

International School of Brain Cells & circuits

“Camillo Golgi”

The Ettore Majorana Foundation and Centre for Scientific Culture opened, in 2015, the International school of brain cells & circuits dedicated to the Italian Nobel laureate “Camillo Golgi”.

The brain, with 10^{12} neurons interacting through 10^{15} synapses, is quite surely the most complex structure of the whole Universe. Neurosciences are systematically tackling brain functions at multiple complexity levels, from cells to microcircuits to the whole brain. Understanding the brain is a Grand Challenge for the Humankind with social implications in the biomedical and technological fields. This relevance has recently been acknowledged by the launch of the *Human Brain Project* in Europe and of the *Brain Active Map Project* in the USA as well as by the award of the 2014 Nobel Prize to Neuroscientists.

The school of Brain Cells & Circuits will face hot topics in modern Neuroscience, providing the basics of understanding, fueling discussion and helping to form a critical perspective in the new generation of Neuroscientists. Our vision is that, in order to explain brain functions, it is fundamental to integrate molecular and cellular knowledge into microcircuits and large-scale networks through the use of models.

Further reading can be found in the review article:

Modelling the brain: Elementary components to explain ensemble functions

Authors: *Egidio D'Angelo and Claudia Gandini Wheeler-Kingshott*

DOI: [10.1393/ncr/i2017-10137-5](https://doi.org/10.1393/ncr/i2017-10137-5) pp. 297-333

2021 course

Modeling the brain

30th November 2021 - 3rd December 2021

Ettore Majorana Foundation and Centre for Scientific Culture
Erice (Italy)



Course Directors:

Egidio D'Angelo, Claudia Gandini Wheeler-Kingshott and Viktor Jirsa

Rationale: The 2020 Course of the school of brain cells and circuits will be dedicated to modelling the brain from local microcircuits properties to large scale network properties, essential to understand how the brain works.

Preliminary Programme

Arrival day – 30th November 2021

9pm : Evening gathering in the Marsala Cellar St. Rocco Monastery, main cloister

Marsala wine and marzipan pastries typical of Erice.
Music and chats as people join in.

Day 1 – 1st December 2021

8:30 – **INTRODUCTION TO THE COURSE**

Why modeling the brain? Where are we now?

Egidio D'Angelo, Claudia Gandini Wheeler-Kingshott, Viktor Jirsa

9:00 – **Multi-scale brain modeling**

Egidio D'Angelo

10:00-10:30 Coffee break & posters display

I – FROM NEURONS TO MICROCIRCUITS

10:30 – **Single neuron computation**

Idan Segev

11:30 – **Physiologically realistic models**

Michele Migliore

12:30-14:30 Lunch

14:30 – **Brain scaffold builders**

Claudia Casellato

15:30 – **Mean field models**

Alain Destexhe

16:30 – **Neuromorphic computation**

Oliver Rhodes

Day 2 – 2nd December

II – THE LARGE SCALE BRAIN

8:30 – **Brain reconstruction from histology**

Roxana Kooijmans

9:30 – **The Allen Brain Atlas**

Stefan Mihalas

10:30-11:00 Coffee break

11:00 – **In vivo microstructure characterisation**

Marco Palombo

12:00 – **Advanced in vivo tissue features with MRI**

Mara Cercignani

13:00-15:00 Lunch

15:00 Chair: Claudia Casellato

Poster blitz (20 posters, 3 min each, 1 slide)

16:00-16:30 Coffee break

16:30 – **MRI to probe information on brain structure and function**

Claudia Gandini Wheeler-Kingshott

17:30 – **The Bayesian brain**

Karl Friston

20:00 SOCIAL DINNER

Day 3 – 3rd December 2021

III – BRAIN FUNCTION FROM NETWORKS

9:00 – **Neural activities and ensemble properties**

Nikos Logothetis

10:00 – **Modeling heterogeneity in local brain dynamics**

Gustavo Deco

11:00-11:30 Coffee break

11:45 – **Modeling neurodegenerative disorders**

Petra Ritter

12:30 – **Modeling psychiatric disorders**

Michael Breakspear

13:15-15:00 Lunch break

15:00 – **Brain states and consciousness**

Giulio Tononi

16:00 – **The Virtual Aging Brain**

Viktor Jirsa

17:00 - DISCUSSION

All speakers

18:00 Poster prize and adjournment

Departure day - 4th December 2021

Farewell

Speakers

Michael Breakspear - University of Newcastle, Australia

Claudia Casellato - University of Pavia, Italy

Mara Cercignani - CUBRIC, Cardiff, UK

Gustavo Deco - Universitat Pompeu Fabra, Barcelona, Spain

Alain Destexhe - CNRS, Paris, France

Egidio D'Angelo - University of Pavia, Italy

Karl Friston - University College London, UK

Claudia Gandini Wheeler-Kingshott - University College London, UK & University of Pavia, Italy

Viktor Jirsa - Aix Marseille, France

Roxana Kooijmans - Netherland Institute of Neuroscience, Amsterdam, Holland

Nikos Logothetis - International Center for Primate Brain Research (ICPBR), Shanghai, China

Michele Migliore - CNR Palermo, Italy

Stefan Mihalas - Allen Institute, Seattle, USA

Marco Palombo - University College London, UK

Oliver Rhodes - University of Manchester, Manchester, UK

Petra Ritter - Charitè, Berlin, Germany

Idan Segev - Hebrew University, Jerusalem, Israel

Giulio Tononi - University of Wisconsin, USA