



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

12 JUNE 2025 3:30 pm

SALA SEMINARI VIMM

(Via Giuseppe Orus 2, Padova)

# PNC SEMINARS

A talk by **Lucilla de Arcangelis**  
(University of Campania “Luigi Vanvitelli”)

## **ON THE RELATION BETWEEN SPONTANEOUS AND STIMULATED ACTIVITY FOR THE BRAIN IN HEALTHY AND PATHOLOGICAL STATES**

The fundamental open question of the relation between spontaneous and evoked activity is a longstanding question in neuroscience. Here we formalize it by means of the stochastic Wilson Cowan model.

An approach inspired in non-equilibrium statistical physics allows to calculate fluctuation-dissipation relations, suggesting that measurements of the spontaneous fluctuations in the global brain activity could provide a prediction for the system response to a stimulus. Theoretical predictions are in good agreement with MEG data for healthy patients performing visual tasks. In pathological conditions the relations still hold and evidence a complex oscillatory behavior in the temporal correlations. The analysis of the entropy production in a range of parameters near the critical point suggests that the system is always out of equilibrium and that the entropy production is minimized if the balance of excitation and inhibition is realized.

## Biography

Lucilla de Arcangelis received the Ph.D. in Physics from the Boston University. She was visiting scientist at the University of Cologne and the CEA in Saclay. In 1990 she was awarded a CNRS (CR1) position at the ESPCI in Paris and in 1993 a Faculty position in Italy.

Her research interests span from percolation, fractals, cellular automata to spin glass, models for fracture and gelation. Recently, she has focused her research on statistical properties of earthquake and solar flare occurrence and, in the last twenty years, on the critical features of spontaneous neuronal activity.

She is associate Editor of JSTAT, Physical Review E and Frontiers in Physiology. She was nominated APS Fellow in 2020 for the Computational Physics Division where she was elected in 2022 Member at large of the Executive Committee. She was Chair of the C3 – Statistical Physics IUPAP Commission for the term 2023-24.