CURRICULUM VITÆ

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Date and place of birth: July 13, 1964, Sanremo (IM), Italy

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CURRENT POSITION

Associate Professor of Bioengineering, University of Genova

ACADEMIC DEGREES AND APPOINTMENTS

1989	University of Genova, Laurea degree in Electronic Engineering, summa cum laude.
1991	Visiting student, Stanford University, CA (USA), Center for Integrated Systems – CIS (May-August)
1993	University of Genova, PhD degree in Bioengineering
1993-2000	Assistant Professor, Dept. of Biophysical and Electronic Engineering, University of Genova
1997	Visiting scientist, Stanford University, CA (USA), Center for Integrated Systems – CIS (October-November)
2000-present	Associate Professor of Bioelectronics, Dept. of Biophysical and Electronic Engineering, University of Genova
2002-2006	Chairman, PhD program in Bioengineering, Material engineering and Robotics, University of Genova
2007-2010	Chairman, Biomedical Engineering and Bioengineering Degree programs, University of Genova
2008-2013	Collaborator as Senior Scientist, Department of Neurosciences and Brain Technologies, Italian Institute of Technology (IIT)
2013-present	Chairman, PhD program in Bioengineering and Robotics, University of Genova in collaboration with the Italian Institute of Technology (IIT)
2014-present	National Habilitation as Full Professor of Bioengineering

MAIN RESEARCH GRANTS (LAST 5 YEARS)

Full Title of Grant	Status	Funding scheme and organization responsible	Participation in it	Size and duration of the funding
A new neuroengineering tool for studying dynamics, plasticity and information processing in natural neuronal networks: photoMEAs coupled with micro patterned substrates PHOTOMEA	Ended February 2009	MIUR – Italian project	National coordinator	257'000 € for the project 90'000 € for the UGDIBE unit 2-years project
Imaging device for electrophysiological activity monitoring of neuronal cell cultures IDEA	Ended December 2008	UE - FP6 STREP NEST Adventure Contract No. 516432	Pincipal investigator in the UGDIBE unit and coordinator of the project for the final 6 months	250'000 €, for the unit coordinated by UGDIBE.
Neuro-cognitive science and Information technology Virtual University NEUROVERSITY	Ended June 2009	UE - FP6 Marie Curie Program	Co-investigator in the University of Genova Unit	250'000 €, for the unit coordinated by UGDIBE. 3-years project
Exploring Cellular Dynamics at Nanoscale EXCELL	Ended May 2012	UE – FP7 NMP-2007 SMALL-1	Co-investigator in the University of Genova Unit	350'000 €, for the unit coordinated by UGDIBE. 3-years project Started: May 2009
Embryonic Stem cell for Screening differentiated to Electrical active Neuronal Cell Cultures ESSENCE	Ended December 2012	UE – FP7 Eurotransbio	Principal investigator in the UGDIBE unit	170'000, for the unit coordinated by UGDIBE. 3-years project Started: January 2010
In vitro alternative assay for neurotoxicity evaluation and prediction NEUROTOX	Ended July 2014	UE – FP7 Eurotransbio	Principal investigator in the UGDIBRIS unit	210'000, for the unit coordinated by UGDIBRIS. 3-years project Started: July 2012
Linking biological and artificial neuronal assemblies to restore lost brain functions: towards the design of innovative bi-directional neuroprostheses BRAINBOW	On going	UE – FP7 FET OPEN young investigator	Co-investigator in the UGDIBRIS unit	260'000, for the unit coordinated by UGDIBRIS. 3-years project Started: February 2012
Innovative high throughput high content neurotoxicity assay based on human adipose tissue-derived stem cells IN-HEALTH	On going	UE – Eurotransbio	Principal investigator in the UGDIBRIS	72'000, for the unit coordinated by UGDIBRIS. 3-years project Started: January 2015

ORGANIZATION OF SCIENTIFIC EVENTS

- Whorkshop Neuroengineering intensive course (4-9 June 2001). Organizing committee.
- Neuroengineering workshop and advanced school NEWS 2002 (10-13 June, 2002). Co-chair.
- 1st European school on Neuroengineering "Massimo Grattarola", Venice (16-20 June, 2003). Co-chair.
- 2nd European school on Neuroengineering "Massimo Grattarola", Genova(9-12 June, 2004). Co-chair.
- 4th Summer school on Neuro-IT and Neuroengineering, Genova, Genova (13-17 June, 2006). Chair
- Bioengineering Summer School, Bressanone 2006, September 25-29, NEURO-ROBOTICA: neuroscienze e robotica per lo sviluppo di macchine intelligenti. Co-chair.
- MEA meeting International Congress, Member of the scientific committee, 2010
- 6th Summer school of Neuroengineering "Massimo Grattarola", Genova, Genova (11-15 June, 2012). Chair
- MEA meeting International Congress, Member of the scientific committee, 2012

MAIN INVITED TALKS

- 4º Convegno scientifico: Meccanismi molecolari in Neuroscienze, 2004, June 17-18, "Reti di neuroni *in vitro* accoppiati bi-direzionalmente ad una matrice di microtrasduttori e ad un mini-robot mobile"
- Chemical Sensors 2004, July 11-14, Tsukuba, Japan, "Electrophysiological Activity Modulation by Chemical Stimulation in Networks of Cortical Neurons Coupled to Microelectrode Arrays: a Biosensor for Neuropharmacological Applications"
- Sensemaker workshop 2005, April 5-7, University of Ulster, Derry (UK) "In-vitro neurons bi-directionally connected to a robotic body: investigation of the adaptive properties and learning mechanisms of the network for robot control"
- SINS2005, "A bi-directional neuro-robotic interface: adaptive properties and distributed synaptic changes in in-vitro neocortical cultures", 3-5 October 2005
- Nano2life, International school on Neuroengineering, Neuchatel (CH), 2007, January 15-19, "Learning and plasticity in neuronal networks and in neuro-robotic systems"
- Technion University, Israel Institute of Technology, Haifa (IL), 2009, January 15-17, 2009, "Network dynamics and plasticity in in-vitro neuronal cell assemblies"
- SIF2009, Mini-symposium on Learning and memory, 23-25 settembre 2009, "Distributed synaptic plasticity in in-vitro cortical networks"
- Bioengineering School on Neuroinformatics, 19-23 settembre 2011, "Dynamics and connectivity in in-vitro cortical networks"
- CNR Bologna, 20 gennaio 2012, "Neural interfaces and network dynamics"
- Tehcnical University of Ilmenau (D), 12 dicembre 2012, "2D patterned and 3D neuronal networks coupled to MEA"
- SINS 2013, "Enhanced network dynamics in 3D neuronal cultures", Rome, 3-5- Ottobre 2013
- University of California at San Diego (UCSD), La Jolla (USA), 5 novembre 2013, "3D engineered neural networks coupled to Micro-Electrode Arrays: development of an innovative in vitro experimental model for neurophysiological studies"
- Stanford University (USA), 21 Novembre 2013, "Engineered neural networks coupled to Micro-Electrode Arrays: an in vitro tools for computational and biomedical applications"
- 1st CSNII School on Neurotechniques, 11-16 March 2014, Padova (Italy). "Bio-artificial networks and hybrid systems to investigate neuronal dynamics and information processing in the brain"

- XVIII edition of the AISEM Annual Conference, 3-5 February 2015, Trento. “In vitro neuro-electronic interfaces: microtransducer arrays and biomedical applications”

SOCIETY MEMBER

IEEE EMBS Engineering in Medicine & Biology Society
SFN Society for Neuroscience
OCNS Organization for Computational Neuroscience
SINS Società Italiana di Neuroscienze
Gruppo Nazionale di Bioingegneria

PROFESSIONAL OBJECTIVES

- To contribute to the advancement and innovation in basic and applied research in a multidisciplinary research environment involving information technology, micro-nano technology and neuroscience, where the educational background and professional experience work synergistically bringing together interdisciplinary expertise.

RESEARCH ACTIVITIES

The research activity of SM is focussed in the field of Neuroengineering. This is a recently defined interdisciplinary research topic with a twofold relevance, both meaningful in the context of basic neuroscience research: (1) for a better understanding of the way the Central Nervous System represents and stores information (i.e. the ‘neural code’), and (2) as a source of inspiration for the design of new biologically-inspired artificial neural systems, under the perspective of the Information Technologies and for the development of novel neural-interfaces.

Neuroengineering, network electrophysiology and computational neuroscience
He is involved in studying the network dynamics of spontaneously developing cortical neurons (from rats/mice) coupled to MEAs. The network dynamics is investigated during development and under electrical and chemical stimulation. The in-vitro “bio-artificial” model is aimed at elucidating basic mechanism of learning, synaptic distributed plasticity and information processing capabilities.
He is also involved in designing new microtransducer arrays for neuroscientific applications and in developing new tools for electrophysiological measurements in in-vitro neuronal systems.

Neuro-robotic interfaces and hybrid systems
In the last ten years, he promoted and has been involved in developing a novel neuro-robotic interface where an artificial body (i.e., an autonomous robot) is bi-directionally connected to a neurobiological system (i.e., a neuronal population coupled to a MEA device). This new experimental paradigm has been established for studying sensori-motor hybrid systems, for investigating the neural code and for developing advanced bi-directional brain-machine interfaces and neuroprostheses.

He has greatly contributed to the introduction of new enabling technologies in the field of in-vitro network electrophysiology and he is one of the leading scientists in the field of MEA-based systems and in-vitro neural interface and neuro-robotics.

On the above topics he has contributed 93 publications on international refereed journals (H-index=27, scopus; H-index=26, isi web of science; H-index=33, google scholar).

He is also associate editor of Frontiers in Neuroengineering, Frontiers in Bioengineering, associate editor of Computational intelligence in Neuroscience and review editor of Frontiers in Neurorobotics.

Keywords:
Neuroengineering, in-vitro electrophysiology, biological neuronal netowrks, microtransducer array for electrochemical measurements, neuro-electronic junction, hybrid-systems.

RECENT PUBLICATIONS (5 YEARS) – INTERNATIONAL JOURNAL PAPERS

1. Spanu, S. Lai, P. Cosseddu, M. Tedesco, S. Martinoia& A. Bonfiglio, An organic transistor-based system for reference-less electrophysiological monitoring of excitable cells. Scientific Report. DOI: 10.1038/srep0880 (2015).
2. Pirino V., Riccomagno E., Martinoia S., and Massobrio P., A topological study of repetitive co-activation networks in in vitro cortical assemblies, *Physical Biology*, 12(1), (2015)
3. Balbi P., Martinoia S., and Massobrio P., Axon-somatic back-propagation in detailed models of spinal alpha motoneurons, *Frontiers in Neuroengineering* doi: 10.3389/fncom.2015.00015 (2015)
4. Frega M., Tedesco M., Massobrio P., Pesce M., and Martinoia S., Network dynamics of 3D engineered neuronal cultures: a new experimental model for in-vitro electrophysiology, Scientific Report, Scientific Reports, 4, 5489, doi:10.1038/srep05489 (2014).
5. Balbi P., Martinoia S., Colombo, Massobrio P., Modelling recurrent discharge in the spinal α-motoneuron: Reappraisal of the F wave, *J. of Clinical Neurophysiology*, doi 0.1016/j.clinph.2013.09.025 (2014)
6. Demelas M., Lai S., Spanu A., Martinoia S., Cosseddu P., Barbaro M., Bonfiglio A., Charge sensing by organic charge-modulated field effect transistors: application to the detection of bio-related effects, *J. of Materials Chemistry B*, 1(31), pp 3811-3819, DOI: 10.1039/c3tb20237b (2013)
7. Kanagasabapathi TT, Franco M, Barone RA, Martinoia S, Wadman WJ, Decré WJ, Selective pharmacological manipulation of cortical–thalamic co-cultures in a dual-compartment device, *J. of Neuroscience Methods*, 214 (1), 1-8 (2013)
8. Massobrio P, Giachello CNG, Ghirardi M, Martinoia S, Selective modulation of chemical and electrical synapses of Helix neuronal networks during in vitro development *BMC neuroscience* 14 (1), 22, (2013)
9. Kanagasabapathi T., Massobrio P., Barone RA., Tedesco M., Martinoia S., Wadman WJ., and Decré MJM, Functional connectivity and dynamics of cortical-thalamic networks co-cultured in a dual-compartment device, *J. Neural Eng.*, 9, 3, doi: 10.1088/1741-2560/9/3/036010 (2012).
10. Zullo L., Chiappalone M., Martinoia S., Benfenati, F., A "Spike-Based" Grammar Underlies Directional Modification in Network Connectivity: Effect on Bursting Activity and Implications for Bio-Hybrids Systems, *PloS one* 7 (11), e49299 (2012)
11. Tessadori J, Bisio M, Martinoia S, Chiappalone M., Modular neuronal assemblies embodied in a closed-loop environment: toward future integration of brains and machines *Frontiers in neural circuits* 6, (2012)
12. Maccione A, Garofalo M., Tedesco M., Berdondini L., Martinoia S., Multiscale functional connectivity estimation on low-density neuronal cultures recorded by high-density CMOS Micro Electrode Arrays, *J. of Neuroscience Methods*, in press (2012).
13. Massobrio G., Massobrio P., Martinoia S., Investigations of extracellular signal shapes recorded by planar microelectrode covered by carbon nanotubes: modeling and simulations, *IEEE Trans. On Nanotechnology*, 10, 6, 1328-1336 (2011).
14. Kanagasabapathi T., Ciliberti D., Martinoia S., Wadman WJ., and Decré MJM., Dual-compartment neurofluidic system for electrophysiological measurements in physically segregated and functionally connected neuronal cell culture, *Frontiers in Neuroengineering*,doi: 10.3389/fneng.2011.00013 (2011)
15. Novellino A., Scelfo B., Palosaari T., Price A., Sobanski T., Shafer TJ., Johnstone AFM., Gross GW., Gramowski A., Schroeder O., Jügelt K., Chiappalone M., Benfenati F., Martinoia S., Tedesco MT., Defranchi E., D'Angelo P., Whelan M., Development of micro-electrode array based tests for neurotoxicity: assessment of interlaboratory reproducibility with neuroactive chemicals, *Frontiers in Neuroengineering*, doi: 10.3389/fneng.2011.00004 (2011)

16. Saenz Cogollo JF, Tedesco M, Martinoia S, Raiteri R, A new integrated system combining atomic force microscopy and micro-electrode array for measuring the mechanical properties of living cardiac myocytes, *Biomedical Microdevices*, 3(4):613-21, (2011).

17. Mulas M., Massobrio P., Martinoia S., Chiappalone M., A simulated neuro-robotic environment for bi-directional closed-loop experiments, *Paladyn Journal of behavioral robotics*, DOI 10.2478/s13230-011-0004-x, (2011)

18. Gandolfo M., Maccione A.,, Tedesco M., Martinoia S., and Berdondini L., Tracking burst patterns in hippocampal cultures with high-density CMOS-MEAs, *J. Neural Eng.* 7 056001, (2010).

19. Maccione A., Gandolfo M., Tedesco M., Nieus, T., Imfeld K., Martinoia S., and Berdondini L., Experimental investigation on spontaneously active hippocampal cultures recorded by means of high-density MEAs: analysis of the spatial resolution effects, *Frontiers in Neuroengineering*, 3:4. doi: 10.3389/fneng.2010.00004, (2010).

20. Bologna LL., Pasquale V., Garofalo M., Gandolfo M., Baljon PL., Maccione A., Martinoia S., Chiappalone M., Investigating neuronal activity by SPYCODE multi-channel data analyzer, *Neural Networks*, 23, 6, 685-697, (2010).

21. Pasquale V., Martinoia S., Chiappalone M., A self-adapting approach for the detection of bursts and network bursts in neuronal cultures, *J. Comp. Neuroscience*, accepted (2010).

22. Bologna L.L., Nieus T., Tedesco M., Chiappalone M., Benfenati F., Martinoia S., Low frequency stimulation enhances burst activity in cortical cultures during development, *Neuroscience*, 165, 3, 692-704, (2010).