

**The Institute for Microelectronics and Microsystems
of the National Research Council (CNR)
opens 2 Post-Docs Positions**

funded through the European Horizon 2020 ICT project **MeM-Scales**
"*Memory technologies with multi-scale time constants for neuromorphic architectures*"
(contract number n. 871371)

Project description.

The overall objective of the **MeM-Scales** project (January 1, 2020 - December 21, 2022) is the joint co-development of a novel class of algorithms, devices and circuits that reproduce multi-timescale processing of biological neural systems. Indeed, biological brains can integrate information across timescales that span many orders of magnitude, from millisecond visual information processing to many years of long-term memory consolidation and forgetting. In MeM-Scales we aim at building a novel class of neuromorphic computing systems that can integrate temporal information over multiple timescales and process efficiently real-world sensory signals and natural time-series data in real-time, e.g. for low-power and always-on IoT and edge-computing applications that do not need to connect to the cloud, and to demonstrate this with a practical laboratory prototype.

The project consortium is broadly interdisciplinary, joining 9 international groups (Research centers, Universities and Industry) from material science through microchip design & manufacturing to computational neuroscience and machine learning. The consortium will lead a cross-disciplinary effort towards the fabrication of an innovative hardware/ software platform as a basis for future products which combine extreme power efficiency with robust cognitive computing capabilities.

Open Position description.

Within the **MeM-Scales** project, **the group at CNR-IMM, Unit of Agrate Brianza (Italy)** (www.mdm.imm.cnr.it) will target in collaboration with international partners the development of novel memory and device technologies, with focus on RRAM and PCM, supporting on-chip learning over multiple timescales. In this framework, we are going to open 2 post- doc positions under the scientific supervision of Dr. Sabina Spiga.

Position A: *Development of novel hardware technologies for supporting multiple timescales.* The focus will be the development of non-volatile memory and of memory devices with tunable volatility that will be used in the project to develop neurons and synaptic circuits implementing multi-timescales online learning. The work for this post-doc position will include both device fabrication (using the local clean room facilities) and electrical testing at the CNR-IMM. Short exchange visit at international partner sites to address the implementation of the new hardware in neuron and synaptic circuits are planned.

Position B. *System-level simulation of spiking neural networks.* The focus will be the development of system level simulation of spiking neural networks implementing the information integration over multiple timescales. Models for neurons and synapses will be developed on the base of experimental data from real hardware. The activity will serve: (i) as a guide for the development of synapse and neuron devices and circuits, and (ii) to guide the tuning of synapse and neuron parameters for specific applications. Simulations and hardware development will be performed in a close loop and continuous feedback. The post-doc will work in close collaborations with international partners and short exchange visits are planned.



Additional Information and specific requirements for the open positions

Institution: CNR-IMM, Unit of Agrate Brianza, Italy

Level: PhD degree

Contract: 1 years, renewable to 3 (project duration)

Salary: 28000-30000 €/year (gross)

Fields: Physics, Electrical Engineering, Computer Engineering, Artificial intelligence, Neuromorphic computing

Application: through public selection which will be posted soon on the CNR web site. Interested candidate can send an e-mail with a CV to the following contact for further information. The planned starting dates for both positions are within the first months of 2020 (February – May 2020), depending on candidate availability and required time for selection procedures.

Contact: [Sabina Spiga, CNR-IMM-Agrate Brianza, sabina.spiga@mdm.imm.cnr.it](mailto:sabina.spiga@mdm.imm.cnr.it)

Specific Requirements for the open positions

Position A. PhD in Physics, Electronic Engineering, or any related disciplines to the project topics. Proven experience in the device fabrication and advanced electrical testing with respect to RRAM and/or PCM memories. Experience with clean room work. Basic knowledge in circuits design, and printed circuit board (PCB) will be considered a plus. Strong motivation to work in the field of neuromorphic computing.

Position B. PhD in Physics, Electronic Engineering, Computer science, machine learning, or any related disciplines to the project topics. Proven experience in neural network simulation, including memristive devices with focus on RRAM and PCM. Strong motivation to work in the field of neuromorphic computing.

