

Lisa Mapelli, PhD

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Graduated in *Biological Sciences* (2004, University of Pavia)

Ph.D. in *Physiological Sciences and Neuroscience* (2008, University of Pavia)

National Academic Qualification (ASN) as Associate Professor (2018, 05/D1, Physiology)

Current position:

Assistant Professor (senior researcher – RTDb; University of Pavia)

Board member of the PhD course in Biomedical Sciences (University of Pavia)

Associate Editor for *Frontiers in Cellular Neuroscience*

EDUCATION AND SCIENTIFIC EXPERIENCE

2019 to present: Assistant Professor (Senior Researcher - RTDb) at the University of Pavia, Dept of Brain and Behavioral Sciences, Neurophysiology Unit.

2016-2019: Assistant Professor (RTDa) at the Dept of Brain and Behavioral Sciences, funded by the University of Pavia.

2015: Postdoctoral position ("assegno di ricerca"-AR) awarded by the Museo Storico della Fisica e Centro Studi e Ricerche Enrico Fermi (Rome).

2012-2014: postdoctoral position (AR) at the Dept of Brain and Behavioral Sciences, University of Pavia.

2010–2012: postdoctoral position (AR) at the CNR-Institute of Neuroscience in Milan.

2009–2010: postdoctoral position (AR) at the Department of Biomolecular Sciences and Biotechnology at the University of Milan.

2008: postdoctoral position ("première assistante") at the Department of Cell Biology and Morphology at the University of Lausanne, funded by the *Synapsis Foundation*.

2004–2007: PhD student in *Physiological Sciences and Neuroscience* at the Neurophysiology laboratory under the supervision of Prof. Egidio D'Angelo (Dept of

Cellular/Molecular Physiological and Pharmacological Sciences, University of Pavia, Italy).

PhD thesis: *Inhibitory control of neurotransmission in the cerebellar glomerular synapses.*

2004-2007: Student of the "Scuola Avanzata di Formazione Integrata" (SAFI) in the "Istituto Universitario di Studi Superiori" (IUSS), Pavia. Final thesis completed in October 2007.

2004: final degree at the Scuola Universitaria Superiore (SUS), in the IUSS.

2004: degree in Biology at the University of Pavia (110/110 *cum laude*).

Dissertation in Neurophysiology: *Neurotransmission and plasticity in an inhibitory synapse of rat cerebellum.*

TEACHING ASSIGNMENTS

Since AA 2019-2020: "Neurophysiology" course (6CFU, MSc in Psychology, Neuroscience and Human Sciences) at the University of Pavia

Since AA 2016-2017: 4 CFU of the "Human Physiology" course (faculty of Pharmacy) at the University of Pavia.

Currently co-supervisor of two PhD students on the characterization of cerebellar cortical network activity using the high-density MEA and optogenetics in acute slices.

Previously supervisor and co-supervisor of 7 PhD students spanning from the electrophysiological characterization of cerebellar alterations in autism to neurovascular coupling in the cerebellum to cerebellar connectivity with the prefrontal cortex *in vivo*.

Supervisor and co-supervisor of several undergraduate thesis in Biological Sciences, Biotechnology, and Pharmacy at the Universities of Milan and Pavia

Teacher at the SIF "Course of Physiology and Biophysics" in Pavia (2015), on electrophysiological recordings using MEA and extracellular signals analysis.

Teacher at the PhD training course of the Dept. of Biomolecular Sciences and Biotechnology of the University of Milan (2009) on: Electrophysiological approach to the study of an inhibitory connection.

2008: tutor of a PENS Summer School student at the University of Lausanne, with the project: Patch-clamp recordings and electroporation in the study of thalamic neurons.

EDITORIAL ROLES

co-Editor of the Special Topic: “From cell physiology to emerging brain functions” for *Frontiers in Cellular Neuroscience* (2018-2019).

Associate Editor at *Frontiers in Cellular Neuroscience* (since 2017)

Review Editor for *Frontiers in Cellular Neuroscience* (since 2012).

Invited reviewer for several international Journals including: PNAS, The Journal of Physiology, PLOS one, International Journal of Molecular Sciences, *Frontiers in Synaptic Neuroscience*, Peer J.

TECHNICAL SKILLS

Electrophysiology (single cell and extracellular recordings) in brain slices, brain primary cultures, iPSC.

Multi-electrode array (MEA) recordings (single-unit and local field potentials) in vivo, in slices and CNS organoids.

Voltage sensitive dye imaging (VSDi) in brain slices.

Optogenetics using adeno-associated viral vectors (ChR2, Chrimson, eNpHR 3.0 expression in brain slices and in vivo).

Calcium-imaging (GCaMP6f) in freely behaving mice.

FOREIGN LANGUAGES

Excellent written and spoken English language

School learning of French language

Basis of written and spoken Russian language

SUMMARY OF RESEARCH ACTIVITY

Since the beginning, the main focus of the research activity has been on the role of inhibition and excitation in shaping neuronal activity and plasticity. Neuronal activity can be investigated at the molecular, cellular, and network level. For this reason, different models were used, from cellular cultures, primary neuronal cultures, acute slices from different rodent CNS regions, human CNS organoids, in vivo anesthetized, and in vivo freely moving mice. Depending on the specific scientific question, different techniques were used to obtain functional data from these models: electrophysiological techniques (whole-cell patch-clamp, extracellular recordings, multi-electrode arrays), imaging (voltage-sensitive dyes, calcium sensors, nitric oxide sensors), and optogenetics.

At present, Lisa Mapelli's research is focused on the network and connectivity level in cerebellar and brain slices, human organoids, and in vivo. Her lab is part of the Human Brain Project and involved in characterizing the cerebellar network in physiological and pathological conditions (as autism spectrum disorders using a mouse model of the disease), and recently expanded the research interest to the mechanisms of neurovascular coupling in the cerebellum.

Lisa Mapelli attended several national and international scientific meetings since 2004 to present, among which: meetings of the Society for Neuroscience (SfN), FENS Forum of European Neuroscience, Society for the Research on the Cerebellum meetings, meetings of the Italian Physiological Society and of the Italian Neuroscience Society (more than 60 contributions as posters or oral communications, more than 10 publications of Conference Proceedings).

PUBLICATIONS ON PEER-REVIEWED JOURNALS

Total number of full papers published in peer-reviewed journals (2006-2021): 26 (average IF: 5.65; H index 16, n. citations 754; source: Scopus).

- 1) Prestori F, Montagna I, D'Angelo E, **Mapelli L** (2020). The optogenetic revolution in cerebellar investigations. *Int J Mol Sci*, Apr 3;21(7):2494. doi: 10.3390/ijms21072494
- 2) Prestori F, **Mapelli L**, D'Angelo E (2019). Diverse Neuron Properties and Complex Network Dynamics in the Cerebellar Cortical Inhibitory Circuit. *Front Mol Neurosci*, doi: 10.3389/fnmol.2019.00267
- 3) Tapella L, Soda T, **Mapelli L**, Bortolotto V, Bondi H, Ruffinatti FA, Dematteis G, Stevano A, Dionisi M, Ummarino S, Di Ruscio A, Distasi C, Grilli M, Genazzani AA, D'Angelo E, Moccia F, Lim D (2019). Deletion of calcineurin from GFAP-expressing astrocytes impairs excitability of cerebellar and hippocampal neurons through astroglial Na⁺/K⁺ ATPase. *GLIA*, Oct 18, doi: 10.1002/glia.23737
- 4) Moscato L, Montagna I, De Propriis L, Tritto S, **Mapelli L***, D'Angelo E* (2019). Long-Lasting Response Changes in Deep Cerebellar Nuclei in vivo Correlate With Low-Frequency Oscillations. *Front Cell Neurosci*, 6;13:84, ISSN: 1662-5102, doi: 10.3389/fncel.2019.00084 (* co-last author and corresponding author)

- 5) Soda T*, **Mapelli L***, Locatelli F, Botta L, Goldfarb M, Prestori F, D'Angelo E (2019). Hyper-excitability and hyper-plasticity disrupt cerebellar signal transfer in the *IB2* KO mouse model of autism. *J Neurosci*, 27;39(13):2383-2397, ISSN: 1529-2401, doi: 10.1523/JNEUROSCI.1985-18.2019 (* co-first author)
- 6) Lim D, **Mapelli L**, Canonico PL, Moccia F, Genazzani AA (2018). Neuronal Activity-Dependent Activation of Astroglial Calcineurin in Mouse Primary Hippocampal Cultures. *International Journal of Molecular Sciences*, vol. 19, ISSN: 1422-0067, doi: 10.3390/ijms19102997
- 7) Gandolfi D, Cerri S, Mapelli J, Polimeni M, Tritto S, Fuzzati-Armentero MT, Bigiani A, Blandini F, **Mapelli L**, D'Angelo E (2017). Activation of the CREB/c-Fos Pathway during Long-Term Synaptic Plasticity in the Cerebellum Granular Layer. *Frontiers in Cellular Neuroscience*, vol. 11, ISSN: 1662-5102, doi: 10.3389/fncel.2017.00184
- 8) **Mapelli L**, Gagliano G, Soda T, Laforenza U, Moccia F, D'Angelo E (2017). Granular layer neurons control cerebellar neurovascular coupling through an NMDA receptor/NO-dependent system. *Journal of Neuroscience* 37(5):1340-1351 doi: 10.1523/JNEUROSCI.2025-16.2016
- 9) Lim D, Rocchio F, **Mapelli L**, Moccia F (2016). From pathology to physiology of calcineurin signalling in astrocytes. *Opera Medica et Physiologica* 2;46-61, ISSN: 2500-2295, doi: 10.20388/OMP2016.002.0029
- 10) D'Angelo E, Antonietti A, Casali S, Casellato C, Garrido JA, Luque N, **Mapelli L**, Masoli S, Pedrocchi A, Prestori F, Rizza MF, Ros E (2016) Modelling the cerebellar microcircuit: new strategies for a long-standing issue. *Frontiers in Cellular Neuroscience*. ISSN: 1662-5102 doi:10.3389/fncel.2016.00176
- 11) D'Angelo E, **Mapelli L**, Casellato C, Garrido JA, Luque N, Monaco J, Prestori F, Pedrocchi A, Ros E (2015) Distributed circuit plasticity: new clues for the cerebellar mechanisms of learning. *Cerebellum*. ISSN: 1473-4222 doi:10.1007/s12311-015-0711-7
- 12) **Mapelli L**, Pagani P, Garrido JA, D'Angelo E (2015) Integrated plasticity at inhibitory and excitatory synapses in the cerebellar circuit. *Frontiers in Cellular Neuroscience*. ISSN: 1662-5102 doi:10.3389/fncel.2015.00169
- 13) Moccia F, Zuccolo E, Soda T, Tanzi F, Guerra G, **Mapelli L**, Lodola F, D'Angelo E (2015). Stim and Orai proteins in neuronal Ca²⁺ signalling and excitability. *Frontiers in Cellular Neuroscience*. ISSN: 1662-5102 doi:10.3389/fncel.2015.00153
- 14) Mignogna ML, Giannandrea M, Gurgone A, Fanelli F, Raimondi F, Mapelli L, Bassani S, Fang H, van Anken E, Alessio M, Passafaro M, Gatti S, Esteban JA, Hugarir R, and D'Adamo P (2015). The Intellectual Disability protein RAB39B regulates selectively GluA2 trafficking determining synaptic AMPAR composition. *Nature Communications*, 6(6504) doi:10.1038/ncomms7504
- 15) Ronco V, Potenza DM, Denti F, Vullo S, Gagliano G, Tognolina M, Guerra G, Pinton P, Genazzani AA, **Mapelli L**, Lim D, Moccia F (2015). A novel Ca²⁺-mediated cross-talk between endoplasmic reticulum and acid organelles: implications for NAADP-dependent Ca²⁺ signalling. *Cell Calcium*, 57(2):89-100, doi: 10.1016/j.ceca.2015.01.001
- 16) Curatolo P, Ben-Ari Y, Bozzi Y, Catania MV, D'Angelo E, **Mapelli L**, Oberman LM, Rosenmund C, Cherubini E (2014). Synapses as therapeutic targets for autism spectrum disorders: an international symposium held in Pavia on July 4th, 2014. *Frontiers in Cellular Neuroscience*, ISSN: 1662-5102

- 17) *Nieus TR, ***Mapelli L**, D'Angelo E (2014). Regulation of output spike patterns by phasic inhibition in cerebellar granule cells. *Frontiers in Cellular Neuroscience*, ISSN: 1662-5102 (* equally contributed).
- 18) Folci A, **Mapelli L**, Sassone J, Prestori F, D'Angelo E, Bassani S, Passafaro M (2014). Loss of hnRNP K Impairs Synaptic Plasticity in Hippocampal Neurons. *The Journal of Neuroscience*, ISSN: 0270-6474
- 19) **Mapelli L**, Solinas S, D'Angelo E (2014). Integration and regulation of glomerular inhibition in the cerebellar granular layer circuit. *Frontiers in Cellular Neuroscience*, vol. 8, ISSN: 1662-5102, doi: 10.3389/fncel.2014.00055
- 20) Prestori F, Bonardi C, **Mapelli L**, Lombardo P, Goselink R, De Stefano ME, Gandolfi D, Mapelli J, Bertrand D, Schonewille M, De Zeeuw C, D'Angelo E (2013). Gating of long-term potentiation by nicotinic acetylcholine receptors at the cerebellum input stage. *Plos One*
- 21) Egidio D'Angelo, Sergio Solinas, Jonathan Mapelli, Daniela Gandolfi, **Lisa Mapelli**, Francesca Prestori (2013). The cerebellar Golgi cell and spatiotemporal organization of granular layer activity. *Frontiers in Neural Circuits*, vol. 7, ISSN: 1662-5110
- 22) Brandalise F, **Mapelli L**, Gerber U, Rossi P (2012). Golgi Cell-Mediated Activation of Postsynaptic GABAB Receptors Induces Disinhibition of the Golgi Cell-Granule Cell Synapse in Rat Cerebellum. *Plos One*
- 23) **Mapelli L**, Canale C, Pesci D, Averaimo S, Guizzardi F, Fortunati V, Falasca L, Piacentini M, Gliozzi A, Relini A, Mazzanti M, Jodice C (2012) Toxic effects of expanded ataxin-1 involve mechanical instability of the nuclear membrane. *Biochimica et Biophysica Acta* **1822(6)**:906-17
- 24) **Mapelli L**, Rossi P, Nieus T, D'Angelo E (2009) Tonic activation of GABA-B receptors reduces release probability at inhibitory connections in the cerebellar glomerulus. *J Neurophysiol* **101(6)**, 3089-99
- 25) Rossi P, **Mapelli L**, Roggeri L, Gall D, de Kerchove d'Exaerde A, Schiffmann SN, Taglietti V, D'Angelo E (2006) Inhibition of constitutive inward rectifier currents in cerebellar granule cells by pharmacological and synaptic activation of GABA_B receptors. *European J Neurosci* **24**, 419-432
- 26) Offenhauser N*, Castelletti D*, **Mapelli L**, Ekalle Soppo B, Regondi MC, Rossi P, D'Angelo E, Frassoni C, Amadeo A, Tocchetti A, Pozzi B, Disanza A, Guarnieri D, Betsholtz C, Scita G, Heberlein U, Di Fiore PP (2006) Increased ethanol resistance and consumption in eps8 knockout mice correlates with altered actin dynamics. *CELL* **127**, 213-226 (* as coauthor)

CONTRIBUTIONS IN SCIENTIFIC TEXTBOOKS

Co-author of the following chapters of the textbook: "Fisiologia e nutrizione per scienze motorie" (Poletto Editore, ed. 2019): "Funzione cellulare", "Funzione endocrina", "Adattamenti omeostatici all'esercizio e heart rate variability - box Regolazione dei processi vitali"

ORAL COMMUNICATIONS

Invited speaker at the 3th HBP Student Conference On Interdisciplinary Brain Research, held at Ghent University, Ghent (Belgium), 6-7 February 2019.

Keynote lecture: *Excitation, inhibition and plasticity in the cerebellar network.*

Invited speaker at the event "Pint of Science" held in Pavia in May 2018.

Oral communication title: *Human Brain Project. Neuroscience and neural functions modeling.*

Invited speaker for the "SIF Prize Lecture" at the 68th SIF National Congress, held in Pavia in September 2017.

Oral communication title: *Synaptic transmission: from physiology to pathology.*

Invited Speaker at the "XXVII Ottorino Rossi Award" entitled "Big Data for Neuroscience", organized by the IRCCS C. Mondino Neurological Institute and the University of Pavia, held in Pavia in October 2017.

Oral communication title: *New Approaches in Neuronal Network Research.*

Invited speaker at the European Researcher Night, at the session organized in Pavia by the Human Brain Project in September 2016

Speaker at the SIF "Course of Physiology and Biophysics" held in Pavia in June 2015

First oral communication title: *Extracellular recordings of spikes and MEA recordings*

Second oral communication title: *MEA signal processing and spike sorting.*

Speaker of a brief communication for the Best Poster Award challenge at the 66th SIF National Congress, Genoa (Italy), held in September 2015.

Oral communication title: *Neurovascular coupling at the cerebellar granular layer.*

Speaker of a brief communication at the 7th International Symposium of the Society for Research in the Cerebellum. Bruxelles (Belgium), held in May 2015.

Oral communication title: *Cerebellar hyper-plasticity in the Ib2 KO mouse model of ASD.*

Speaker at the FENS Satellite Meeting held in Pavia in July 2014: Synapses as therapeutic targets for Autism Spectrum Disorders.

Oral communication title: *Cerebellar plasticity in the Ib2 KO mouse model of ASD.*

Speaker at the informal seminar at the Division of Pharmacology and Neurobiology of the Biozentrum, University of Basel, Switzerland.

Oral communication title: *Quantal properties and dynamics of synaptic inhibition in the cerebellar glomerulus.*

Speaker at the First Meeting of the Italian Doctorate and Bursars in Neuroscience and Related Subjects, Torino, March 2007.

Oral communication title: *Quantal transmission at the Golgi cell to granule cell synapse of rat cerebellum.*

GRANTS

At present:

- Currently involved as scientific coordinator in the tasks and vouchers specified below in the European Union **Human Brain Project** [Third Specific Grant Agreement (**SGA3**) Grant Agreement ID: 945539 (1 April 2020 - 31 March 2023)]

WP1: Task T1.5 (Multiscale regional models of human cerebral cortex, hippocampus, cerebellum and basal ganglia), Task T1.6 (Simulation of whole-brain network dynamics and its rhythmic activity, constrained by region-wide differences), Task T1.15 [Whole-bRaIn rodent SpikING neural NETworks (RisingNet)], Task T5.18 [Arbor Implementation of the Inferior Olive Network (ArborIO)]

Vouchers: i) Enhanced mouse atlas for cerebellar connectivity (ATLAS-cer); ii) BOLD signal reconstruction and simulation from cellular data-driven models (BOLDsim); iii) SODIUM signal reconstruction and simulation from cellular data-driven models (SODIUMsim)

- Currently involved as scientific advisor of two PhD students in the **CEN (Cerebellum and Emotional Networks)** project, a Marie Skłodowska-Curie Innovative Training Network funded by the European Research Council that will support 3 PhD students working across the consortium over the next 4 years (2021-2024).

Past grants:

- 2017 to 2019: **Principal Investigator (PI)** of the **Blue Sky Research (BSR)** grant of the University of Pavia, with the project "Disentangling the role of prefrontal cortex and cerebellum in autism spectrum disorders".

- 2018 - 2019: **PI** of the **FFABR** (Fondo per il Finanziamento delle Attività Base di Ricerca) granted by the Italian Ministero dell'Istruzione, dell'Università e della Ricerca (MIUR).

- Scientific coordination of the following tasks in the European Union **Human Brain Project** [Second Specific Grant Agreement (**SGA2**) Grant Agreement ID: 785907 (1 April 2018 - 31 March 2020)]

SP1: T1.2.5 Structure and function of the interneurons of microcircuits within the cerebellar cortex

T1.4.2 Multiscale organization of circuit activity and plasticity in the mouse cerebellum following patterned sensory stimulation

T1.4.5 Structural and functional connectomics of brain subcircuits using multiscale recording techniques with cellular resolution

Co designed project: CDP2 Mouse-Based Cellular Cortical and Subcortical Microcircuit Models

- participation and coordination of specific tasks in the European Union **Human Brain Project** [First Specific Grant Agreement (**SGA1**) Grant Agreement ID: 720270 (1 Apr 2016 - 31 Mar 2018)]

SP1 - T1.2.4 - Morphological Reconstruction and Physiological Characterization of Cerebellar Neurons

CDP2 - Mouse-Based Cellular Cortical and Sub-Cortical Microcircuit Models

AWARDS

2017: SIF Prize, as best Young Researcher in Physiology for 2017 (awarded by the Italian Physiological Society).

2008: Best Poster Award in the session Plasticity at the meeting: Molecular Mechanisms in Neuroscience (Milan), with the poster: Tonic activation of GABA-B receptors regulate release probability and the dynamics of synaptic inhibition in the cerebellar glomerulus.

Pavia, 31/03/2021

Autorizzo il trattamento dei miei dati personali ai sensi del Decreto Legislativo 30 giugno 2003, n. 196 "Codice in materia di protezione dei dati personali".