UNIVERSITÀ DEGLI STUDI DI TORINO

ANNEX 4

CALL FOR PHD POSITIONS – 35 cycle
PHD PROGRAMME IN NEUROSCIENCES

PhD Programme Coordinator	Prof. Marco Sassoè Pognetto
Department	Neuroscience "Rita Levi Montalcini"
PhD Programme Length	4 years
PhD web site	http://dott-neuroscienze.campusnet.unito.it/cgi-bin/home.pl
Course start date	1st November 2019
Departments involved in PhD programme	Department of Neuroscience *"Rita Levi Montalcini"*, Department of Life Science and Systems Biology, Department of Veterinary Sciences, Department of Psychology, Department of Clinical and Biological Sciences, Department of Drug Science and Technology, Department of Public Health and Pediatrics

Positions offered [1]	
n. 6 positions with scholarship, of which n. 1 reserved to candidates with international qualifications	of which n. 6 scholarships funded by the University
n. 2 positions without financial support	

Titles of Research Projects /Research Fields
The list of research projects is available at the end of this PhD Programme's annex. This list may be updated until Call's deadline.

Calendar of entrance examinations

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[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 http://www.unito.it/ricerca/fare-ricerca-unito/dottorati-di-ricerca and http://en.unito.it/research/phd/phd-programmes until Call's deadline.

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The calendar with information on dates and venues of entrance examinations shall be published on the websites: http://www.unito.it/ricerca/fare-ricerca-unito/dottorati-di-ricerca and http://en.unito.it/research/phd/phd-programmes starting from **9th April 2019.**

Useful information for applicants

Application fee: €50.00 for each application submitted. Candidates with international qualifications are exempted from paying the application fee.

Application fee deadline: 16th April 2019 (mandatory deadline). Candidates who do not pay the application fee within the deadline will be excluded from the competition.

CALL FOR ALL POSITIONS	
Admission procedure for ordinary positions, including positions reserved to applicants with international qualifications	
Assessment of qualifications, research project and interview	
Qualifications to be uploaded in the on-line application	
- Application form (duly signed and including identification document/passport) - For International qualifications: submit on-line documentation as specified in Art. 4 of this Call - For applicants under condition: provision of Bachelor's degree grade, certificate or self-certification with a complete list of academic transcripts concerning the 1st cycle degree (Laurea Triennale) and 2nd cycle degree (Laurea Magistrale) with marks, weighted average and credits. For applicants applying under condition, please also check Art. 5 of the Call. - Research project (max 3000 words, excluding references) written in English following the scheme provided in section 'Further information on assessment of qualifications, project and interview'. - Publications (max. 5) - Letters of reference (max 2, see 'Further information on assessment of qualifications, project and interview')	

Assessment criteria (for non-reserved positions)	maximum score 100 points
Assessment of qualifications and research project:	**maximum score 55 points**
Final grade of Laurea/2nd cycle degree (or weighted average of examinations taken during the Laurea Magistrale/2nd and the Laurea triennale/1st cycle degree for candidates applying under condition) 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 Candidates with international qualifications will	maximum score 10 points

be assessed considering their Curriculum studiorum and vitae (as per information provided in the Application Form) and not exclusively according to the score of the Master's degree.	
Publications 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)	maximum score 5 points
Other qualifications Second/additional master degree: 1 point Italian specialising master 1st and 2nd level degree if relevant: 1 point Any other pertinent specialising courses: 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 on assessment of qualifications, project and interview:

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.

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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.

Instructions for reference letter

Applicants will indicate the email addresses of referees on the online application form. Referees (max 2) will then upload their references online. Applicants are required to check with them that they have done so by the deadline. If references arrive late, they cannot be considered when assessing the application. Applicants are strongly advised to arrange for their referees to send their references at least 1 week before the deadline.

Reference letters should contain an evaluation of the candidate based on the following scheme:

	below average *sotto la media*	**average** *media*	**good** *buono*	**exceptional** *eccezionale*
ACADEMIC/SCIENTIFIC Accademico/scientifico				
Capacity for independent thinking, creativity, curiosity Capacità di ragionare in modo indipendente, creatività, curiosità				
Motivation for research and commitment Motivazione alla ricerca e impegno				
Research skills: bench work skills, scientific communication skills Attitudine alla ricerca: capacità tecniche e di comunicazione				
S*OCIAL Social*				
Reliability: sense of responsibility Affidabilità: senso di responsabilità				
Interpersonal relationships: ability to get along with others, teamwork Relazioni interpersonali: capacità di rapportarsi con gli altri, capacità di lavorare in gruppo				

Overall judgment on the candidate (max 20 lines) / Giudizio Complessivo del candidato (massimo 20 righe).

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Dottorato di Ricerca in NEUROSCIENZE
Titoli dei progetti di ricerca

PhD Programme in NEUROSCIENCE
Titles of research projects

1) Disorganized attachment: effects on executive functions, social cognition, and neurophysiological functioning *(supervisor: Adenzato Mauro)*

2) Body self-awareness and food choice: a sensory-motor approach *(supervisor: Berti Annamaria)*

3) Sensory-motor simulation in remembering events *(supervisor: Bucciarelli Monica)*

4) Phenotypic and functional heterogeneity of astrocytes: identification of intrinsic and extrinsic determinants in the rodent and human cerebellum *(supervisor: Buffo Annalisa)*

5) Development of different strategies to promote peripheral nerve regeneration *(supervisor: Gambarotta Giovanna)*

6) Autonomic neuropathy in Parkinson's disease: association with disease phenotype, disability, and progression *(supervisor: Lopiano Leonardo)*

7) Suicide attempts and suicidal ideation in obsessive-compulsive disorder: comorbidity, age at onset, and association with specific obsessive-compulsive symptoms *(supervisor: Maina Giuseppe)*

8) Neurodegenerative diseases induced by intracellular calcium dysregulation *(supervisor: Marcantoni Andrea)*

9) Advanced therapeutical approaches in neuromuscular disorders: the role of innovative outcome measures in rare diseases (evaluation scales, imaging, biomarkers) *(supervisor: Mongini Tiziana/Vitiello Benedetto)*

10) Genesis and function of newborn neurons in the lesioned striatal parenchyma *(supervisor: Peretto Paolo Marcello/Luzzati Federico)*

11) Probing the role of the vestibular system in spatial and motor cognition (*supervisor: Ricci Raffaella*)

12) Neural circuits of long-term fearful memories (*supervisor: Sacchetti Benedetto*)

13) Central nervous system involvement in children with neuromuscular disorders: cognitive and behavioral issues (*supervisor: Vitiello Benedetto*)

14) **Aberrant sensory encoding in Autism Spectrum Disorders: the case of Rett syndrome (*supervisor: Giustetto Maurizio*)**

PhD in NEUROSCIENCE – Description of the research projects (XXXV)

1. Disorganized attachment: effects on executive functions, social cognition, and neurophysiological functioning *(supervisor: Adenzato Mauro)*
Clinical trials suggest that the disorganised attachment (DA) is associated with high vulnerability to a wide range of psychopathological disorders, hindering the development of supplementary higher mental functions and social cognition. Several studies have reported that DA is significantly represented in both clinical and non-clinical samples. From a neurobiological point of view, attachment experiences model and shape the early organisation of the brain, significantly influencing mental development. Although studies investigating cognitive and neuro-psychophysiological correlates associated with various attachment styles have increased significantly in recent years, neuro-psychophysiological changes associated to DA in adults is still an unexplored research area. In particular, to date no study has simultaneously investigated cognitive, neural and psychophysiological changes that are seen following activation of the attachment system in the non-clinical adult population with DA. The aim of this project is to fill this significant gap by using converging methods.

2. Body self-awareness and food choice: a sensory-motor approach *(supervisor: Berti Annamaria)*
This research project aims at investigating the relation between body cognition and food choice in healthy and pathological population. In particular we shall study how body self-awareness, personal preferences and emotional cues would affect, modulate and predict eating behaviour by registering, in different experiments, with different methodological and technical tools, the activation of the subjects' motor systems. On the bases of previous studies, we hypothesise different outcome within healthy population (taking into account omnivorous vs vegetarian/vegan diet) and between healthy and pathological subgroups of patients with eating disorders. The results may offer a new methodological and theoretical framework to understand eating behaviour and to predict food choice in normal and pathological population.

3. Sensory-motor simulation in remembering events *(supervisor: Bucciarelli Monica)*
Memory retrieval can be considered a covert mental simulation of the original experience (Kent & Lamberts, 2008). Some authors hypothesized that these mental simulations heavily depend on the bodily states and the brain's sensory-motor system to such an extent to call them 'sensory-motor simulations' (e.g., Korner et al., 2015). Studies have revealed that recovery of an autobiographical memory is facilitated when we assume the same body posture we had at the time of the memorized event. Modality specific states of perception and action that were

activated when an event was experienced are re-activated again when the experience is recalled, to the extent that concurrent tasks involving the same neural resources involved in the re-enactment processes interfere with retrieval (Ianì & Bucciarelli, 2018). The aim of the project is an in-depth exploration into the type of body manipulations and movements that can affect memory retrieval.

4. Phenotypic and functional heterogeneity of astrocytes: identification of intrinsic and extrinsic determinants in the rodent and human cerebellum *(supervisor: Buffo Annalisa)*

Astrocytes phenotypic and functional heterogeneity is an emerging issue. Yet, the ontogenesis of such glial diversity remains poorly understood. By studying the mouse cerebellum, we recently provided the first evidence that a remarkably ordered developmental program, tightly regulated in space and time, controls the emergence of astrocytes diversity. Further, we showed that the distinct types of cerebellar astrocytes derive from embryonic and postnatal progenitors with different lineage potentials. We now aim to reconstruct the developmental trajectories underlying this diversity, unveiling what genetic/epigenetic determinants are implicated in the progenitors' fate decisions and in the specification, maintenance and function of each cerebellar astrocyte type. The prospective PhD student will be engaged in transcriptomic analyses, bioinformatic analyses on original and already publicly available datasets, high resolution imaging, clonal approaches, in vitro and in vivo assays. Analyses will also expand to human samples to highlight consistency or variation between mouse and human development.

5. Development of different strategies to promote peripheral nerve regeneration *(supervisor: Gambarotta Giovanna)*

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. In this context, a pivotal role is played by Neuregulin1 (NRG1), a factor expressed as a soluble isoform by Schwann cells to promote their dedifferentiation and proliferation, and as transmembrane isoform by axons to promote their remyelination.

In this project, different conduits/membranes obtained with naturally derived biomaterials will be functionalized for the controlled release of different factors, including soluble NRG1, and the interplay between soluble NRG1 and other factors necessary for nerve regeneration will be carefully investigated.

6. Autonomic neuropathy in Parkinson's disease: association with disease phenotype, disability, and progression *(supervisor: Lopiano Leonardo)*

Autonomic neuropathy (AN) is a common feature of Parkinson's disease (PD), occurring in at least 30% of patients, and may occur early in the disease course. AN has been associated with a more severe PD phenotype, but its clinical impact remains poorly quantified and incompletely understood. In particular, the natural history of AN, the deep characterization of the AN

subtypes (i.e., orthosympathetic, parasympathetic, and mixed), the association with different PD genotype, the influence of PD treatments (including advanced therapies) on AN severity, and the complex interplay between AN and other clinical features in determining a more severe course of PD still need to be elucidated. This research project aims to deeply characterize PD-associated AN features and quantify how AN could influence PD therapies, PD progression, the development of disability milestones, and patients' quality of life.

7. **Suicide attempts and suicidal ideation in obsessive-compulsive disorder: comorbidity, age at onset, and association with specific obsessive-compulsive symptoms** *(supervisor: Maina Giuseppe)*

Although a growing number of studies have investigated suicidal thoughts and behaviours in individuals with obsessive compulsive disorder (OCD), there is controversy about the frequency and burden of suicidality in OCD. This study aims to examine the association between suicidality and clinical features in a large sample of subjects with OCD. One key development is the ideation-to-action framework, which stipulates that (a) the development of suicidal ideation and (b) the progression from ideation to suicide attempts are distinct phenomena with distinct explanations and predictors. The aims of this research project are to: 1) explore the rate of suicide, planned and unplanned suicidal attempts, and suicidal ideation in OCD; 2) identify clinical factors that predict ideation from those that predict suicide attempts.

8. **Neurodegenerative diseases induced by intracellular calcium dysregulation** *(supervisor: Marcantoni Andrea)*

Neurodegenerative diseases such as Parkinson and Alzheimer's disease (PD, AD) are characterized by a long lasting asymptomatic phase during which neurons alter their synaptic and excitable properties without clearly affecting brain function. In this scenario calcium ions play a critical role as their intracellular concentration tends to increase together with the appearance of neuronal symptoms. Considering the relevance of early diagnosis, in this project we will develop different strategies for characterizing both the early synaptic dysfunctions in hippocampus, enthorinal cortex and the altered dopamine release from nigrostriatal terminals. The role of intracellular calcium concentration in governing synaptic function and excitability will be taken into account by combining electrophysiological, amperometrical and calcium imaging experiments.

9. **Advanced therapeutical approaches in neuromuscular disorders: the role of innovative outcome measures in rare diseases (evaluation scales, imaging, biomarkers)** *(supervisor: Mongini Tiziana/Vitiello Benedetto)*

In the last few years, a number of new therapeutical approaches for neuromuscular disorders reached the clinical phase, including enzymatic replacement therapies, corrective gene therapy, gene product modifiers. For some of them, namely DMD, SMA, and glycogenosis 2, approved drugs are already available for children and adult patients. Both for clinical trials and for the daily practice, it is very important to collect longitudinal data to prove the treatment efficacy in a long-term period and in larger populations. Currently, only a limited number of validated outcome measures are used, mainly aimed to muscle strength and resistance, and quality of life.

New and more refined outcome measures are necessary, often specifically designed for single disorders and for each age groups. For example, new technologies applied to commonly used devices (PC, smart phones), muscle imaging by magnetic resonance and by ultrasound techniques, and new serum or spinal fluid biochemistry are under evaluation.

10. Genesis and function of newborn neurons in the lesioned striatal parenchyma (supervisor: Peretto Paolo Marcello/Luzzati Federico)
Previously, we demonstrated that neuronal progenitors are activated in the mammalian striatum in both physiologic and pathologic condition, and that these cells belong to a population of astrocytes. The mechanisms underlying neurogenic competence acquisition and lineage progression in astroglia, as well as the fate and role of striatal newborn neurons are still largely elusive. The project will investigate in parallel the neurogenic transformation of astrocytes, the fate of newborn striatal neuroblasts, and their structural and functional relevance for compensatory plasticity elicited by striatal neurodegenerative diseases.

11. Probing the role of the vestibular system in spatial and motor cognition (supervisor: Ricci Raffaella)
Human spatial and motor cognition relies on the integration of different sensory signals (i.e. multisensory integration). Most studies on multisensory integration mainly concern vision, audition, touch and proprioception. Although the vestibular system has widespread connections in the Central Nervous System, its role in multisensory integration and cognition has been largely neglected and is poorly understood. With the present research project, we aim to investigate the contribution of the vestibular system to specific components of spatial and motor cognition. To this end we will employ both well-established and novel experimental protocols and multiple techniques (e.g., non-invasive brain stimulation, neuroimaging) in healthy individuals and patients with disorders of the vestibular function. Findings of this research project will provide novel insights into the role of the vestibular system in human cognition, its neural bases and putative interventions suitable to counteract disorders of the vestibular function.

12. Neural circuits of long-term fearful memories (supervisor: Sacchetti Benedetto)
During an emotional experience, sensory stimuli, like odors, sound and colors, acquire a positive or negative value through their association with rewards or punishments. This process can be investigated through associative learning paradigms in which a previously neutral conditioned stimulus (CS), such as a light or tone, is paired with an unconditioned stimulus (US). In aversive conditioning, the US is often represented by a footshock, loud sound or air puff. Studies over the recent years have demonstrated that fearful memories in mammals are mediated by an intricate neural network that encompasses prefrontal areas, the amygdala and sensory cortices. Here we will address two related questions: i) how the emotional meaning that sensory stimuli acquire with the experience is processed and encoded at the level of sensory cortex, ii) whether and how the sensory cortex interacts with prefrontal cortex and the amygdala during the formation and the long-term storage of memories of threatening events.

13. **Central nervous system involvement in children with neuromuscular disorders: cognitive and behavioral issues** *(supervisor: Vitiello Benedetto)*

Central nervous system (CNS) involvement has emerged as a frequent and prominent feature in a number of neuromuscular disorders, including mitochondrial diseases, myotonic dystrophies, and Duchenne muscular dystrophy. In other diseases, such as in the new emerging phenotype of Pompe disease, CNS involvement is evident thanks to the longer survival of treated patients. In most cases, the knowledge on type and extension of CNS dysfunction in neuromuscular diseases is still limited. In particular, and most relevant to clinical care, no validated clinical protocol to test and to treat children with neurological impairment is currently available. The aim of this project is to characterize the CNS involvement in children with different neuromuscular diseases, with particular focus on cognitive and behavioral functions, and to search for possible therapeutical options.

14. Aberrant sensory encoding in Autism Spectrum Disorders: the case of Rett syndrome (*supervisor: Giustetto Maurizio***)**

Children and adults with autism spectrum disorder (ASD) as well as Rett Syndrome (RTT) patients show profound alterations in sensorymotor functions. However, neither the neural mechanisms underlying tactile sensory processing deficits in affected individuals nor the relationship between somatosensory deficits and social behavior are understood. The 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 sensorymotor processing, will be studied in mice modeling RTT (Mecp2- and CDKL5-KO mice). This project will shed light on multisensory atypicalities with an experimental setting taking advantage of a combination of behavioral tests, electrophysiology and circuit analyses in mouse models, with the prospective to unveil novel targets for intervention.