

CURRICULUM VITAE

ILARIA COLOMBI

1. PERSONAL DATA

2. EDUCATION AND DEGREES

- 21/02/2019** **PhD in Neuroscience**, curriculum **Neuroscience and Neurotechnology**, Università degli Studi di Genova, Genova, Italy
- 31/03/2015** **Master in Bioengineering**, 110/110 with worthiness of publication, Università degli Studi di Genova, Genova, Italy
- 28/09/2012** **Bachelor of Biomedical Engineering**, Università degli Studi di Genova, Genova, Italy

3. CURRENT POSITION

- 1/11/2021-present **Postdoctoral Awarded Fellowship from Jerome Lejeune Foundation**
Brain Development and Disease group, Department of Neuroscience and Brain Technologies, Istituto Italiano di Tecnologia, Genova

4. RESEARCH AND WORK EXPERIENCE

- 31/10/2018-31/10/2021** **Post-doctoral Fellow** in the laboratory of Dr. Laura Cancedda.
Brain Development and Disease group, Department of Neuroscience and Brain Technologies, Istituto Italiano di Tecnologia, Genova
- 1/11/2015--31/10/2018** **PhD Student** under the supervision of Dr. Michela Chiappalone
Neural Interface and Network Electrophysiology lab (NINElab), Department of Neuroscience and Brain Technologies, Neurotechnology Unit, Istituto Italiano di Tecnologia, Genova.

Project *“In vitro neuronal networks on MEA: an engineering approach to study the brain in physiological and pathological conditions”*

- 1/05/2015 - 31/10/2015** **Research assistant** under the supervision of Dr. Michela Chiappalone
Neural Interface and Network Electrophysiology lab (NINElab), Department of Neuroscience and Brain Technologies, Neurotechnology Unit, Istituto Italiano di Tecnologia, Genova.
Project *“Long-term characterization of neuronal activity through Micro-Electrode Arrays (MEAs): experiments and analysis”*
- 1/07/2015 - 24/07/2015** **Visiting scholar (INCF Travel Grant)**
Faculty of Pharmaceutical, Biomedical and Veterinary Sciences. Dept Biomedical Sciences. Theoretical Neurobiology & Neuroengineering. University of Antwerp, Belgium
- 30/05/2014 - 30/04/2015** **Research assistant** for Master Thesis under the supervision of Dr. Michela Chiappalone and Dr Valter Tucci
Neural Interface and Network Electrophysiology lab (NINElab), Department of Neuroscience and Brain Technologies, Neurotechnology Unit, Istituto Italiano di Tecnologia, Genova.
Project *“Circadian rhythm monitoring and manipulation in neural assemblies”*.
- 01/03/2011 - 30/12/2012** **Research assistant** for Bachelor’s Degree, Neural Interface and Network Electrophysiology lab (NINElab), Department of Neuroscience and Brain Technologies, Neurotechnology Unit, Istituto Italiano di Tecnologia, Genova. Supervisor Michela Chiappalone.
Project: *“Effects of antiepileptic drugs on hippocampal neurons coupled to micro-electrode arrays”*

5. PROFESSIONAL SKILLS

5.1 Experimental models and techniques

- Biochemistry experiments
- Preparation and recording of primary neuronal cultures grown over MEAs
- Preparation and recording of rat and mouse brain slices on MEAs
- Transcardial perfusion of the adult mouse
- Pharmacological manipulation of neuronal assemblies and brain slices on MEA
- Preparation and recording of neurons derived from human induced pluripotent cells (iPSC) grown over MEAs

5.2 Computer Skills

- Excellent software Matlab programming

- Analysis of multichannel electrophysiological data with Matlab tools
- Machine learning algorithms
- Analysis of *In vivo* calcium imaging of freely moving mice (spatial coding, place cells)
- Python, C++ and C programming
- Statistics tools : Originlab, SigmaStat

6. AWARD

- 06/2015** **INCF Travel Grant.** Visit and collaboration with the laboratory of Theoretical Neurobiology & Neuroengineering lead by Prof. Michele Giugliano at the University of Antwerp (Belgium). "Designing and implementing new tools to analyze the electrical signals generated by acute cortico-hippocampal slices from adult rats' brains during epileptiform activity".
- 09/2019** **PhD thesis award** in Neuroengineering "MASSIMO GRATTAROLA" (17th Ed.) "assigned by the National Bioengineering Group (GNB)
- 10/2021** **Postdoctoral Awarded Fellowship from Jerome Lejeune Foundation.**
Project: Early NKCC1 Inhibition to treat epilepsy and hyperactivity in Down syndrome

7. SCIENTIFIC PUBLICATIONS

A. SELECTED PUBLICATIONS

- A.1 **Colombi I.**, Rastogi M, Parrini M, Alberti M, Potenzieri A, ..., Contestabile A, Cancedda L. Heterogeneous subpopulations of GABAAR-responding neurons coexist across neuronal network scales and developmental stages in health and disease. *iScience*. 2024 Mar 8;27(4):109438.
- A.2 Parrini M., Naskar S., Alberti M., **Colombi I.**, Morelli G. , ..., Contestabile A., Cancedda L. Restoring neuronal chloride homeostasis with anti-NKCC1 gene therapy rescues cognitive deficits in a mouse model of Down syndrome. *Molecular Therapy*, 2021.
- A.3 **Colombi I.**, Mahajani S. ,Frega M., Gasparini L.* and Chiappalone M.* Effect of antiepileptic drugs on hippocampal neurons coupled to Micro-Electrode Arrays . *Frontiers in Neuroengineering* , 2013.

B. INTERNATIONAL JOURNALS

- B.1 **Colombi I.**, Tinarelli F, Pasquale V, Tucci V*, Chiappalone M*. A Simplified In vitro Experimental Model Encompasses the Essential Features of Sleep. *Frontiers in Neuroscience*. 2016
- B.2 Panuccio G., **Colombi I.**, Chiappalone M. Recording and Modulation of Epileptiform Activity in Rodent Brain Slices Coupled to Micro Electrode Arrays. " *Journal of visualized experiments: JoVE* 135 (2018).
- B.3 El Merhie, A.*, Ito, D.*, **Colombi I.**, Keshavan, S., Mishra, N., Miseikis, V., ... & Chiappalone M.*, Dante, S.* (2018). Single Layer Graphene functionalized MEA for enhanced detection of neuronal network development. *Sensors and Actuators B: Chemical*.

- B.4 Buccelli, S.*, Bornat, Y.*, **Colombi, I.**, Ambroise, M., Martines, L., Pasquale, V., Bisio, M., Tessadori, J., Nowak, P., Grassia, F., Chiappalone M. A neuroprosthetic system to restore neuronal communication in modular networks. *iScience*, 2019.
- B.5 Panuccio, G., Semprini, M., Natale, L., Buccelli, S., **Colombi, I.**, & Chiappalone, M., 2018. Progress in Neuroengineering for brain repair: New challenges and open issues. *Brain and Neuroscience Advances*, 2, 2398212818776475.
- B.6 Pace M.*, Colombi I.*, Falappa M., Freschi A., Bandarabadi M., Armirotti A., María Encarnación B., R Adamantidis A., Amici R., Cerri M., Chiappalone M.,* Tucci V*. Loss of Snord116 alters cortical neuronal activity in mice: a pre-clinical investigation of Prader-Willi syndrome. *Human molecular genetics*, 2021 , 29(12), 2051-2064.
- B.7 Dominguez-Morales JP., Buccelli S., Gutierrez-Galam D., **Colombi I.**, Jimenez-Fernandez A. , Chiappalone M. Real-time detection of bursts in neuronal cultures using a Neuromorphic Auditory Sensor and Spiking Neural Networks. *Neurocomputing*, 2021
- B.8 **Colombi I.***, Nieus T.*, Massimini M., Chiappalone M. Spontaneous and Perturbational Complexity in Cortical Cultures *Brain sciences*, 2021
- B.9 Tinarelli F., Ivanova E., **Colombi I.** , Barini E., Balzani E., ..., Michela Chiappalone, Gavin Kelsey, Valter Tucci. Cell–cell coupling and DNA methylation abnormal phenotypes in the after-hours mice. *Epigenetics & Chromatin*, 2021

C. BOOK CHAPTERS

- C.1 Bisio, M., Pimashkin, A., Buccelli, S., Tessadori, J., Semprini, M., Levi, T., **Colombi I.**, ... & Kazantsev, V., Pasquale V., Chiappalone M. (2019). Closed-Loop Systems and In Vitro Neuronal Cultures: Overview and Applications. In *In Vitro Neuronal Networks* (pp. 351-387). Springer, Cham.

D. PEER REVIEW CONFERENCE PROCEEDING

- D.1 **Colombi I.**, Tinarelli F, Pasquale V, Tucci V, Chiappalone M. Circadian rhythm monitoring and manipulation in neural assemblies, *MEA Meeting 2016*
- D.2 **Colombi I.**, Pace M., Tucci V, Chiappalone M Sleep-related electrophysiological activity of cortical cultures on MEA. *MEA Meeting 2018*
- D.3 Buccelli, S., Tessadori, J., **Colombi, I.**, Martines, L., Bisio, M., Averna, A., ... & Chiappalone M. (2018, May). Closed-loop electrophysiology: Past, present and future perspectives and applications. In *Circuits and Systems (ISCAS), 2018 IEEE International Symposium on* (pp. 1-5). IEEE.

E. ABSTRACT

- E.1 **Colombi, I.** Pasquale V., Contestabile A., Tucci V., Chiappalone M. “In vitro neuronal networks as a model of brain diseases: an engineering approach. *M&M Conference, London 2017*.
- E.2 **Colombi I.**, Alberti M. Pasquale V., Cancedda L., Contestabile A, Michela Chiappalone. “Modulation of electrophysiological activity in neuronal networks of Down syndrome mice using Microelectrodes array”. *7th International Summer School of Neuroengineering “Massimo Grattarola”, Genova 2018*.
- E.3 **Colombi I.**, Pace M., Tucci V, Chiappalone M. “Sleep- related electrophysiological activity of cortical cultures on MEA”. *GNB 2018, Milano*.
- E.4 **Colombi I.**, Pace M., Tucci V, Chiappalone M. “Sleep- related electrophysiological activity of cortical cultures on MEA”. *Society of Neuroscience, San Diego, 2018*.
- E.5 El Merhie A., Ito D., **Colombi I.**, Keshavan S., Mishra N., Miseikis V., Diaspro A., Coletti C., Chiappalone M., Dante S. “SLG Functionalized MEA for Enhanced Detection of Neural Network Development”. *Graphene 2018*
- E.6 El Merhie A., **Colombi I.** , Coletti C., Diaspro A., Chiappalone M., Dante S. SLG Bio-interface: Boosted N2a Differentiation and Enhanced Detection of Neuronal Network Development”. *The International Conference On Nanomedicine And Nanobiotechnology, 2018*

- E.7 **Colombi I.**, Alberti M., Chiappalone M., Contestabile A, Cancedda L. "Modulation of electrophysiological activity in neuronal networks of Down syndrome mice using Microelectrodes array". *T21RS Conference 2019, Barcellona*.
- E.8 Alberti M. , **Colombi I.**, Nanni M., Contestabile A., Cancedda L. "miRNA dysregulation ives neuronal intracellular chloride accumulation in down syndrome " *T21RS Conference 2019, Barcellona*.
- E.9 **Colombi I.**, Alberti M., Chiappalone M., Contestabile A, Cancedda L. "Pharmacological modulation of intracellular chloride concentration restores GABA-mediated inhibition in Down syndrome neuronal networks". *Society of Neuroscience, Chicago 2019*.
- E.10 **Colombi I.**, Ziogas I., Savardi M., Alberti M., Contestabile A, Cancedda L. Altered GABA-mediated inhibition during development in neuronal networks from the Ts65Dn mouse model of Down syndrome. *FENS 2022, Paris*
- E.11 **Colombi I.**, Ziogas I., Parrini M., Fumagalli A., Savardi M., Contestabile A, Cancedda L. Early-in-life interventions targeting NKCC1 rescue the altered GABAergic signaling and the epileptic and locomotor deficits in the adult DS mice. *IBRO 2023, Granada*