



**Operational Program European Social Fund - Regione Liguria 2014-2020
ASSE 3 "Education and training"**



**UNIVERSITÀ DEGLI STUDI
DI GENOVA**

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EXCERPT OF INFORMATION SHEET NEUROSCIENCES	
GENERAL INFORMATION	
STRUCTURE OF THE TRAINING PROJECT	
DURATION AND ORGANIZATION OF THE COURSE	<p>The course starts officially on 1 of November 2018 and lasts three years. At the end of each year, doctoral students shall present the Teaching Body with a detailed written account of the activities carried out. The Teaching Body may ask for the account to be discussed according to procedures it has established.</p> <p>Coordinator of the course: Prof. Giovanni Abbruzzese; E-mail address: giabbr@csita.unige.it Department coordinating for research: Department of Neurosciences, rehabilitation, ophthalmology, genetics and mother and child sciences (Dipartimento di Neuroscienze, riabilitazione, oftalmologia, genetica e scienze materno-infantili – DINOGMI).</p>
TRAINING PROJECT	<p>The following 3 projects/scholarships are activated:</p> <p>Curriculum CLINICAL AND EXPERIMENTAL NEUROSCIENCES (CODICE 7304)</p> <p><u>Project/scholarship No. 1: Development, engineering and testing of a rehabilitation device for tracking and monitoring the movements of the upper limbs of patients affected by neuromusculoskeletal disorders.</u></p> <p><i>Months abroad:</i> 12 at Vrije Universiteit Brussel</p> <p><i>In cooperation with:</i></p> <ul style="list-style-type: none"> - SWHARD S.r.l. - Polo Ligure Scienze della Vita <p><i>Project/scholarship details:</i></p> <p>For the application development will be selected and exploited the most recent innovations in the field of motion sensors, in order to gather information on the orientation of the patient's limbs under very different measurement conditions occurring during the normal daily activities. A crucial and innovative part will be focused on the analysis and combination of the data provided by the sensors to create a three-dimensional mapping of the movement space</p>

accessible to the patient and on the consequent engineering of the system, integrated with all the components.

The project will take place partly at the university Campus of Savona, where there is a research laboratory of the DINOEMI aimed at the study of movement and motor control, and partly in the SWHARD facilities, located in Genova Campi at the BIC, Business Innovation Center by FILSE.

The student will perform a part of the study and experimentation at DINOEMI, where he will learn the skills necessary to understand the clinical problems related to the recovery of motor function in patients suffering from neuro-musculoskeletal disorders. He will also have the opportunity to observe and participate in the research currently underway on related issues, with the related methodologies and investigation procedures.

The project will continue at SWHARD, where the PhD student will work on the construction of a first prototype of the sensors network needed for monitoring. This prototype will have to respond to the specific needs and requirements established together with the DINOEMI researchers. A phase of testing and experimentation will follow, in order to detect any problem and improve their characteristics. This will lead to an engineered and working prototype, from which a first pre-series can be obtained.

A part of the training will take place at the Vrije Universiteit Brussel, under the supervision of Prof. Erik Catrysse, at the Department of Experimental Anatomy (EXAN). This period will make it possible to integrate the previous acquired skills and to develop new abilities relative to work in international and multicultural teams, indispensable both in the academic and business fields.

The student will spend six months at DINOEMI and one and half year (18 months) at SWHARD. The remaining 12 months will be spent at the indicated foreign institution (Vrije Universiteit Brussel), where he will have the possibility to complete his scientific and technical-operational training.

The student granted of the scholarship must have a degree in technical-scientific subjects (Physics, Engineering, Computer Science) or alternatively a solid base in software and hardware development. The skills in the biomedical field will be provided during the period of work at the DINOEMI, so they do not represent a fundamental requirement for access, although they will be nevertheless positively evaluated.

Project/scholarship No. 2: Mechanobiology of aging: role piezo1 and piezo2 mechanosensitive ion channels in Alzheimer disease

Months abroad: 12 at ETH Zurich

In cooperation with:

- FAB Crea Srl
- Polo Ligure Scienze della Vita

Project/scholarship details:

The molecular mechanisms by which A β exerts neurotoxic effects during Alzheimer disease is not completely known. It was reported that A β oligomers causes alterations of intraneuronal calcium homeostasis triggering biochemical events that lead to activation of apoptosis. Notwithstanding how A β alter intracellular calcium is still unknown. Currently, it has been proposed that A β interact with membrane structures to cause changes in the mechanical properties. Thus alterations in the cell membrane biomechanical features could represent the first event of A β -mediated neurotoxicity. In this context, the study of the molecular mechanisms responsible of the A β impairment of calcium homeostasis will represent the topic of the current research project. In detail, the role of the mechanosensitive ion channels piezo1 and 2 will be studied as possible determinant of A β neurotoxicity.

The PhD program will be organized along the following phases:

A] Evaluation of the effect of A β on the mechanical properties of single cells; the student will be introduced to the biological aspects of the topic at the UNIGE Lab and (s)he will also receive a specific technical training on Single Cell Force Spectroscopy at the joint FABCrea-CNR Lab.

B] Development of a mechanosensitivity assay based on a dedicated set-up

	<p>integrating nanomanipulation and calcium imaging (under technical supervision of the partner FABCrea).</p> <p>C] Study of the adhesion forces developed against substrates of different rigidity and as a function of the expression level of piezo1 and piezo2 by means of Traction Force Microscopy (activity abroad, ETH Zurich).</p> <p>D] Role of Aβ on the cellular biomechanics and physiology as a function of the expression of piezo1 and piezo2. The skills acquired during phases A and B will be exploited to fully characterize the interplay between Aβ and piezo proteins at the single cell level.</p> <p>The student will carry out his/her activity in Genova (2 years), in the premises of the company FABCrea and at the University site, and in Zurich, Switzerland (1 year) in the lab of Dr Ferrari.</p> <p><u>Project/scholarship No. 3: Development of new software for the post-processing and quantitative analysis of amyloid PET images</u></p> <p><i>Months abroad:</i> 12 at University of Geneva, Switzerland</p> <p><i>In cooperation with:</i></p> <ul style="list-style-type: none"> - Camelot Biomedical Systems S.r.l. - Polo Ligure Sceinze della Vita <p><i>Project/scholarship details:</i></p> <p>It is possible to quantify the beta amyloid burden in the human brain in vivo using positron emission tomography (PET) and with amyloid-specific radiotracers. These images are usually evaluated with a dichotomic visual scale (positive vs negative scans for pathological amyloid beta burden). This dichotomic approach, however, does not allow to easily evaluate those images with an intermediate amyloid burden, which paradoxically could represent those borderline cases usually more difficult to diagnose on clinical grounds alone.</p> <p>In this project, we thus aim to develop robust semi- quantitative approaches to amyloid PET images to better classify PET amyloid scans and possibly to better understand the clinical significance of different amyloid PET patterns.</p> <p>Planned work-flow</p> <p>I: From qualitative to quantitative evaluation of PET images: development of multiple composite metrics of amyloid brain deposition to develop a summary index of amyloid burden over the whole brain.</p> <p>II: Amyloid PET patterns evaluation: regional analysis of amyloid PET images and correlation of regional measures of amyloid burden both with clinical status and with clinical, cognitive and imaging.</p> <p>The PhD student will spend 12 months at the University of Genoa, the University of Geneva (Switzerland) and at Camelot Biomedical Systems to complete this project and to acquire a balanced portfolio of skills useful both in academia and in the high-tech industry sector.</p> <p>The successful candidate will have a university degree in technical and scientific fields such as engineering, physics or computer science or a strong quantitative background in medical images analysis</p>
PhD FUNDING	<p>The annual gross amount of the grant, including social security expenses to be paid by the recipient, is € 16,500.00.</p> <p>The amount of the doctoral grant shall be increased by 50% for an overall period of not more than 18 months, if the graduate student is authorized to by the teaching body to carry out research abroad.</p> <p>Starting from the first year, each graduate student will have, besides the grant, a budget for research activities in Italy and abroad which will not be less than 10% of the grant.</p>
ADMISSION REQUIREMENTS	
COURSE ADMISSION	<p>Admission is subject to the passing of the selection tests and is conditioned by the positive outcome of the medical examinations, where required, that are carried out in health facilities and aimed at ascertaining the suitability for the</p>

	specific task in accordance with D. Lgs. No. 81/08.
REQUIRED QUALIFICATION	Degree which has been conferred according to the rules and regulations in force prior to the reform of didactic freedom in universities, or a specialist/II level degree or an equivalent foreign academic qualification

SELECTION PROCESS	
SELECTION COMMITTEE	The committees are made up of at least 3 university professors for each course; they may be integrated by not more than 2 experts, who may also be foreign nationals, from public and private research institutions and structures.
ADMISSION TEST VENUE	Università degli studi di Genova, DINOGMI, Clinica Neurologica, largo Daneo 3, Genova, c/o aula clinica neurologica, piano terra
TYPE OF ADMISSION TEST	<ul style="list-style-type: none"> • Comparative assessment of the qualifications/publications. • Written test (research project). • The interview consists in the discussion of the written test (research project) and the description of the candidate's research area of interest, also on the basis of previous activities stated in his/her scientific-professional curriculum <p>The tests are focused on confirming the candidates' aptitude for scientific research.</p>
METHODS FOR INVITING THE CANDIDATES AND COMMUNICATING THE OUTCOMES OF THE TESTS	<p>The examination schedule is as follows:</p> <ul style="list-style-type: none"> • Evaluation of qualifications, curriculum and written test (research project): 26.7.2018, 9.00 am • Interview: 26.7.2018, 2.00 pm, at DINOGMI, Clinica Neurologica, room clinica neurologica, ground floor. <p>Candidates can use video conference mode; and, for identification purposes, the candidate must show the original document of which he has deposited a certified copy at the time of application.</p> <p>The list of those admitted to the interview will be affixed at the Dipartimento di Neuroscienze, riabilitazione, oftalmologia, genetica e scienze materno-infantili (DINOGMI).</p> <p>The final lists shall be announced on 10th August 2018, and will appear solely on:</p> <ul style="list-style-type: none"> • the noticeboard of the relevant research Departments/facilities for the research courses; • the noticeboard of the University; • on the Internet address https://unige.it/usg/it/dottorati-di-ricerca <p>No information whatsoever shall be posted to candidates' domicile.</p>
WRITTEN TEST	<p>The research project (10 pages maximum) has to be attached to the online application form, and it must concern one or more research Projects/grants highlighted in the section 'TRAINING PROJECT'.</p> <p>The research project will be evaluated as practical test for the selection, together with the evaluation of the qualifications and the scientific-professional curriculum, in order to identify the candidate's aptitude for scientific research in terms of originality, feasibility, clarity in the definition of objectives, methods and expected results.</p>
INTERVIEW	<p>The interview consists in the discussion of the written test (research project) and the description of the candidate's research area of interest, also on the basis of previous activities stated in his/her scientific-professional curriculum</p> <p>During the interview, the candidate shall also prove his/her proficiency in the</p>

	<p>following foreign language: English. Non-Italian candidates will also have to prove knowledge of the Italian language.</p>
<p>PERCENTAGE VALUES OF TO EACH TEST</p>	<p>To each candidate can be assigned a maximum of 150 points, divided as follows:</p> <ul style="list-style-type: none"> - comparative assessment of the qualifications/publications: max score 30/30, pass mark 20/30. - Written test (research project):max score 60/60, pass mark 40/60. - Interview: max score 60/60, pass mark 40/60. <p>The final ranking will be drawn up by adding the scores assigned in comparative assessment, written test and interview. Candidates will be selected in compliance with the principles of equal opportunities.</p>
<p>ADDITIONAL CRITERIA FOR ADMISSION TO THE COURSE</p>	<p>In the case of equal grades, the evaluation of candidates' incomes prevails for the assignation of grants, as per D.P.C.M. 9 April 2001</p>
<p>PROJECT CO-FINANCED BY THE EUROPEAN UNION Regional Operational Program for Liguria - European Social Fund 2014-2020</p>	