



P A D O V A
neuroscience
C E N T E R

12 DECEMBER 2024 3:00 pm

SALA SEMINARI VIMM

(Via Giuseppe Orus 2, Padova)

PNC SEMINARS

A talk by Carlotta Martelli

(University of Mainz)

NON-GENETIC VARIATION IN BRAIN WIRING: DEVELOPMENTAL ORIGINS AND FUNCTIONAL IMPLICATIONS

The wiring of the nervous system follows a complex genetic plan during development. However, due to stochastic processes and environmental factors, genetically identical individuals seldom show the same phenotypic outcome. In poikilothermic animals like insects, temperature affects developmental speed, but whether this alters brain wiring and function was so far unclear. We have investigated the effect of temperature on brain wiring in *Drosophila*, showing that neuronal connectivity scales exponentially with temperature, with lower connectivity at higher temperatures. To explain this finding, we extended the metabolic theory of ecology to model the coordination between body and brain development. The theory predicts a temporal shift between body and brain development, which we have validated experimentally. Physiological analysis suggest that temperature-induced changes in brain wiring have circuit-specific consequences for function. We conclude that while some circuit computations are robust to the effects of developmental temperature on wiring, others exhibit phenotypic plasticity with possible adaptive advantages.

Biography

Carlotta Martelli studied physics at the University of Rome “La Sapienza”, where she also obtained her PhD in biophysics. After a postdoc at the Department of Molecular, Cellular and Developmental Biology at Yale University, she was an Alexander von Humboldt fellow at the Georg-August Universität Göttingen. Since 2019, she is a group leader at the University of Mainz (<https://mrtlllab.uni-mainz.de/>). Her research mostly focuses on the role of adaptation in odor coding (from single neurons to populations), on the influence of environmental factors on the wiring and function of the olfactory system, including behavioral implications, and on the evolution of the olfactory system in flies and ants.