Ministry of Human Resources and Social Security

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

2019 Helmholtz – OCPC – Program
for the involvement of postdocs in bilateral collaboration projects

PART A

Title of the project:
Structure of cortical and hippocampal networks

Helmholtz Centre and institute:
Forschungszentrum Jülich GmbH, Institute of Neuroscience and Medicine,
JARA-Institute Brain structure-function relationships (INM-10)

Project leader: Prof. Dr. Joachim Lübke

Web-address: the INM-10 was recently founded and a new webpage is in progress

Description of the project:
The group „Structure of Synapses“ at the new founded INM-10 at the Research Centre Jülich GmbH is interested in structural and functional aspects of synaptic transmission and plasticity at the level of neuronal networks, synapses and the molecular level in the normal, developmental and pathologically altered neocortex and hippocampus of various animals models, but most important in the human brain. The final goal of our investigations is to unravel the neuronal and synaptic organization of each cortical layer of a cortical column exemplified in the human temporal lobe neocortex and hippocampus.
This will be achieved using high-end, fine scale Transmission (TEM) and Scanning Focused Ion Beam (SEM-FIB) electron microscopy and computer-assisted three-dimensional (3D) volume reconstructions. The quantitative 3D-models of synapses provide the basis for first, further studies in epileptic and Alzheimer patients, where the structure and synaptic organization undergoes severe changes with ongoing disease which are to date only poorly understood and second, numerical and/or MonteCarlo simulations of various synaptic parameters still inaccessible to experiments, at least in humans.
In a second project, the density, distribution and possible co-localization of various synaptic proteins (for example synaptobrevin-, -tagmin, -physin, munc's), neurotransmitter receptors of the main systems (glutamate, GABA) and ion channels (various Ca^{2+}-channels) at the so-called active zone at synapses that at the molecular level drive synaptic transmission and plasticity, are investigated. We use high-end Freeze Fracture replication of neuronal tissue combined with single or multiple postimmunohistochemistry and subsequent quantitative analysis to generate individual so-called "receptor fingerprints" at synaptic structures in the normal and pathologically altered animal and human brain.
Our studies will contribute to an improved understanding of the structure of microcircuits in the normal and pathologically altered animal and human brain.

Description of existing or sought Chinese collaboration partner institute:
I am open for any collaboration with scientific institutions in China, for example Peking University or the Academy of Science.

Required qualification of the post-doc:

- PhD in Biology or Medicine
- Experience in: basic neuroscience, laboratory and computational skills, high motivation in learning new high-end technics including TEM and SEM-FIB electron microscopy
- Additional skills: ability to work in a team, good english language skills

PART B

Documents to be provided by the post-doc, necessary for an application to OCPC via a postdoc-station in China, which is affiliated to a research institution like a university:

- Detailed description of the interest in joining the project (motivation letter)
- Curriculum vitae, copies of degrees
- List of publications
- 2 letters of recommendation
- Proof of command of English language

PART C

Additional requirements to be fulfilled by the post-doc:

- Max. age of 35 years
- PhD degree not older than 5 years
- Very good command of the English language
- Strong ability to work independently and in a team