



DOCTORAL PROGRAMME IN BIOMEDICAL SCIENCES

Director Prof. Niccolò Taddei

XLII cycle – academic year 2026/2027

BIOMEDICAL AREA	
ADMINISTRATIVE OFFICE	Department of Experimental and Clinical Biomedical Sciences “Mario Serio”
WEB	www.sbisc.unifi.it/dottorato
CURRICULA	1. Human Morphology and Morphogenesis 2. Functional Biology of Biomolecules and Biosystems 3. Physiological and Nutritional Sciences 4. Experimental Pathology 5. Endocrinological, Molecular and Regenerative Biotechnologies 6. Biomedical Sciences of Evolutive Age 7. Gender Medicine 8. Single Cell Multi-Omics Technologies in Biomedical Sciences
POSITIONS AVAILABLE: 13 Positions with scholarship: 12 Positions without Scholarship: 1* <i>*standard ranking only</i>	
RANKING LIST FOR STANDARD POSITIONS SCHOLARSHIPS AVAILABLE: 9	6 - University of Florence 3 - Department of Experimental and Clinical Biomedical Sciences “Mario Serio” – Ministerial Project “Dipartimenti di Eccellenza 2023–2027” - CUP B13C22004460001
RANKING LISTS FOR POSITIONS WITH SPECIFIC RESEARCH TOPICS SCHOLARSHIPS AVAILABLE: 2	1 - Department of Neuroscience, Psychology, Drug Research and Child Health (NEUROFARBA) Thematic: “Integrating advanced cardiac Imaging and multiscale models to understand arrhythmias” Funded by: CERBAIHEARTCORE- CUP B13C25003720005 Project description: The PhD project is part of the ERC Advanced Grant HeartCORE, which aims to develop a new paradigm for studying cardiac arrhythmias through the quantitative integration of structural and functional data acquired from the whole heart. Despite recent advances, predicting the onset of arrhythmias remains an open challenge, mainly due to the complex interaction between structural remodeling of cardiac tissue and electrophysiological dynamics. The PhD candidate will be involved in the development and application of advanced optical imaging techniques for the three-dimensional characterization of cardiac

	electrical activity and tissue architecture across different spatial scales. In particular, the project involves the use of innovative panoramic and transmural optical mapping systems for volumetric reconstruction of electrical activity, combined with tissue clearing techniques and light-sheet microscopy to obtain high-resolution structural images of the entire organ. A central element of the research will be the integration of morphological and functional data obtained from the same biological samples, with the aim of building realistic computational models ("virtual hearts") capable of simulating the propagation of electrical impulses in complex cardiac geometries. These models will incorporate information on fiber orientation, fibrosis distribution, cellular composition, and electrophysiological heterogeneity, enabling systematic investigation of the mechanisms underlying arrhythmogenesis. 1 - Department of Experimental and Clinical Biomedical Sciences "Mario Serio" Thematic: "Tumor heterogeneity and response to radiotherapy: integrated omics approaches for the identification of therapeutic targets" Project Description: The research project aims to investigate the molecular mechanisms underlying the response to radiotherapy in oncology, with particular emphasis on intratumoral heterogeneity, recognized as one of the main determinants of radioresistance. The study will employ patient-derived models, including tumor explants and primary cultures, which preserve the biological characteristics of the original tumor. These models will be integrated with in vitro cell lines, used for functional analyses aimed at dissecting the molecular pathways involved in the response to radiation-induced damage. Integrated omics technologies (transcriptomics, epigenomics, and proteomics) will be applied, including single-cell level analyses, in order to characterize the different cellular subpopulations and identify molecular determinants associated with radiosensitivity or radioresistance. The results obtained will enable the identification of potential therapeutic targets, which will be validated in experimental models for the development of combination strategies with radiotherapy. The project is framed within the context of personalized medicine and aims to improve the effectiveness of oncological treatments through an integrated translational approach.
RANKING LISTS FOR POSITIONS WITH SPECIFIC RESEARCH TOPICS SCHOLARSHIPS AVAILABLE: 1 <i>(subject to the grant of funding)</i>	Agenzia Spaziale Italiana – ASI Call for funding of 45 scholarships on topics of interest to ASI Thematic: "Synaptic integrity under microgravity: risks and countermeasures for long-duration space missions" Project Description: The project investigates how chronic exposure to microgravity affects the brain's capacity to maintain homeostatic equilibrium, known as synaptic resilience. It posits that microgravity acts as a physical stressor that induces subtle nanoscopic alterations in the synaptic cleft, mimicking the early stages of neurodegenerative diseases. By utilizing advanced 2D and 3D neuronal models, such as human iPSC-derived neuron-astrocyte co-cultures, and simulating microgravity with specialized equipment like Random Positioning Machines, the research aims to identify key biophysical vulnerability nodes, including membrane fluidity changes and calcium dysregulation. A central goal of the study is to evaluate the efficacy of natural antioxidant compounds as potential "synaptic shields" to protect astronaut brain health. The project will perform dose-response analyses to define therapeutic windows, specifically

	investigating if the increased blood-brain barrier permeability observed in space could shift these compounds from being protective to neurotoxic. By integrating high-density multielectrode array (HD-MEA) data with machine learning frameworks, the researchers intend to develop predictive models of synaptic responses to both microgravity and pharmacological interventions. Ultimately, this work seeks to provide a mechanistic foundation for neuroprotection in space while identifying early, reversible markers of neurodegeneration relevant to aging populations on Earth. Please note: scholarships will be awarded ONLY if the respective funding will be granted
STUDY/RESEARCH PERIODS ABROAD	at least 3 months at least 6 months for ASI - Agenzia Spaziale Italiana scholarship
DOCUMENTS REQUIRED FOR THE ADMISSION	• Copy of the Identification Document • Self-certification for qualifications obtained in Italy (laurea triennale, specialistica o magistrale o ciclo unico) with list of exams taken, credits and related grade, title of the thesis and graduation mark (using this template or similar forms containing the required information) • Qualifications obtained abroad (Bachelor's and Master's Degrees or combined cycle Degree) with a list of all exams taken, credits and related grade, rating scale, title of the thesis and graduation mark <i>The same documentation except for the final mark must be submitted by those who will graduate within the 31/10/2026</i>
DOCUMENTS REQUIRED FOR THE EVALUATION	MANDATORY • Curriculum vitae • Research Project OPTIONAL • List of publications • Any other qualification document
RESEARCH PROJECT	The research project, written in English on one page and of maximum 700 words, which must include a brief introduction, methodology, expected results and 2-3 references in brief form (Example Rossi et al. 2017 J. Mol Biol. 23, 340-345). As far as the Scholarships in ordinary ranking are concerned, the project must refer specifically to one or more of the working themes listed in the section below "Thematics". For grants related to a specific theme, the project must be consistent with the description provided in the box "Subject-topic scholarships with separate ranking".
INTERVIEW MODE	In person In the application form candidates may ask to conduct the interview remotely
FURTHER INFORMATION	The interview can be conducted in English language.

EVALUATION MARKS	<table><tr><th>parameter</th><th>minimum score</th><th>maximum score</th></tr><tr><td>Curriculum vitae, publications, and other qualification documents</td><td>–</td><td>45/120</td></tr><tr><td>Research Project redaction</td><td>–</td><td>25/120</td></tr><tr><td colspan="3">Applicants who obtain a mark of at least 50/120 in the evaluation of the above parameters will be admitted to the interview</td></tr><tr><td>Interview: discussion of the research project, publications, and other qualification documents</td><td>–</td><td>50/120</td></tr><tr><td colspan="3">Eligibility is achieved with a minimum score of 80/120</td></tr></table>	parameter	minimum score	maximum score	Curriculum vitae, publications, and other qualification documents	–	45/120	Research Project redaction	–	25/120	Applicants who obtain a mark of at least 50/120 in the evaluation of the above parameters will be admitted to the interview			Interview: discussion of the research project, publications, and other qualification documents	–	50/120	Eligibility is achieved with a minimum score of 80/120		
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THEMATICS	Curriculum in Human Morphology and Morphogenesis: 1) Systematic and topographic anatomy: anatomical variants of organs and apparatuses of anatomical relevance 2) Applied anatomy: anatomic characteristics and topographical relations of organs and apparatuses of interest for diagnostic imaging and clinical semeiotics 3) Morpho-functional histology and cytology: structure-function relationships and mechanisms of regulation in physiological conditions and in pathological models 4) Embryology and organogenesis: mechanisms of cell and tissue differentiation for regenerative medicine 5) Histochemistry: localization of specific functional molecules in cells and tissues by advanced microscopy methods 6) Adaptations to muscle activity and to sport of musculoskeletal apparatus, respiratory and circulatory systems. Training methodologies Curriculum in Functional Biology of Biomolecules and Biosystems: 1) Biophysics of proteins, lipid bilayers and biomembranes 2) Cell proteostasis and its regulation 3) Cell biology of amyloids and its relevance on associated systemic and neurodegenerative pathologies 4) Phospholipid signalling 5) Yeast and other model systems proteomics 6) Anti-aggregation power and nutraceutical properties of natural compounds Curriculum in Physiological and Nutritional Sciences: 1) Molecular mechanism, regulation and mechanochemical coupling of striped muscle contraction 2) Electrophysiology and mechanics of smooth muscle 3) Nervous mechanisms involved in respiratory activity genesis and control 4) Components and strategies involved in motor control of the human voluntary movement 5) Pathophysiology of gastrointestinal apparatus and of nutrition and prevention of chronic-degenerative pathologies. Epidemiological and intervention studies on foods and alimentary profiles Curriculum in Experimental Pathology: 1) Molecular and cellular mechanisms of cancer transformation and progression 2) Cancer stem cells; characterization and targets for new therapies 3) Innovative approaches to cancer diagnosis and prognosis 4) Mechanisms of Microbial Pathogenicity																		

	5) Antimicrobial Drugs: Mechanisms of Action and Resistance 6) Molecular and cellular mechanisms of aging and longevity Curriculum in Endocrinological, Molecular and Regenerative Biotechnologies: 1) Pathophysiology of male reproductive apparatus and its accessory glands 2) Genetic aspects of male infertility 3) Control mechanisms of human spermatogenesis 4) DNA fragmentation in human spermatozoa: biochemical mechanisms and clinical meaning and significance 5) Pathophysiology of thyroid, hypophysis and adrenal gland 6) Pathophysiology of fat tissue Curriculum in Biomedical Sciences of Evolutive Age: 1) Clinical biochemistry and modifications of cell and systemic redox status in human physiology and pathology 2) Innovative strategies for neoplastic and cardiovascular therapy by the use of plant polyphenols 3) Specific aspects of diagnostics, therapy and prevention in pediatrics 4) Hygiene public health and health organization 5) Detection of high priority malocclusions in evolutive age in orthodontics 6) Prevention of infective and chronic pathologies, vaccinations, food hygiene and public health laboratory Curriculum in Gender Medicine: 1) Endocrinological aspects of the female vs male reproductive apparatus 2) Mechanisms of control of the female vs male sexuality 3) Endocrinological-metabolic control mechanisms of the female vs male reproduction 4) Endocrinological and gynecological aspects of the female oncologic pathology 5) Pathophysiology of the metabolic diseases in the female and the male Curriculum in Single Cell Multi-Omics Technologies in Biomedical Sciences: 1) Single cell multi-omics technological platforms (analysis of genomics, transcriptomics, proteomics and metabolomics) and their applications. 2) Single cell multi-omics technologies in the study of cell subpopulations in order to clarify the role in the pathophysiological processes underlying organ damage, inflammatory and regenerative. 3) Single cell multi-omics technologies in the study of the endocrine-metabolic aspects involved in organ pathology. 4) Single cell multi-omics technologies in the study of tumor heterogeneity and tumor microenvironment. 5) Single cell multi-omics technologies in the study of early alterations involved in neurodegeneration processes. 6) Computational analysis, integration and interpretation of data generated by single cell multi-omics technologies. 7) In situ spatial multi-omics analysis approach at cellular and subcellular resolution to visualize and quantify RNA and proteins.
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EXAMINATION SCHEDULE			
	DATE	TIME	PLACE
INTERVIEW	July 14 th , 2026	09:30 a.m.	Department of Experimental and Clinical Biomedical Sciences “Mario Serio” Viale Giovanni Battista Morgagni, 50 Firenze Aula A
The list of the candidates admitted to the interview and the final ranking will be published at the page PhD courses			

ENROLLMENT ROUNDS		
Enrollment must be completed within the specified mandatory deadlines, under penalty of exclusion (as per Art. 12 of the Call for Applications - Annex 1)		
	Opening Date	Deadline for Enrollment
Enrollment (successful candidates)	Ranking's publication date (by July 31, 2026)	by 11.59 pm (CEST) on August 25th 2026 *
1st round (eligible candidates)	from 31st August 2026	by 11.59 pm (CEST) on September 7th 2026
2nd round (eligible candidates)	from 10th September 2026	by 11.59 pm (CEST) on September 17th 2026
* Please note that the University will be closed from August 8 th to August 23 th , 2026.		
Subsequent reassignment of vacant positions: The reassignment of any residual positions after the first two rounds will be activated on every Tuesday until October 27th, with a mandatory enrollment deadline set for the following Friday (11:59 PM CEST). It is the sole responsibility of the candidate to check their personal reserved area No personal communications will be sent to candidates. Technical instructions for enrollment can be found here		