal of Physiology-Paris*, February 2013.

Memory Beyond Synaptic Plasticity: The Role of Intrinsic Neuronal Excitability Papoutsi A., Sidiropoulou K., Poirazi P., Book Chapter in *Memory Mechanisms in Health and Disease: Mechanistic Basis of Memory*, World Scientific Pub Co Inc., 2012.

Conference papers

An Architecture for the Acceleration of a Hybrid Leaky Integrate and Fire SNN on the Convey HC-2ex FPGA-Based Processor Kousanakis E., Dollas A., Sotiriades E., Papaefstathiou I., Pnevmatikatos D.N., Papoutsi A., Petrantonakis P., Poirazi P., Chavlis S., Kastellakis G. selected full paper, *FCCM 2017 (IEEE).*

An Architecture for the Acceleration of the Hodgkin and Huxley Spiking Neural Network Model on the Convey HC-2ex FPGA-Based Processor Kousanakis E., Dollas A., Sotiriades E., Papaefstathiou I., Pnevmatikatos D., Papoutsi A., Petrantonakis P.C., Poirazi P. *WRC 2016*, Prague.

Towards Predicting Persistent Activity of Neurons by Statistical and Fractal Dimension-Based Features Petrantonakis P., Papoutsi A., Poirazi P. 2013 *International Joint Conference on Neural Networks*.

Invited Speaker

The CapoCaccia Workshops toward Neuromorphic Intelligence, April 2023, Alghero, Italy.

OIST Neuroscience Online Seminars (ONOS), April 2021, Okinawa, Japan.

IBRO-Simons Computational Neuroscience Imbizo, January 2020, Cape Town, South Africa.

IBRO-Simons Computational Neuroscience Imbizo, January 2019, Cape Town, South Africa.

EITN Workshop, Dendritic integration and computation with active dendrites, February 2018, Paris, France.

CNS Workshop, Dendrite function and wiring: experiments and theory, July 2015, Prague, Czech Republic.

Selected Oral Presentations

Modeling of orientation preference in the apical and basal tress of L2/3 V1 pyramidal neurons HSfN 2019, October 2019, Heraklion, Crete (selected junior scientist speaker).

A Tale of Two Trees: Modeling Apical and Basal Tree Contribution to L2/3 V1 Pyramidal Cell Orientation Selectivity Petousakis K.E., Papoutsi A., Poirazi. P. HSfN 2017, December 2017, Athens, Greece.

Contribution of Apical and Basal Dendrites to Orientation Encoding of Pyramidal Neurons in Mouse V1 Park J., Papoutsi A., Marin M.A., Ash R.T., Rasband M.N., Poirazi P., M. Smirnakis S.M., Dendrites 2016 EMBO Workshop, Heraklion, Greece.

The role of microcircuits in the pre-frontal cortex in detecting and encoding temporally patterned information Melachrinos C., Papoutsi A., Poirazi P. "Rate vs. temporal coding schemes: mutually exclusive or cooperatively coexisting? CNS 2015 Workshop", July 2015, Prague, Czech Republic.

Mechanisms underlying the emergence of Up and Down states in a model PFC microcircuit Krioneriti D., Papoutsi A., Poirazi P. CNS 2011, Stockholm, Sweden.

Posters

Peer reviewed poster presentations

Structured connectivity exploits NMDA-non-linearities to induce diverse responses in a PFC Circuit Stefanou S.S., Papoutsi A., Poirazi P. CNS (2019), Barcelona, Spain.

M**odeling orientation preference in the apical and basal trees of L2/3 V1 neurons** Papoutsi A., Park J., Ash R.T., Smirnakis S.M., Poirazi P. CNS (2017), Antwerp, Belgium.

The effect of basal and apical tree biophysical properties on the orientation tuning of a single L2/3 pyramidal neuron Kontodimou G., Papoutsi A., Poirazi P. EMBO Conference: Dendritic Anatomy, Molecules and Function (2016), Heraklion, Greece.

The role of microcircuits in the pre-frontal cortex in detecting and encoding temporally patterned information Melachrinos C., Papoutsi A., Poirazi P. CNS (2015), Prague, Czech Republic.

Interplay of dendritic non-linearities and network size mediate persistent activity in a PFC microcircuit model Papoutsi A., Sidiropoulou K., Poirazi P. Front. Syst. Neurosci. Conference Abstract: 4th NAMASEN Training Workshop - Dendrites (2014), Heraklion, Greece.

Structured Connectivity Shapes Microcircuit Function in the Prefrontal Cortex Stamatiadis S.S., Papoutsi A., Poirazi P. Front. Syst. Neurosci. Conference Abstract: 4th NAMASEN Training Workshop - Dendrites (2014), Heraklion, Greece.

A simulation study on the effects of dendritic morphology on layer V PFC pyramidal cell firing behavior Psarrou M., Stefanou S.S., Tzilivaki A., Papoutsi A., Cutsuridis V., Poirazi P. Front. Syst. Neurosci. Conference Abstract: 4th NAMASEN Training Workshop-Dendrites (2014), Heraklion, Greece.

A simulation study on the effects of dendritic morphology on layer V PFC pyramidal cell firing behavior Psarrou M., Stefanou S.S., Tzilivaki A., Papoutsi A., Cutsuridis V., Poirazi P. AREADNE (2014), Research in Encoding and Decoding of Neural Ensembles, Santorini, Greece.

Non-random microcircuits shape prefrontal function Stefanou S.S., Papoutsi A., Poirazi P. AREADNE (2014), Research in Encoding and Decoding of Neural Ensembles, Santorini, Greece.

Dendritic nonlinearities enable PFC microcircuits to serve as predictive modules of persistent activity Papoutsi A., Petrantonakis P., Poirazi P. CNS (2013), Paris, France.

Influence of dendritic morphology on single neuron arithmetic Psarrou M., Papoutsi A., Poirazi P. AREADNE (2012), Research in Encoding and Decoding of Neural Ensembles, Santorini, Greece.

Mechanisms underlying the emergence of Up and Down states and their transition to persistent firing in a model PFC microcircuit Krioneriti, D, Papoutsi, A., Poirazi, P, EMBO Conference, The Assembly and Function of Neuronal Circuits, Ascona (2011), Switzerland.

Microcircuits in the prefrontal cortex: In silico investigation of their role in the emergence, maintenance and termination of persistent activity Papoutsi A., Sidiropoulou K. Poirazi P. AREADNE (2010), Research in Encoding and Decoding of Neural Ensembles, Santorini, Greece.

Distinct interneuron cell types shape persistent activity properties in a PFC microcircuit model Konstandoudaki X., Papoutsi A., Sidiropoulou K., Poirazi, P. AREADNE (2010), Research in Encoding and Decoding of Neural Ensembles, Santorini, Greece.

Information coding via persistent activity in layer V prefrontal cortical neuron models Sidiropoulou K., Papoutsi A., Poirazi P. EMBO Conference: The Assembly and Function of Neuronal Circuits, Ascona (2009), Switzerland.

The role of distinct interneuron cell types in initiation and maintenance of persistent activity in a prefrontal cortical microcircuit model Konstantoudaki X., Sidiropoulou K., Papoutsi A., Poirazi P. Frontiers in Behavioral Neuroscience (2009). 41st EBBS Meeting, Rhodes Island, Greece.

Mechanisms underlying persistent activity in a model PFC microcircuit Papoutsi A., Sidiropoulou K., Poirazi P. CNS (2009), Berlin, Germany.

Biophysical mechanisms involved in initiating and maintaining persistent activity in a PFC pyramidal model neuron Sidiropoulou K., Papoutsi A., Poirazi P. AREADNE (2008), Research in Encoding and Decoding of Neural Ensembles, Santorini, Greece.

Poster Presentations

Investigating the Synaptic Dynamics of Adaptive Behavior in the mouse frontal cortex Pandi I., Oraby H., Nashaat M., Larkum M., Papoutsi A., Poirazi P. FRM (2023), Algarve, Portugal.

Structured Connectivity Shapes Network Function in the Prefrontal Cortex Stefanou S. S., Petrantonakis P., Papoutsi A., Poirazi P. FENS Forum (2016), Copenhagen, Denmark.

Single-neuron integration of background activity generates prolonged depolarizations in a PFC model cell Papoutsi A., Georgopoulou D., Poirazi P. FENS (2012), Barcelona, Spain.

Influence of dendritic morphology on single neuron arithmetic Psarrou M., Papoutsi A., Poirazi P. The 8th FENS Forum of Neuroscience (2012), Barcelona, Spain.

Encoding of persistent firing in a model of layer V prefrontal cortical neurons Sidiropoulou K., Papoutsi A., Poirazi P. Society for Neuroscience (2009), Chicago, IL, USA.

Cellular and synaptic mechanisms underlying persistent activity in a model PFC microcircuit Papoutsi A., Sidiropoulou K., Poirazi P. 22nd Conference of the HSfN (2008), Athens, Greece.

The role of cellular and synaptic mechanisms during persistent activity in a model neuron Papoutsi A., Sidiropoulou K., Poirazi P. 21st Conference of the HSfN (2007), Thessaloniki, Greece.

Expression and function of the GABAA receptor during differentiation of P19-N neurons Xilouri M., Papoutsi A., Papazafiri P. 27th Scientific Conference of the Hellenic Society for Biological Sciences (2005), Nafplio, Greece.

Awards / Scholarships

Postdoctoral Fellow, IMBB, FORTH (ERC STG: *dEMORY*, January 2014-October 2018).

PhD Scholarship, IMBB, FORTH (ERC STG: *dEMORY*, January 2013-December 2013).

PhD Scholarship, IMBB, FORTH (NSRF grant: *Synergasia*, October 2011-December 2012).

PhD Scholarship, IMBB, FORTH (FP-7 grant: *HP-SEE*, September 2010- September 2011).

PhD Scholarship, IMBB, FORTH, (September 2009-September 2010).

Theodor-Theochari Cozzika Award, Young Greek Neuroscientist Award for the poster presentation during the 22nd conference of HSfN (October 2008).

Maria-Michail Manassaki Scholarship, UoC (October 2007 - September 2008).

Maria-Michail Manassaki Scholarship, UoC (October 2006 - September 2007).

Hellenic Mathematical Society Award, 56th National Mathematical Competition (January 1996).

Greek Ministry of Education Award, for exceptional performance (June 1994).

Teaching Experience

MSc-level seminars / Courses

Course organizer/Lecturer, *Principles of Computational Modeling in Neural Circuits*, Graduate Program in Neurosciences (biennial, open also for the Brain and Mind and Bioinformatics Master Programs), University of Crete, Greece, 2020 - .

Lecturer, *Reinforcement Learning*, Brain and Mind Graduate Programme, 23 &26 May, 2023.

Lecturer, *Synaptic Plasticity Models*, MSc-level seminar, Multicellular organization of life course, Molecular Biology and Biomedicine Program, Heraklion, Greece, 2022 & 2023.

Lecturer, *Grundlagen der Physiologie des Neocortex SoSe 2021*, Master Level Course, Humbodt University, Berlin, Germany, 01-11/06 2021.

Lecturer, *Computational Neuroscience Course*, Athens International Master's Programme in Neurosciences, National and Kapodistrian University of Athens, Greece, March 11th, 2021.

Lecturer, *The role of dendrites in information processing: Insights from computational models*, Medical School, University of Patras, February 11th, 2016.

Tutor in Computational Neuroscience
IBRO-Simons Computational Neuroscience Imbizo, Cape Town (7-28 January 2018).

IBRO-Simons Computational Neuroscience Imbizo, Cape Town (9-28 January 2017).

Teacher of Biology
Epilogi Preparatory School, Heraklion, Crete (September 2008-June 2014).

Student supervision

PhD candidates:
Jiameng Wu, Psychedelics and neuronal circuits, Member of the supervision committee, Humboldt University, since 2022.

Konstantinos-Evangelos Petousakis Dissecting Orientation Selectivity in L2/3 V1 Neurons Using Detailed Computational Models, July 2019 - March 2022.

Ioanna Pandi Spine remodeling in an animal model of schizophrenia, July 2019- March 2022.

Students:

Lydia Ntanavara (Post-graduate research assistant) Mechanistic Understanding of behavioral flexibility, October 2022-February 2023.

Iliana Mantouka (MSc student), Development of a task for flexible behavior in mice, September-November 2022.

Sotiris Papadopoulos (MSc student) Implementation of the dendritic spikes of human neurons in an artificial neural network, May 2019-April 2020.

Georgia Soursou (MSc student) Anticoincidence detection in the dendrites of human neurons, February 2019-January 2020.

Fabian Bentely (MSc student) Simulation of pyramidal neurons with the python library Brian, October 2018-March 2019.

Georgia Kontodimou *(*MSc student) The effect of basal and apical tree biophysical properties on the orientation tuning of a single L2/3 pyramidal neuron model, March 2016-September 2016.

Konstantinos-Evangelos Petousakis (MSc student) The effect of inhibition and receptive field on the orientation tuning of a single L2/3 pyramidal neuron model, March 2017-March 2019.

Eleni Genitsaridi (MSc student) A computational study on the role of the diverse properties (single cell and network related) of projection neurons in the olfactory bulb: Mitral and Tufted cells, November 2015-March 2016.

Dimitra Georgopoulou (BSc student) Impact of basal dendrites in the emergence of Up and Down states, Undergraduate Practical training, May 2011-June 2011.

Maria Psarrou (MSc student) Role of dendritic morphology and ionic mechanisms on bursting activity in pyramidal neurons, March 2010 - March 2011.

Daphne Krioneriti (MSc student) Modeling up and down states in a PFC microcircuit, May 2010-June 2011.

Positions of Responsibility and Interests

Co-editor

Tomoe Ishikawa, Ayako Wendy Ishikawa, Athanasia Papoutsi, Asami Tanimura and Keisuke Yonehara, "**Subcellular Computations and Information Processing**", Frontiers Research Topic (2022).

Athanasia Papoutsi , Yiota Poirazi, Stefan Remy, European Journal of Neuroscience **Special Issue on Computational Models** (2017).

Ad hoc reviewer for
European Journal of Neuroscience, PLoS Computational Biology, Nature Communications, Nature Neuroscience, Frontiers, ELife, CNS meetings.

Review Editor for:
Frontiers in Neural Circuits.

Organizer of
Symposium: Athanasia Papoutsi and Spyridon Chavlis, **Encoding in neurons and beyond: applications in machine learning**, FENS 2022, Paris, France.

Tutorial: Everton Agnes, Spyridon Chavlis, Athanasia Papoutsi, William Podlaski, **Simulating dendrites at different levels of abstraction**, CNS 2019, Barcelona, Spain.

Workshops:
Panayiota Poirazi, Athanasia Papoutsi, Constantinos Melachrinos, **Evidence For and Against Synaptic Clustering and Its Role in Neuronal Functions**, COSYNE 2015, Denver, USA.

Spyridon Chavlis, Athanasia Papoutsi, Naoya Takahashi, **Dendritic computations and neuro-inspired AI**, COSYNE 2023, Montreal, Canada.

Other Responsibilities
Member of the OCNS Program Committee, since 2022.

Selection committee of the Bernstein SmartSteps award, 2021.

Member of the ALBA network, since 2021.

Member of the Gender Equality Committee, FORTH, Greece, since 2021.

Member of EU-LIFE workgroup for Gender Equality, since 2020.

Member of IMBB Gender Equality Group, since 2020.