Finanziato dall'Unione europea
NextGenerationEU

UNIVERSITÀ DI TORINO

MUR

Documento aggiornato in data 04/07/2023
Correzioni o aggiornamenti sono riportati in rosso

Document updated on 04/07/2023
Amendments or updates are in red

ALLEGATO 1 / ANNEX 1

Corso di Dottorato in Neuroscienze

PhD Programme in Neuroscience

Coordinatore / Coordinator	Prof. Andrea CALVO
Email Coordinatore/*Coordinator's email*	andrea.calvo@unito.it
Dipartimento / *Department*	Neuroscienze "Rita Levi Montalcini"
Durata Corso di Dottorato / *Programme Length*	3 anni / 3 *years*
Sito web Corso di Dottorato / Programme website	https://dott-neuroscienze.campusnet.unito.it/do/home.pl
Data inizio attività / *Programme start date*	1° novembre 2023 / 1st November 2023
Strutture / *Departments*	*Dipartimenti di Neuroscienze, Scienze Veterinarie, Scienza e tecnologia del farmaco, Psicologia, Scienze Cliniche e Biologiche, Scienze delle Sanità Pubbliche e Pediatriche, Scienza della Vita e Biologia dei Sistemi*

Totali posti disponibili: n. 17, di cui n. 2 posti con borsa riservati ai/lle laureati/e all'estero / *Total number of available positions: no. 17, of which no. 2 with scholarship reserved to candidates holding a foreign degree*	
BORSE D.M. 117/2023 **DOTTORATI INNOVATIVI CHE RISPONDANO AI BISOGNI DI INNOVAZIONE DELLE IMPRESE (M4C2 I. 3.3)** ***PhD IN COOPERATION WITH INDUSTRIAL PARTNERS (M4C2 I. 3.3)***	
N. 3 posti con borsa **DM 117/2023** / *No. **3** positions with **D.M. 117/2023** scholarships*[1]	Di cui / *Of which*: - n. 3 borse **M4C2 I. 3.3** (vincolate a progetti n. 1, 16 e 18) / *no. 3* **M4C2 I. 3.3** scholarships *(bound to projects no. 1, 16 and 18)*;
N. 1 posti con borsa **DM 118/2023** / *No. 1 positions with **D.M. 118/2023** scholarships* [2]	Di cui / *Of which*: - n. 1 borse **M4C1 I. 4.1** (vincolate a progetti n. 2) / *no. 1 **M4C1 I. 4.1** scholarships (bound to projects no. 2)*;
POSIZIONI ORDINARIE CON BORSA (FINANZIATE DALL'ATENEO O DA TERZI) ***STANDARD POSITIONS WITH SCHOLARSHIP (FUNDED BY THE UNIVERSITY OR THIRD PARTIES)***	
N. 13 posti con borsa di studio / *No. 13 PhD scholarships*[3]	Di cui / *Of which*: - n. **10** borse di Ateneo / *No. **10** PhD scholarships funded by the University of Torino;* - n. **1** borsa finanziata Novartis (collegata a progetto n. 12) / *no. **1** scholarship funded by Novartis (bound to project no. 12)*; - n. **1** borsa finanziata dal Dipartimento di Neuroscienze - Progetto Dipartimenti di Eccellenza (abbinata a progetto n. 13) */ no. **1** scholarship funded by the Neurosciences Department - Excellence Departments Project* Associazione San Secondo. *13);* - n.**1** borsa finanziata dall'Associazione San Secondo (collegata al progetto n.17) / n. *scholarship funded by Associazione San Secondo (bound to project no. 17).*

[1] Si noti che le borse D.M. 117/2023 sono vincolate alla presentazione di progetti specifici, i cui titoli sono elencati al fondo del documento / Please, note that D.M. 117/2023 scholarships are bound to specific projects listed at the end of the sheet.

[2] Si noti che le borse D.M. 118/2023 sono vincolate alla presentazione di progetti specifici, i cui titoli sono elencati al fondo del documento / Please, note that D.M. 118/2023 scholarships are bound to specific projects listed at the end of the sheet.

[3] Eventuali borse aggiuntive e contratti di Apprendistato di Alta Formazione e Ricerca (Art. 45 D.lgs 81/2015), finanziati in tempi successivi alla pubblicazione del presente bando, saranno resi noti mediante pubblicazione sul sito della Scuola di Dottorato, entro la data di scadenza del bando/*Any 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 Doctoral School website until the Call's deadline*.

I documenti richiesti possono essere prodotti in inglese o italiano/ The required documents can be provided in English or Italian MODALITÀ' DI AMMISSIONE (titoli incluso progetto di ricerca + colloquio) / ADMISSION PROCEDURE (qualifications, including research project + interview)		
	Punteggio massimo / Score max	***Informazioni/ Documentazione per la candidatura Information/ Application documents***
TITOLI / *QUALIFICATIONS*	***40***	
CV	15	CV redatto come da modello (allegato 2) / */ CV as per template (annex 2)* Incluse le **pubblicazioni** da caricare su piattaforma domanda (massimo 2) / *Including publications to be uploaded on application platform (max 2)* Incluse eventuali lettere di referenza (massimo 2)*/ Including any reference letters (max. 2)*
Progetto di Ricerca / *Research Project*	25	Il **Progetto di Ricerca** deve essere scelto tra quelli proposti nella lista / *The research project must be selected from the list* *Le/I candidate/i sono tenuti a presentare una proposta di ricerca (in inglese) di non più di 3000 parole (esclusi i riferimenti). Il progetto dovrà aderire al titolo scelto dal candidato al momento della domanda. La proposta di ricerca presentata verrà utilizzata durante il processo di candidatura per valutare la comprensione da parte del candidata/o di ciò che comporta la ricerca nelle neuroscienze.* *La proposta dovrebbe normalmente includere le seguenti informazioni:* *1. Titolo indicativo della ricerca prevista.*

		2. Riassunto: La proposta dovrebbe includere una sintesi della ricerca prevista di non più di 150 parole. *3. Premesse: La proposta dovrebbe essere congrua con il contesto della letteratura esistente, riassumendo lo stato attuale delle conoscenze sull'argomento.* *4. Obiettivi di ricerca: la proposta dovrebbe definire gli obiettivi centrali e le domande che guideranno la ricerca.* *5. Metodi: la proposta dovrebbe delineare i metodi di ricerca per ciascun obiettivo specifico, inclusa la motivazione per la scelta dei metodi quando esistono alternative.* *6. Significato dei possibili risultati: la proposta dovrebbe includere una breve descrizione dei risultati attesi, spiegando perché la ricerca è importante (ad esempio, spiegando come la ricerca si svilupperà e colmerà i divari e le lacune nello specifico campo o esponendo i motivi per cui è opportuno studiare l'argomento proposto).* *7. Bibliografia: La proposta dovrebbe includere una breve bibliografia (fino a 20 riferimenti) che identifichi i lavori più rilevanti per l'argomento di ricerca proposto. /* *Applicants are required to submit a research proposal (in English) of no more than 3000 words (excluding references). The project should adhere to the title chosen by the candidate at the time of*

		application. 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.*
Soglia minima per l'accesso al colloquio*/ Threshold to be admitted to the interview*	*25*	
COLLOQUIO / *INTERVIEW*	**60**	Il colloquio verterà sugli argomenti del progetto di ricerca / *The interview will focus on the research project* *Il colloquio verterà sugli argomenti del progetto di ricerca: i candidati discuteranno la proposta di ricerca presentata, i loro titoli e la loro motivazione per perseguire un dottorato di ricerca in Neuroscienze. Per l'ammissione è richiesta un'adeguata padronanza dell'inglese parlato e scritto / The interview will focus on the research project: 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.*
Soglia minima per il superamento del colloquio */ Threshold to pass the interview*	*40*	

Titoli dei progetti di ricerca abbinati a borse: D.M. 117 (M4C2 I. 3.3)
Dottorato di Ricerca in Neuroscienze

Research Topics bound to scholarships: D.M. 117 (M4C2 I. 3.3)
PhD Programme in Neuroscience

Per maggiori informazioni, contattare il referente scientifico / *For any further information concerning the research topics, please, contact the scientific director*

Progetto n. 1 / *Project n. 1*	
Titolo Progetto/ *Research Topic*	Analysis of human behavior in the aerospace context: development of an integrated multi-biosensor approach for psychophysiological stress monitoring during training and different workloads.
Referente scientifico / *Scientific Director*	Prof. Lorenzo Priano
Lingua progetto/ *Project language*	Inglese / *English*
Descrizione sintetica / *Abstract*	In the aerospace context, stress is a relevant topic as mental workload, tiredness and distraction may cause human errors, small inefficiencies, up to major disasters. Subjective evaluations cannot provide a real-time index, so tools for real-time objective evaluations are desirable. Autonomic and hormonal regulation play a role in the stress response and can be evaluated in terms of physiological signals (e.g. ECG, respiratory rate, electrodermal activity). This research project aims to assess the stress conditions of pilots using a multi-source approach (wearable sensors for biosignals, eye and movement tracking systems) to combine and optimize results. Analysis algorithms will be developed to generate integrated indices that objectively quantify and classify the stress conditions related to workloads.

Progetto n. 16 / *Project n. 16*	
Titolo Progetto/ *Research Topic*	Cerebral activity in natural and urban environments: evidences from functional near-infrared spectroscopy (fNIRS) and neurofeedback.
Referente scientifico / *Scientific Director*	Prof. Alessandro Piedimonte

Lingua progetto/ *Project language*	Ingelese / *English*
Descrizione sintetica / *Abstract*	The main assumption of environmental psychophysiology is that every action, emotion and cognition have a neural substrate tightly linked to a specific environmental context. Nowadays, we are facing one of the fastest changes regarding this context: namely the change from natural to urban and digitalized contexts. Natural environments have been found capable to boost motor performance, somatosensory perception and cognition. However, there is still little to no evidence on the neural correlates of this interaction. This research project aims to ecologically investigate brain areas involved with these changes through the use of functional near-infrared spectroscopy (fNIRS), a novel neuroimaging technique that measures changes in cerebral cortex's hemoglobin concentration. A secondary aim of the project is to strengthen the influence of natural environments via neurofeedback, a technique where signals recorded with fNIRS will be used to enhance positive effects of these contexts (e.g. presented through pictures, videos or virtual reality).

Progetto n. 18/ *Project n. 18*	
Titolo Progetto/ *Research Topic*	Sviluppo di "nanovettori" per la somministrazione controllata di farmaci utilizzati per il trattamento dei disturbi del movimento e dei disturbi del sonno nelle persone anziane o fragili. Development of nanocarriers for the contro/led delivery of drugs used in the treatment of movement disorders and sleep disorders in the elderly or frail people
Referente scientifico / *Scientific Director*	**Prof. Priano Lorenzo**
Lingua progetto/ *Project language*	**Inglese/English**
Descrizione sintetica / *Abstract*	Levodopa (L-DOPA) and apomorphine, are effective antiparkinsonian drugs but their pharmacokinetic profile is not satisfactory, due to the fluctuations of plasma levels and brain concentrations. This project aims to develop controlled release formulations consisting of drug-loaded nanocarriers or a cross-linked cyclodextrin (nanosponge). Using nanocarriers, the trespassing of Blood Brain Barrier (BBB) is considerably facilitated and a greater amount of drug is released at the CNS. Apomorphine, L-DOPA and other molecules (e.g melatonin) included in nanocarriers will be tested to obtain a controlled

	delivery for clinical purposes after oral administration. In vitro release kinetics studies will be carried out using multi-compartment rotating cells with a dialysis membrane. Flocel's Dynamic In vitro Blood-Brain Barrier (DIV-BBB) will be used to simulate the passage of nanocarriers or drugs released through BBB. In vivo evaluation of the pharmacokinetics, tissue distribution and clinical effect of the drugs will be evaluated in proper animal models.

Titoli dei progetti di ricerca abbinati a borse: D.M. 118 (M4C1 I. 4.1)
Dottorato di Ricerca in Neuroscienze

Research Topics bound to scholarships:* D.M. 118 *(M4C1 I. 4.1)
PhD Programme in Neuroscience

Per maggiori informazioni, contattare il referente scientifico / *For any further information concerning examinations, please, contact the scientific director*

Progetto n. 2 / *Project n. 2*	
Titolo Progetto/ *Research Topic*	Differential response to medical and device-aided therapies of Parkinson's disease patients with GBA mutations
Referente scientifico / *Scientific Director*	Prof Leonardo Lopiano
Lingua progetto/ *Project language*	*Inglese / English*
Descrizione sintetica / *Abstract*	Glucosylceramidase β1 (GBA1) gene mutations have been recently found as a common and strong risk factor for the development of Parkinson's disease (PD). PD patients who are carriers of GBA1 mutations typically have an earlier age at onset and a more aggressive disease course, with a higher burden of neuropsychological issues. However, the high number of GBA1 variants and other more elusive aspects such as genetic, epigenetic, or environmental modulators may modify the penetrance, age at onset, and the course of the disease in carriers of the same mutation. The response of GBA1 patients to medical therapies and especially to the device-aided therapies used for complicated disease stages, including Deep Brain Stimulation and infusion therapies, still needs to be elucidated. This research project aims to analyzed the differential response to therapies of PD patients with GBA1 mutations in advanced disease stages, considering relevant clinical (e.g., neurobehavioral and neuropsychological issues) and genetic aspect (i.e., mutation variants).

Titoli dei progetti di ricerca abbinati a borse ordinarie
Dottorato di Ricerca in Neuroscienze

Research Topics bound to standard scholarships
PhD Programme in Neuroscience

Per maggiori informazioni, contattare il referente scientifico / *For any further information concerning examinations, please, contact the scientific director*

Numero Titolo/*Topic number*	**Referente scientifico / *Scientific director***	**Titolo del progetto / *Research Topic***
3	Prof. Valentina Carabelli	Role of alfa synuclein in neuronal early dysfunction Parkinson's disease is caused by the progressive loss of dopaminergic neurons in the *Substantia Nigra pars compacta* and is characterized by the deposition of misfolded and aggregated α-synuclein. With the aim of identifying molecular targets for diagnosing at the onset, early neuronal dysfunction will be studied to provide molecular insights of the pathophysiological impact of α-synuclein and to identify novel targets for pharmacological intervention. Complementary approaches (electrophysiology, multi-electrode arrays and the cutting edge technology of diamond-based biosensors) will be exploited to investigate how progressive α-synuclein aggregation and α-synuclein spreading may affect the interplay between neuron excitability and neurotransmitter release, prior to neuronal demise. Also, we will focus on the role of environmental pollutants in causing neuronal detrimental effects, oxidative stress, Ca^{2+} dyshomeostasis, impaired neuronal excitability and α-synuclein aggregation. To this purpose, we will investigate whether the concomitant exposure toenvironmental neurotoxic agents and α-synuclein may exert synergic adverse effects.

4	Prof. Monica Bucciarelli	Sensorimotor simulation in reasoning Scientific evidence has highlighted the sensory and motor nature of reasoning; humans build mental representations rich in sensory and motor details and this, at least in part, by exploiting their sensorymotor resources, i.e., their bodies. The goal of this research project is to investigate whether motor simulation is involved in spatial reasoning. Even if we start from premises describing the position of objects in space, we build mental representations through our bodies that are rich in motor details and simulate the state described by the premises. Therefore, we can hypothesize that we can facilitate or impede reasoning processes by manipulating the experimental instructions (activating mental simulation at different levels), the content of the premises (activating motor activation to different extents), the arm movements of the participants (the same effectors involved in the simulation), and finally directly the pre-motor and motor cortex (e.g., applying rTMS).
5	Prof. Giovanni Abbate Daga	Psychotherapy Treatments in Eating Disorders: An Integrated Staging and Neuroscience Perspective Eating disorders (EDs) are serious and potentially life-threatening psychiatric disorders. The etiology of EDs is multifactorial. There is growing evidence to suggest that neurobiological, genetic, environmental, and psychological factors all play a role in the onset and maintenance of these disorders. Psychotherapy is one of the most widely used and effective treatments for EDs, and several studies have demonstrated its efficacy in reducing symptoms, improving quality of life, and promoting long-term recovery. However, the mechanisms by which psychotherapy exerts its therapeutic effects remain poorly understood. There is a need for a more integrated understanding of the complex interplay between neurobiological, psychological, and social factors in the development and maintenance of EDs. Recent advancements in neuroscience research have revealed growing data on the neurobiological underpinnings of eating

		disorders. These findings may represent a potential improvement in psychotherapeutic treatments for individuals with EDs. For example, neuroimaging studies have shown that individuals with EDs display alterations in the reward and self-control circuits of the brain, which may contribute to the development and maintenance of disordered eating behaviors. Understanding these neurobiological mechanisms can inform the development of more effective psychotherapeutic interventions that target specific neural circuits involved in EDs. Additionally, advances in neurofeedback technology and brain stimulation techniques hold promise for enhancing the efficacy of psychotherapy by directly targeting and modulating neural activity. The primary objective of this research proposal is to develop an integrated staging and neuroscience perspective that will help to understand better the underlying mechanisms of psychotherapy in treating EDs. The secondary objective is to evaluate the efficacy of this model in improving clinical outcomes, including symptom severity, quality of life, and neurobiological markers. Finally, we can hypothesize that incorporating a neuroscience perspective into psychotherapeutic treatments for EDs can lead to more personalized and effective interventions that address the complex interplay between neurobiological, psychological, and social factors.
6	Prof. Mauro Adenzato	Disorganized attachment: cognitive, neural, and psychophysiological effects Attachment experiences shape the early organization of the brain and significantly influence mental development. Clinical studies suggest that disorganized attachment (DA) is associated with high vulnerability to a number of psychopathological disorders and hinders the proper development of higher mental functioning and social cognition. Several studies have reported that DA is significantly represented in both clinical and nonclinical samples. Although the number of studies examining the cognitive and neuropsychophysiological correlates of different attachment styles has increased substantially in recent years, the neuropsychophysiological

		changes associated with DA in adults remain a virtually unexplored area of research. In particular, there are no studies that have simultaneously examined cognitive, neural, and psychophysiological changes following attachment system activation in the non-clinical adult population with DA. The goal of this project is to address this significant gap through the use of converging methods.
7	Prof. Benedetto Sacchetti	Neuronal mechanisms of the long-term maintenance of aversive and incentive memories An important challenge for the brain is managing memories of distinct events that share common features or that occur in temporal proximity. The specificity of each memory should be preserved over time, and the common features of these experiences should be remembered. How this can be achieved is yet to be determined. Dysfunctions in the neural mechanisms underlying the distinction across highly similar memories form the core of several neuropsychiatric disorders, such as post-traumatic stress disorder and emotional-related disturbances. The specificity of each memory may be related to its emotional (e.g., pleasant vs. unpleasant) content. Moreover, different events can occur close together or far apart in time. This research project aims to investigate the cellular mechanisms involved in forming highly specific emotional memories with different emotional contents or related to different events that occur close together or far apart in time.
8	Prof. Francesca Garbarini	Bodily-self representation early in life Bodily-self representation (BSR) is fundamental to form our sense of self, however its emergence is still unknown. BSR components may develop early in life, along with the maturation of i) the primitive ability to represent the bodily-self in space based on proprioception, likely emerging soon after birth,

		and ii) the capability to discriminate the one's own body from the others', that develops along with the motor specialization during the postnatal life. Here, we aim to describe implicit biomarkers of these BSR components' development. To this aim, multisensory and visual paradigms will be administered to newborns and infants, while measuring neurophysiological responses through electroencephalography (EEG) and functional magnetic resonance (fMRI). The successful candidate should have a degree in Psychology, Neuroscience, Bio-engineering (or related disciplines). Candidates with previous experience in EEG and/or fMRI and a background in developmental neuroscience are strongly encouraged to apply. Data analysis and programming competences will be appreciated.
9	Prof. Annalisa Buffo	CerebellOM: investigating mouse and human cerebellar development, physiology and pathophysiology through high throughput "omic" approaches Astrocyte phenotypic heterogeneity is an emerging issue but its ontogenesis and functional relevance remains poorly understood. To clarify these matters and based on our study revealing the lineages giving rise to astrocytes diversity in the mouse cerebellum, we now plan to extend the investigation also to the human cerebellum and : i) investigate the molecular mechanisms underneath the ontogenesis of cerebellar astrocyte heterogeneity; ii) delineate the distinctive molecular, morphological and functional profiles of emerging astrocyte subtypes; iii) assess the impact of manipulations of candidate mechanisms implicated in astrocyte subtype differentiation and/or interplay with neurons. We will particularly emphasize on astrocytes of the cerebellar nuclei, which have been neglected so far, but have a distinctive neurochemical profile. In terms of methodology, this study will combine in vitro/in vivo LoF/GoF approaches and state of the art -omics including single-cell/nucleiRNA-seq, ATAC-seq,

		spatial transcriptomics, and in silico analyses of original and publicly available datasets.
10	Prof. Benedetto Vitiello	Technology outcome measure (TOM) development for genetic neuromuscular disorders Reliable, valid, and accurate outcome measures for motor function assessment are essential to quantify functional changes and allow clinical trial readiness in neuromuscular disorders (NMDs). The tests currently used to monitor clinically meaningful changes in motor function of NMD patients present limitations, including learning effect, limited reproducibility, influence of motivation and attention (especially in pediatric patients), and lack of sufficient sensitivity to capture relevant changes in slowly progressive muscle diseases. Technology outcome measure, both device-based and instrumented clinical tests, allow monitoring of patients' physical functions, such as gait and upper limb function, as well as overall physical activity, to be conducted both inside and outside the boundaries of a clinical setting. This research project aims to develop a protocol for the application of wearable inertial systems for the definition and detection of significant motor outcome measures in genetic NMDs.
11	Prof. Adriano Chiò	Towards a personalized medicine in amyotrophic lateral sclerosis (ALS): advanced approaches to define new diagnostic and prognostic biomarkers Motor neuron diseases (MNDs) are a heterogeneous group of disorders, whose most frequent entity is Amyotrophic lateral sclerosis (ALS). Among MNDs is possible to identify different clinical entities characterized by huge variability of clinical manifestations and, consequently, the risk of not offering ALS patients an appropriate tailored therapy. In this perspective, it is crucial to reach a deep phenotypic stratification of ALS patients based on multiple parameters. One way to achieve this goal is to perform an evaluation of clinical, neuroradiological, genetic and biochemical parameters using a multidimensional approach and

		subsequently resort to artificial intelligence methods with the aim of maximizing the probability of identifying variables associated with phenotypic traits. This approach would allow either the development of reliable prognostic algorithms or the identification of reproducible *in vitro* models from patient-derived cells aiming for possible tailored therapies.
12	Prof. Adriano Chiò	Prognostic stratification and early identification of progressive Multiple Sclerosis: MRI, histopathology and new CSF/serum biomarkers. Multiple Sclerosis (MS) is a chronic immune-mediated disease of the central nervous system. Progressive MS course (pMS), characterized by the gradual accumulation of disability over time, currently represents the greatest therapeutic challenge in MS. With the increasing availability of new therapeutic options for pMS, it is important to define biomarkers to predict the prognosis of pMS and identify early signs of progression in all MS patients. Several MRI biomarkers have been proposed, but many still need to be validated and their histopathological substrate needs to be further investigated. Cerebrospinal fluid (CSF) and serum biomarkers have also been proposed, and could complement clinical/MRI data. The aim of the present project is to integrate the use of MRI and CSF/serum biomarkers, with a parallel validation of these by histopathology on postmortem MS series, in order to achieve a better prognostic stratification of pMS and a reliable identification of early signs of progression. **Progetto vincolato a borsa finanziata da Novartis / *Project bound to scholarship funded by Novartis*** 13 Prof.ssa Mirella Ghilardi Meccanismi di separazione di fase neuronali nella memoria e nella neurodegenerazione *Neuronal phase separation mechanisms in memory and neurodegeneration* The formation and plasticity of neuronal synapses are fundamental processes underlying learning and memory. Moreover, the pathological alteration of these processes can contribute significantly to

		the cognitive, neurological, and psychiatric symptoms of neurodegenerative disorders. In recent years, it has emerged that a biophysical process called liquid-liquid phase separation (LLPS), which leads to the spontaneous organization of protein molecular machineries in cells, plays a fundamental role in neuronal and synaptic functioning, as well as in neurodegenerative disorders. This research project will investigate the pathophysiological role of the LLPS of neuronal proteins involved in both short- and long-term synaptic plasticity. The project will be developed through a multidisciplinary approach integrating techniques of molecular biology and genetics, cell culture of vertebrate and invertebrate neurons, advanced confocal imaging, and electrophysiological recordings of synapse function and plasticity. **Progetto vincolato alla borsa finanziata dal Dipartimento di Neuroscienze / *Project bound to the scholarship funded by the Neurosciences Department***
14	Prof. Franco Cauda	Investigating the mechanisms underlying the different interindividual susceptibility to brain disease through a network-oriented approach and big-data analyses The dynamic nature of the human brain involves the ability to reconfigure its structure and function adaptively in response to internal or external changes. Despite being a critical feature of the brain in situations of dysfunction and pathology, there is strong inter-individual variability in the relationship between the quantifiable degree of brain alteration and its clinical expression. One hypothesis is that the observed variability could depend on different morphology and recruitment of brain networks. The advent of large-scale datasets and biobanks that combine multimodal brain data opened the way to innovative strategies to investigate this research domain. In particular, the study of big data in neuroimaging allows to develop a set of functional and structural connectivity phenotypes that

		can be reliably extracted and compared between different datasets. In addition, the use of graph theory, allows to map brain network characteristics that change greatly across different cognitive functions and behaviors. Therefore, this project will involve the application of network analysis techniques to large biobanks to investigate how plasticity shapes network organization, how it is reconfigured during brain dysfunction, and how different network topographies relate with different response to pathological conditions.
15	Prof.ssa Livia Colle	Rehabilitation of theory of mind/mentalization in personality disorders Impairment in the ability to understand mental states, one's own and those of others, is crucial to explaining the difficulties observed in patients with Personality Disorders. These abilities are defined respectively as metacognition (Semerari et al. 2007) and theory of mind (Premack & Woodruff 1978). Patients with PDs present a variety of metacognitive dysfunctions, ranging from the inability to describe one's own affects (Dimaggio et al. 2007), to the inability to form integrated representations of one's own mental states (Clarkin et al., 1999; Semerari et al. 2007). Aim of the project is to evaluate metacognitive dysfunction in PDs before and after a group skill training specially developed to improve these abilities (Colle et al. 2021). Two semi-structured interviews, The Theory of Mind Assessment Scale (Bosco et al. 2009) and The Metacognition Assessment Interview (Semerari, et al. 2012) will be used to evaluate metacognitive abilities before and after the group training.
17	Prof. Elisa Rubino	**Investigating the role of neuroinflammatory mechanisms in Alzheimer's disease** Alzheimer's disease (AD) is the leading cause of dementia worldwide. Pathologically, AD brain is characterized by the accumulation of toxic amyloid-ß oligomers and hyperphosphorylated Tau protein, resulting in atrophy and neuronal loss. In recent years, neuroinflammation has been shown to play a crucial role in the pathogenesis and progression of AD, through the activation of microglia and astrocytes. Microglia is significantly activated in AD brain, and several studies revealed that inflammatory biomarkers are increased in AD patients. Furthermore,

		advances in molecular imaging using positron emission tomography (PET) supported the hypothesis of an early occurrence of neuroinflammation in patients with AD. Apart from a direct neurotoxic effect, activated microglia and astrocytes can promote Aß deposition. Several experimental studies demonstrated that amyloid deposition is increased under inflammatory conditions, underlying the potential role of systemic inflammation in priming microglial cells. Recently, some studies showed a higher risk of developing new-onset AD after SARS-CoV-2 infection, linking viral infections and amyloidosis. Thence, neuroinflammation might represent an important bridge between SARS-CoV-2 infection and AD. The overall objective of this research proposal will be to investigate the role of neuroinflammatory mechanisms in Alzheimer's disease. Firstly, the project will evaluate blood and cerebrospinal fluid concentrations of both consolidated and new biomarkers of neurodegeneration and neuroinflammation in patients belonging to the AD continuum (NIA-AA criteria). The second aim will be to establish the relations between the "core" AD biomarkers, the new AD biomarkers reflecting neuroinflammatory dysfunction, and the clinical characteristics of the disease. Furthermore, the project will also investigate the role of new PET biomarkers for neuroinflammation, and their relationship with the remaining biomarkers. Finally, the project will involve patients with previous SARS-CoV-2 infection, already hospitalized during the COVID-19 pandemic, to evaluate the potential long-term effects of the infection on cognitive decline and risk to develop AD. **Progetto vincolato alla borsa finanziata dal Associazione San Secondo per la Ricerca sull'Alzheimer / *Project bound to the scholarship funded by the Associazione San Secondo per la Ricerca sull'Alzheimer***