PhD Position
3D ultrastructural morphology of the astrocyte

SECTOR: Higher Education Institution

LOCATION: France, Grenoble

RESEARCHER PROFILE:
□ First stage researcher,

INSTITUTION: Univ. Grenoble Alpes, University of Innovation

One of the major research-intensive French universities, Univ. Grenoble Alpes enjoys an international reputation in many scientific fields, as confirmed by international rankings. It benefits from the implementation of major European instruments (ESRF, ILL, EMBL, IRAM, EMFL*). The dynamic ecosystem, grounded on a close interaction between research, education and companies, has earned Grenoble to be ranked as the 5th most innovative city in the world. Surrounded by mountains, the campus benefits from a natural environment and a high quality of life and work environment. With 7000 foreign students and the annual visit of more than 8000 researchers from all over the world, Univ. Grenoble Alps is an internationally engaged university.

A personalized Welcome Center for international students, PhDs and researchers facilitates your arrival and installation.

In 2016, Univ. Grenoble Alpes was labeled «Initiative of Excellence ». This label aims at the emergence of around ten French world class research universities. By joining Univ. Grenoble Alpes, you have the opportunity to conduct world-class research, and to contribute to the social and economic challenges of the 21st century ("sustainable planet and society", "health, well-being and technology", "understanding and supporting innovation: culture, technology, organizations" "Digital technology").

* ESRF (European Synchrotron Radiation Facility), ILL (Institut Laue-Langevin), IRAM (International Institute for Radio Astronomy), EMBL (European Molecular Biology Laboratory), EMFL (European Magnetic Field Laboratory)

Key figures:
• + 50,000 students including 7,000 international students
• 3,700 PhD students, 45% international
• 5,500 faculty members
• 180 different nationalities
• 1st city in France where it feels good to study and 5th city where it feels good to work
• ISSO: International Students & Scholars Office affiliated to EURAXESS
REFERENCES:

International Strategic Partnership – Idex Project : ASTRO 3D EM
SUBJECT TITLE: 3D ultrastructural morphology of the astrocyte
RESEARCH FIELD : Biological sciences, Neurosciences
SCIENTIFIC DEPARTMENT : Grenoble Institute of Neurosciences, in collaboration with the University of Lausanne
DOCTORAL SCHOOL'S: Chimie et Sciences du Vivant, CSV, Grenoble
SUPERVISOR’S NAME: Karin PERNET GALLAY and Andrea VOLterra

SUBJECT DESCRIPTION:

Astrocytes are engaged in bidirectional communications with neurons and modulate synaptic and circuit functions. Release of neurotransmitters during synaptic activity can activate receptors on astrocytic processes and induce Ca2+ signals in astrocytes. These signals can, in turn, start an active response of the astrocytes, e.g. via Ca2+-dependent gliotransmitter release. The key language of astrocyte communication thus lays on changes in the intracellular Ca2+ concentration. Moreover, the group of prof. Volterra has shown that large part of the overall Ca2+ activity in a 3D astrocyte is compartmented and occurs mainly in micro-domains at the interface with synapses and blood vessels that could represent elementary communication units of the astrocyte.

What defines these “local domain” properties is unknown. No obvious morphological characteristics making them recognizable as defined structural compartments have been described so far. One obstacle to this is the poor preservation of the astrocyte ultrastructure upon standard chemical fixation EM procedures. Therefore, whether astrocytes have specialized and restricted communication domains with specific organelles and molecular signaling complexes that match elementary Ca2+ domains remains to be established. In this project, we will first try to decipher the morphological and molecular correlates that underlie calcium signal compartmentalization and astrocyte communication properties. Then we will investigate the morphological and molecular reorganization that astrocytes undergo in pathological conditions, notably in a transgenic mouse model of Alzheimer’s disease.

For this purpose, the student will set up a methodology to visualize astrocytes in 3D by electron microscopy. The first goal will be to optimally preserve the astrocyte ultrastructure by using cryo-methods; than image stack will be acquired with a focused ion beam/scanning electron microscope. Astrocytes and their intracellular components included in the images stack will be segmented as well as the associated synapses. Quantitative morphological 3D measurements and 3D rendering will be achieved by using open sources softwares. In a second phase, the student will establish a novel protocol to localize proteins in 3D electron microscopy either by using viruses expressing proteins tagged with a peroxidase marker or by pre-embedding immuno-labelling protocols in order to localize astrocytic signaling proteins at the ultrastructural level. Finally, the same workflow will be applied on samples from a transgenic mouse model of Alzheimer’s disease.

- The student will have to travel between Lausanne and Grenoble for the purpose of the collaboration
- Student specialized in neuroscience, cell biology AND/OR Electron microscopy will first be considered
- Knowledge and English speaking is mandatory

ELIGIBILITY CRITERIA

Applicants must hold a Master’s degree (or be about to earn one) or have a university degree equivalent to a European Master’s (5-year duration),

Applicants will have to send an application letter in English and attach:
- Their last diploma
- Their CV
- A motivation letter
- Letters of recommendation are welcome.

Address to send their application: ufrchimiebiologie-astro3d@univ-grenoble-alpes.fr
SELECTION PROCESS
Application deadline: **15 August 2018** at 17:00 (CET)
Applications will be evaluated through a three-step process:

1. Eligibility check of applications in August 2018
2. 1st round of selection: the applications will be evaluated by a Review Board in August 2018. Results will be given in the 27th of August 2018.
3. 2nd round of selection: shortlisted candidates will be invited for an interview session in Grenoble the second week of September 2018. (if necessary)

**TYPE of CONTRACT:** temporary-3 years of doctoral contract
**JOB STATUS:** Full time
**HOURS PER WEEK:** 35
**OFFER STARTING DATE:** 1st November 2018
**Salary:** between 1768.55 € and 2100 € brut per month (depending on complementary activity or not)