



"Annex 1" updated on 12th May 2020

(The updates and the corrections are highlighted in red colour)

(Annex 1)

CALL FOR PHD POSITIONS – 36th CYCLE PHD PROGRAMME IN NEUROSCIENCE

PhD Programme Coordinator	Prof. Marco Sassoè Pognetto
Department	Neuroscienze "Rita Levi Montalcini"
PhD Programme Length	4 years
PhD website	http://dott-neuroscienze.campusnet.unito.it/cgi-bin/home.pl
Course start date	1 st October, 2020
Departments involved in PhD programme	Dipartimento di Neuroscienze "Rita Levi Montalcini", Dipartimento di Scienze della Vita e Biologia dei Sistemi, Dipartimento di Scienze Veterinarie, Dipartimento di Psicologia, Dipartimento di Scienze Cliniche e Biologiche, Dipartimento di Scienza e Tecnologia del Farmaco, Dipartimento di Scienze della Sanità Pubblica e Pediatriche dell'Università degli Studi di Torino

Positions offered¹ by the PhD Programme	
n. 8 positions with scholarships, of which n. 1 reserved to candidates with international qualifications	of which: <ul style="list-style-type: none">- 6 scholarships funded by the University of Torino- 2 scholarships funded by Department of Neuroscience (<i>Dipartimenti di Eccellenza Project</i>)
n. 2 positions without scholarship	

CALL FOR POSITIONS

Admission procedure

Assessment of qualifications, research project and interview

Qualifications to be uploaded in the online application

¹ All additional scholarships and apprenticeship contracts (Legislative Decree no. 81/2015 art.45), which may become available after the publication of this Call, will be announced on the University websites [Dottorati di Ricerca](#) and [PhD](#) until Call's deadline.



<ul style="list-style-type: none"> • Research project (max 3000 word, excluding references) • Letters of reference (max 2 letters) 	
Assessment criteria	Maximum score 100 points
Assessment of qualifications	Maximum score 55 points
<p>Final grade of Laurea/ second cycle degree (or weighted average of examinations taken during the Laurea Magistrale/2nd cycle degree for candidates applying under condition)</p> <p>110L 10 points 110 9 points Da 107 a 109 8 points Da 104 a 106 6 points Da 100 a 103 4 points =< 99 2 points</p> <p>Candidates with international qualifications will be assessed considering their Curriculum studiorum et vitae (as per information provided in the online application) and not exclusively according to the score of the Master's degree.</p>	maximum score 10 points
<p>Publications</p> <p>Publication as main author on an indexed journal: 2 points Publication as co-author on an indexed journal: 1 point Publication on a non-indexed journal or book chapter: 0.5 points Abstracts for congresses: 0.2 points up to 1 point in total (max 5 already published publications will be assessed)</p>	maximum score 5 points
<p>Other qualifications:</p> <ul style="list-style-type: none"> - Second/additional master degree: 1 point - Italian specialising master 1st and 2nd level degree if relevant: 1 point - Any other pertinent specialising course: 1 point - Non-university master: 0.5 points - Other qualifications: up to 0.5 points 	maximum score 2 points
Research project	maximum score 35 points
Max 2 letters of reference signed by professors or qualified researchers (1.5 points for each letter)	maximum score 3 points
Minimum threshold for admission to the interview	40 points
Interview	Maximum score 45 points
Minimum threshold for passing the interview	30 points
Further information about the examination	



Research proposal

Applicants are required to submit a research proposal (in English) of no more than **3000 words** (excluding references). Note that, if admitted, students will not be expected to pursue the research project as it is outlined in the proposal (though it may form the basis of their doctoral work). The submitted research proposal will be used during the application process to assess the applicant's understanding of what doing research in neuroscience entails.

The proposal should normally include the following information:

1. Tentative **title** for the intended research.
2. **Abstract:** The proposal should include a concise statement of the intended research of no more than 150 words.
3. **Background:** The proposal should situate the project in the context of the existing literature, summarising the current state of knowledge and recent debates on the topic.
4. **Research Questions:** The proposal should set out the central aims and questions that will guide the research.
5. **Research Methods:** The proposal should outline the research methods for each specific aim, including the rationale for the choice of methods when alternatives exist.
6. **Significance of the possible results:** The proposal should include a brief description of the expected results, explaining why the research is important (for example, by explaining how the research builds on and adds to the current state of knowledge in the field or by setting out reasons why it is timely to research the proposed topic).
7. **References:** The proposal should include a short bibliography (up to 20 references) identifying the most relevant works for the topic.

Interview

During the interview, candidates will discuss the submitted research proposal, their qualifications and their motivation for pursuing a PhD in Neuroscience. Adequate command of spoken and written English is required for admission.

Titoli progetti di ricerca

Dottorato di Ricerca in Neuroscienze

Titles of research projects

PhD Programme in Neuroscience

1. **Valutazione e relazione tra competenza comunicativa pragmatica e funzioni cognitive nello sviluppo atipico (Tutor: Francesca M. Bosco) /Assessment and relation between communicative pragmatic ability and cognitive functions in atypical development (Tutor: Francesca M. Bosco)**

Pragmatic communication refers to an individual's ability to convey a specific meaning in a given context using different modalities, as language and non-verbal, i.e. gestures, body movements, tone of voice, expressive means. Pragmatic ability also includes narrative competence, i.e. the ability to describe things and events. Pragmatic ability may be impaired in acquired, i.e. cerebral lesions, and



congenital, i.e. Autistic Spectrum Disorder, developmental clinical conditions. These clinical conditions are also characterized by a deficit of other cognitive functions as attention, working memory, Executive Functions – planning, inhibition and shifting- and Theory of Mind, i.e. the ability to infer others' mental states. Aim of the project is to provide a complete assessment of communicative pragmatic and narrative abilities in atypical development – cerebral lesions and autistic spectrum disorder -and to investigate the relation between this ability and other cognitive functions, as attention, working memory Executive Functions and Theory of Mind.

2. Eterogeneità dei progenitori degli oligodendrociti nello sviluppo del sistema nervoso e nella riparazione della mielina / Oligodendrocyte progenitor heterogeneity in CNS development and myelin repair (Tutor: Annalisa Buffo, Enrica Boda)

Myelination is required for proper CNS development and, in the adult, for different types of learning, memory consolidation and recall. Myelin is produced by glial cells called oligodendrocytes (OLs), that in turn arise from oligodendrocyte progenitor cells (OPCs). Growing evidence indicate that OLs and OPCs are heterogeneous, but very little is known about the molecular substrates of OPC diversity, and on how such diversity impacts on OPC oligodendrogenic potential in physiology and pathology (i.e. myelin repair, in the context of neurodevelopmental disorders or upon exposure to airborne toxicants). These issues will be tackled by means of in vivo lineage tracing approaches, animal models of multiple sclerosis and microcephaly, administration of airborne particulate matter, metabolic/molecular analyses, high resolution confocal and electron microscopy analyses, and in vitro assays.

3. Lo sviluppo della consapevolezza corporea nelle prime fasi di vita (Tutor: Francesca Garbarini)/Body awareness early in life (Tutor: Francesca Garbarini)

Body awareness is an inherently multimodal concept, since all senses together contribute to build a full body representation. It is reasonable to hypothesize that multisensory integration plays a major role in the development of body awareness in newborns. However, newborns' ability to integrate different sensory inputs into a coherent multimodal representation is a controversial issue. In the present project, we aim at investigating multisensory-related physiological correlates as biomarkers of body awareness in prenatal and neonatal life. To this aim, fetuses' and newborns responses to unimodal vs multimodal stimuli will be recorded, by using fetal magnetoencephalography and electroencephalography. The successful candidate should have a degree in Psychology, Neuroscience (or related disciplines) and should be highly motivated to work in a multidisciplinary team. Candidates with previous experience in using EEG and/or MEG, are strongly encouraged to apply. Programming competences and a background in body awareness and multisensory integration will be appreciate.

4. Il sistema dei neuroni specchio nella corteccia premotoria: confronto tra indagine fMRI ed elettrocorticografia nella awake surgery (Tutor: Giuliano C. Geminiani)/Mirror system in premotor cortex: comparison between fMRI investigation and electrocorticography in awake brain surgery (Tutor: Giuliano C. Geminiani)

Rizzolatti and colleagues (1996) discovered in the ventral premotor cortex (area F5) of the monkey neurons which discharge both when the monkey performs a specific motor action and when it observes another mammalian performing a similar action (Rizzolatti et al., 2004). These cells, called Mirror



Neurons, appear to provide a neural mechanism for action representation. Several functional neuroimaging studies have identified the mirror neuron system in human especially in inferior parietal lobule (IPL) and the ventral premotor cortex (PMv) plus the caudal part of the inferior frontal gyrus (IFG). However, there is no agreement about the anatomical and functional architecture of these areas among fMRI studies. In fact, some of them identify this system in Broca's area (Buccino et al., 2001) while others in dorsal premotor cortex, mesial frontal cortex and superior parietal lobule (Iacoboni, 2005). Few studies have investigated mirror neurons directly onto the human brain cortex. The purpose of the project is to compare two techniques while studying the mirror system in the premotor cortex: fMRI based method and electrocortical technique during awake surgery.

5. Deficit dell'elaborazione sensoriale e disturbi dello spettro autistico nella patologia da deficienza di CDKL5 / Aberrant sensory encoding and autistic-like traits in CDKL5 deficiency (Tutor: Maurizio Giustetto)

Children and adults with autism spectrum disorder (ASD) suffer from social isolation, cognitive deficits, compulsive behaviour, and somatosensory deficits, including impaired multisensory integration ability and altered sensitivity to pain. However, neither the neural mechanisms underlying tactile sensory processing deficits and nociception in affected individuals nor the relationship between somatosensory deficits and social behavior are understood. The prospective PhD student will be engaged in studies of molecular, cellular and circuit mechanisms involved in encoding sensorial inputs. CNS areas such as primary sensory and motor cortices, relevant for sensorimotor processing, will be in mouse models of CDKL5 deficiency disorder, a severe form of ASD. Circuit organization and plasticity will be evaluated adopting high resolution imaging techniques (e.g.: in-vivo 2-photon and confocal microscopy) combined with electrophysiological and molecular analysis as well as in-vivo re-expression of CDKL5 via viral vectors.

6. Funzioni cognitive in pazienti parkinsoniani trattati con stimolazione cerebrale profonda: aspetti clinici e neurofisiologici / Cognition in advanced Parkinson's disease treated with deep brain stimulation: clinical and neurophysiological features (Tutor: Leonardo Lopiano)

Subthalamic nucleus deep brain stimulation (STN-DBS) is a therapeutic option of proven efficacy in treatment of advanced Parkinson's disease (PD). Nevertheless, cognitive side effects, i.e. a mild impairment in verbal fluency and in executive functions, have been reported. Effects of STN-DBS on oscillatory activity of the brain may influence many cognitive tasks. Therefore, it may be useful to elucidate whether these side effects are a consequence of disease progression rather than of the treatment. Clinical neurophysiology, namely event-related evoked potentials (ERP) and quantitative electroencephalography (qEEG), provides useful tools for assessment of cognition but data on how STN-DBS parameters (principally frequency of stimulation) modify ERP and qEEG remain ambiguous. This research aims to better characterize STN-DBS-associated cognitive side effects by use not only of neuropsychological tests but also of clinical neurophysiology.

7. Circuiti neurali e fattori molecolari coinvolti nella modulazione di stimoli sensoriali socio-sessuali / Neural Circuits and Molecular Factors mediating socio-sexual cues (Tutor: Paolo M. Peretto, Serena Bovetti)



Sexual behaviour in rodents requires a multimodal integration among salient external cues (i.e. olfactory and acoustic stimuli), endocrine factors and brain circuits featured by high level of neural plasticity. Accordingly, during the last years we have shown that in adult mice male pheromones enhance neural plasticity (i.e., integration of new neurons) in olfactory bulb circuits, through a fine-tune interplay with gonadal hormones. The functional bases of such integration still remain unclear. In this project by using multiple approaches, including 2-photon imaging combined with selective ablation of key cell populations by using Cre-dependent viral vectors, we will investigate cortical/subcortical circuits and HPG factors (e.g., gonadotropin releasing hormone) involved in mediating perception of sensory cues eliciting sexual behaviour.

8. Sviluppo di strategie innovative per promuovere la rigenerazione dei nervi periferici / Development of different strategies to promote peripheral nerve regeneration (Tutor: Isabelle Perroteau, Giovanna Gambarotta)

Peripheral nerve injury is a common event and although peripheral nerve fibers retain a regeneration potential also in the adult, recovery is usually rather poor, especially when large nerve defects occur and proximal and distal nerve stumps need to be joined with a nerve graft or a conduit. Schwann cells are the key player of the nerve regeneration, both for myelin debris removal during axon degeneration, both for axon regrowth and remyelination. Nevertheless, they are not the only players: other cell types participate to the response to nerve injury and are involved in nerve regeneration: macrophages, endothelial cells, nerve fibroblasts. In this context, different factors released by the different cell types participate in the response to the nerve injury, regulating the transcription of genes playing key roles. The study of the cells and the factors activated following nerve injury might contribute to develop new strategies to promote nerve regeneration.

9. Le radici sensomotorie e cognitive del sé corporeo / The sensorimotor and cognitive roots of bodily self (Tutor: Lorenzo Pia)

Bodily self stands at the root of human nature being an ubiquitous element in perceptual experience as well as the most familiar object animals encounter. Despite the consensus that the bodily self arises through the interplay between sensorimotor and cognitive elements, the character and the form of this relationship remain unclear. The key aim of this PhD project is pinpointing the anatomo-functional mechanisms subserving bodily self-consciousness by means of an interdisciplinary approach: classical neuropsychology, physiology, neuroimaging, immersive virtual reality and others. The whole program will take place at the SpAtial, Motor and Bodily Awareness Research Group (University of Turin). Any suitable candidate shall have a degree in Psychology, Neuroscience or related disciplines. Previous experiences within the field of neuropsychology, cognitive neuroscience or experimental psychology are strongly encouraged. Basic methodological skills and/or ability in stimulus presentation software are appreciated.

10. Studio di neuroimaging sulle modifiche della connettività cerebrale pre e post riabilitazione cognitiva in pazienti affetti da schizofrenia / Neuroimaging study on changes in brain connectivity after cognitive rehabilitation in patients with schizophrenia (Tutor: Paola Rocca)



Over 80% of subjects with schizophrenia have cognitive impairments which affect their real-world functioning. Some cognitive deficits correlate with specific functional and structural neuroimaging alterations. Cognitive Remediation Therapy (CRT) is effective in reducing cognitive deficits and improving the functional outcome of schizophrenia. Different studies investigated neuroimaging changes after CRT, however, no study carried out a combined evaluation of whole brain functional and structural connectivity. Our project aims to broaden the knowledge about these brain connectivity changes and to identify neuroradiological patterns of good or poor response to CRT. The experimental sample will consist of 30 patients with schizophrenia (DSM 5), aged between 18 and 50. Brain connectivity will be studied before and after a six-month computer-assisted CRT, using a 3T magnetic resonance with resting state (functional) and diffusion tensor imaging (structural) sequences. Graph analysis and basic network statistics will be employed to describe and compare neuroimaging data.

11. Deficit neurocognitivi nel bambino con danno cerebrale acquisito: sviluppo e validazione di metodi di accertamento e riabilitazione / Neurocognitive outcomes in children with acquired brain injury: development and validation of assessment and rehabilitation methods (Tutor: Benedetto Vitiello)

Acquired brain injury (ABI) is a leading cause of disability in children and adolescents worldwide. It can result from traumatic brain injury, brain tumor, stroke, infection, epilepsy, or central nervous system surgery or treatment. ABI often results in impairments not only in the motor/neurological domain, but also in cognitive, affective/behavioral, and social functioning, where deficits may be less evident. In particular, deficits in attention, processing speed, executive functions, memory, language, visuospatial abilities, and social cognition may be difficult to ascertain and treat. As survival among children with ABI continues to increase, the long-term neurocognitive sequelae that often impact their quality of life have become more clinically relevant. This project aims to advance the systematic assessment of ABI neuropsychiatric sequelae in children and to develop sensitive measures of treatment response that can be used to evaluate the effects of therapeutic interventions.

12 - Calcium-dependent alterations of synaptic function in neurodegenerative disorders. (*tutor: Marco Sassoè Pognetto*) (research project funded by Department of Neuroscience "Dipartimenti di Eccellenza Project")

13 - Understanding the role of SMN in spinal muscular atrophy and beyond. (*tutors: Alessandro Vercelli, Marina Boido*) (research project funded by Department of Neuroscience "Dipartimenti di Eccellenza Project")