



**ISTITUTO DI NEUROSCIENZE**

Consiglio Nazionale  
delle Ricerche

*Virtual* Retreat 2020

Scientific Program

November, 9<sup>th</sup>, 10.00 (GMT+1)

Opening lecture

*A cross-species approach to empathy and prosociality*

Prof. Christian Keysers

Netherlands Institute for Neuroscience & University of Amsterdam

**Abstract**

How does our brain make us understand what other people do and feel? How does our brain motivate us to help others?

Regarding actions, I will present evidence showing that humans recruit somatosensory and cerebellar regions involved in their own actions while witnessing the actions of others, and that disrupting brain activity in these regions interferes with the ability to perceive the kinematics of other people's actions.

Regarding emotions, to follow up on evidence that humans have brain regions (including the somatosensory, insular and cingulate cortices) that increase their BOLD activity both while observing and experiencing emotions such as pain and disgust, I will present experiments in humans and rats showing that altering brain activity in these putative affective mirror systems indeed alters emotional contagion and prosociality and, using data from single cell recordings in the rat cingulate cortex, that mirror neurons for emotions exist in the very same region that correlates with empathy in humans.

Together this points preserved mechanisms that makes individuals sensitive to the emotions of other across humans and rodents. This mechanism could serve the detection of dangers by using other individual's fear and pain as danger antennas and indirectly make individuals averse to harming others.



November, 11<sup>th</sup>, 9.30 (GMT+1)

Symposium

*Pre-clinical and clinical correlates of neurorehabilitation*

9:30-10:00 *Preclinical models of combined rehabilitation*  
Claudia Alia, Cristina Spalletti, Anna Letizia Allegra  
Mascaro  
IN-CNR Pisa

10:00-10:30 *Personalized Electroceuticals against multiple sclerosis fatigue*  
Franca Tecchio  
ISTC-CNR

10:30-11:00 *Action Observation as a tool to promote motor recovery in neurorehabilitation*  
Arturo Nuara, Doriana De Marco, Stefano Lenzi,  
Pietro Avanzini  
IN-CNR Parma

11:00-11:30 *Robotic technologies for neurorehabilitation*  
Matteo Malosio  
STIIMA-CNR

11:30-12:00 Discussion

**Chair:** Anna Letizia Allegra Mascaro, Pietro Avanzini, Maria Luisa Malosio.

November, 13<sup>th</sup>, 9.15 (GMT+1)

Symposium

***Young Researchers Symposium***

- 9:15                    *Introduction*  
Prof. Michela Matteoli
- 9:30-9:45            *Synaptic vesicle and autophagosome trafficking in neuronal health and disease*  
Fabrizia Guarnieri (IN-CNR, Milano)
- 9:45-10:00         *Reversible phosphorylation decouples RIPK3 from necroptosis*  
Nicoletta Concetta Surdo (IN-CNR, Padova)
- 10:00-10:15       *Acetylcholine controls social novelty discrimination via nicotinic acetylcholine receptors*  
Marilena Griguoli (IN-CNR, Pisa)
- 10:15-10:30       *Exploring emotions, action and perception using invasive methods in humans*  
Fausto Caruana (IN-CNR, Parma)
- 10:30-10:45       *Neurophysiology of the motor cortex in health and disease*  
Claudia Alia (IN-CNR, Pisa)
- 10:45-11:00       *Rehabilitation and neuro-modulation: novel therapeutic strategies in murine models of brain diseases*  
Cristina Spalletti (IN-CNR, Pisa)



- 11:00-11:15 *On the role of mitochondrial metabolism in Neurofibromatosis type 1-related tumors*  
Ionica Masagras (IN-CNR, Padova)
- 11:15-11:30 *Targeting Ca<sup>2+</sup> and mitochondrial dysfunctions to fight neurological deficits*  
Beatrice D'Orsi (IN-CNR, Pisa)
- 11:30-11:45 *Metabolic alterations in Alzheimer's disease related models: role of mitochondria.*  
Riccardo Filadi (IN-CNR, Padova)
- 11:45-12:00 *Developing new tools to study non-canonical functions of Tau and to isolate the local transcriptome*  
Cristina Di Primio (IN-CNR, Pisa)
- 12:00-12:15 *Autosomal dominant lateral temporal epilepsy (ADLTE): Effects of REELIN gene mutations and restoring protein function*  
Emanuela Dazzo (IN-CNR, Padova)
- 12:15-12:30 *Novel insights in the neurophysiopathology of chronic pain keywords: chronic neuropathic pain;*  
Antonio Zippo (IN-CNR, Milano)
- 12:30-12:45 *Lipidomic characterization in Batten Disease*  
Giuseppe Martano (IN-CNR, Milano)
- 12:45-13:00 *Gut microbiota, stress and ethanol addiction: multiple ways to modulate the brain plasticity*  
Giuseppe Talani (IN-CNR, Cagliari)

**Chair:** Prof. Michela Matteoli

November, 19<sup>th</sup>, 9.45 (GMT+1)

Symposium

***GPCR unexpected signaling: translational potential in neuroscience***

9.45-10.00 Introduction to the topic of the course

10.00-11:00 *G-protein coupled receptors are not on/off switches but complex integrators of cell signalling that function as multi-protein arrays*

Peter McCormick

Queen Mary University of London (UK)

11.00-12:00 *GPCR signaling diversity: a matter of conformational dynamics*

Jean-Louis Baneres

Université de Montpellier (FR)

12.00-13:00 *Biased signalling at the GLP-1 receptor: concept to translational potential in metabolic disease*

Ben Jones

Imperial College of London (UK)

**Chair:** Eleonora Grespan, Bice Chini, Maria Luisa Malosio



November, 20<sup>th</sup>, 15.00 (GMT+1)

Symposium

***Glial modulation of synapses, from development to adult functions***

15.00-15.30 *Glia-derived PTX3 affects synapse maturation during brain development*

Giuliana Fossati  
IN-CNR Milano-Humanitas

15.30-16.00 *Role of microglia in synapse elimination.*

Fabio Perrucci  
Humanitas University

16.00-16.30 *Astrocytes-derived Extracellular Vesicles in motion at the neuron surface: involvement of the prion protein.*

Giulia D'Arrigo  
IN-CNR Milano

16,30-17 *Calcium microdomains in astrocytes are required for LTP consolidation in perirhinal cortex.*

Gabriele Losi  
IN-CNR Padova

17-17,30 *Circadian remodeling of the synaptic environment.*

Annalisa Scimemi  
State University of New York at Albany, NY

**Chair:** Elisabetta Menna

November, 23<sup>rd</sup>-24<sup>th</sup>

*Annual Meeting of the Dept. of Biomedical Sciences – CNR*

November, 27<sup>th</sup>, 15.00 (GMT+1)

Symposium

*Intracellular signalling and bioenergetics in brain dysfunction*

15.00-15.30 *Astrocytic Ca<sup>2+</sup> signalling dysfunction along the progression of Alzheimer's Disease*

Annamaria Lia  
IN-CNR Padova

15.30-16.00 *Optical manipulation of neural activity combined with longitudinal motor training enhance functional recovery after stroke*

Emilia Conti  
IN-CNR Pisa, University of Florence

16.00-16.30 *APP and Tau: the trigger and bullet in Alzheimer disease*

Antonella Borreca  
IN-CNR Milano

16.30-17.00 *A Mitochondrial Etiology of the Common Complex Diseases: A different perspective*

Alessia Angelin  
Center for Mitochondrial and Epigenomic Medicine,  
Children's Hospital of Philadelphia

17.00-17.30 *Discussion and final remarks*

**Chair:** Emy Basso, Diana Pendin



November, 30<sup>th</sup>, 9.30 (GMT+1)

Symposium

***Brain and glioma cells crosstalk***

9.30-10.30 *Role of Calcium activity in cell invasion and migration by Intravital Two-photon Imaging of Glioblastoma Mouse Models*

Vinoshene Pillai  
IN-CNR Pisa

10.30-11.30 *Bidirectional neuron-glioma interactions: effects of glioma cells on synaptic activity and its impact on tumor growth*

Elena Tantillo  
IN-CNR Pisa

11.30-12.30 *Role of extracellular vesicles in glioblastoma invasiveness*

Matteo Tamborini  
IN-CNR Milano

**Chair:** Elisa Greotti, Eleonora Vannini

November, 30<sup>th</sup>, 13.30 (GMT+1)

Symposium

***Artificial intelligence and computational neuroscience***

13:30-14:30 *Computational modeling of synaptic integration and dendritic function*

Sergio Solinas

Dip. Di Science Biomediche, Università di Sassari

14:30-15:30 *Form structure- to AI-based virtual screening: the present and future of in silico drug discovery*

Sandro Cosconati

DiSTABiF, Univ. della Campania "Luigi Vanvitelli"

15:30-16:30 *Microarray data analysis: "old" platform with great datasets and new tools*

Ivan Arisi

EBRI

16:30-17:30 *State of the art of computational neuroscience, looking forward*

Michele Migliore

IBF-CNR

**Chair:** Luca Murru, Antonella Borreca



December, 3<sup>rd</sup>, 17.00 (GMT+1)

Closing Lectures

17:00-18:00 ***Unravelling autism connectopathy with cross species fMRI***

Alessandro Gozzi,  
Italian Institute of Technology

Atypical functional connectivity as measured with resting state fMRI (rsfMRI) is a hallmark of autism. However, fundamental questions as to the origin and significance of functional connectopathy in autism remain open. Why is functional connectivity so heterogeneous across patient cohorts, and what are the implications of this heterogeneity? And can we back-translate specific rsfMRI dysconnectivity signatures into physiologically interpretable events?

To address these questions, my laboratory has developed methods to map rsfMRI connectivity in the mouse, a physiologically accessible species where autism-relevant etiologies can be modelled with great specificity, minimizing environmental confounds. In my lecture I will summarize some key results from this recent line of inquiry. I will highlight substantial correspondences in the organization of mouse and human rsfMRI networks, supporting the translational relevance of this approach. I will next show how this approach can help uncover the basis and significance of connectational heterogeneity in autism, reconciling conflicting findings in clinical populations. Finally, I will illustrate how autism-relevant synaptopathy can be mechanistically linked to clinically-relevant signatures of network dysfunction, defining a unifying multi-scale model of autism pathology. These examples outline a novel research platform that is poised to significantly advance our understanding of functional connectopathy in autism.

18:00-19:00 ***Unique neural and motor deficits in autism:  
Comparing autism with developmental  
coordination disorder***  
Prof. Lisa Aziz-Zadeh,  
University of Southern California

A deficit in pre-cognitively mirroring other people's actions and experiences may be related to the social impairments observed in autism spectrum disorder (ASD). However, it is unclear whether such embodied simulation deficits are unique to ASD or instead are related to motor impairment, which is commonly comorbid with ASD.

Here, we aim to disentangle how, neurologically, motor impairments contribute to simulation deficits and identify unique neural signatures of ASD. We compare children with ASD to children with Developmental Coordination Disorder (DCD) as well as a typically developing group during fMRI tasks in which children observe, imitate, and mentalize about other people's actions. We also compare the three groups in behavioral motor and social measures and white matter connectivity. Finally, we discuss preliminary data correlating neural deficits in ASD with gut microbiota dysbiosis.