

Template for advertising Phd/Postdoc position

Title of the position: Multi-scale analysis of structural reorganization of secondary motor cortex.

Job position: PhD position

Deadline of the application: 31.10.2023

Starting date: Immediately

Contract length: 3-4 years

City: Düsseldorf/Heidelberg

Country: Germany

Institute: German Diabetes Center, institute for vascular and islet cell biology

Contact details:

Name of the PI: Dr. Vijayan Gangadharan

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Website of your institute/department: <https://ddz.de/en/research/institute-for-vascular-and-islet-cell-biology/junior-research-group-preclinical-diabetic-neuropathy/>

Description:

1. **Project Summary:** Long-lasting structural changes in neocortical areas such as cingulate and motor cortices may contribute to chronic pain, as suggested by grey matter volume changes found in patients and rodent models. However, the cellular basis of such long-term structural plasticity remains poorly understood. Using a newly developed longitudinal in vivo two-photon imaging, we recently discovered loss of neurons in the secondary motor cortex (M2) in neuropathic pain conditions. The aim of the project is to understand how nerve injury triggered loss of neurons in medial M2 contributes to neuropathic pain development using a wide range of techniques, such as volume EM, 2-photon microscopy, behaviour, molecular and image analysis. This project would also involve testing treatment options such as non-invasive cortical stimulation and cellular therapy to reverse neuropathic pain.

2. **References (3-5):**

Gupta AD, Zheng H, John J, Kaushalya S, Asan L, Beretta CA, Kuner R, Knabbe J, Kuner T. Loss of secondary motor cortex neurons in chronic neuropathic pain. bioRxiv 2023.01.05.522932; doi: <https://doi.org/10.1101/2023.01.05.522932>

Lomba S, Straehle J, Gangadharan V, Heike N, Khalifa A, Motta A, Ju N, Sievers M, Gempt J, Meyer HS, Helmstaedter M. Connectomic comparison of mouse and human cortex. *Science*. 2022 Jul 8;377(6602):eabo0924. doi:10.1126/science.abo0924.

Gan Z, Gangadharan V, Liu S, Körber C, Tan LL, Li H, Oswald MJ, Kang J, Martin-Cortecero J, Männich D, Groh A, Kuner T, Wieland S, Kuner R. *Science*. Layer-

specific pain relief pathways originating from primary motor cortex. Science. 2022;378(6626):1336-1343. doi: 10.1126/science.add4391 2.

Gangadharan V, Zheng H, Taberner FJ, Landry J, Nees TA, Pistolic J, Agarwal N, Männich D, Benes V, Helmstaedter M, Ommer B, Lechner SG, Kuner T, Kuner R. Neuropathic pain caused by miswiring and abnormal end organ targeting. Nature. 2022;606(7912):137- 145. doi: 10.1038/s41586-022-04777-z

3. Methods that will be used: Scanning electron microscopy, 2-photon microscopy, iPSC, rTMS, behavioural and image analysis.
4. Cooperation partners: Prof. Thomas Kuner (Heidelberg), Prof. Rohini Kuner (Heidelberg), Prof. Moritz Helmstaedter (MPIBR, Frankfurt Am Main), Dr. Amit agarwal (Heidelberg) Dr. Katrin Schrenk-Siemens (Heidelberg) and Dr. Claudio Acuna (Heidelberg)
5. Eligible qualifications: A master's degree in biology, biochemistry or related disciplines.
6. Desirable skills:
A strong interest in neuroscience
Previous experience in using advanced microscopy techniques is desirable
Ability to work in a team and open to discussing new ideas
Qualification for in vivo models (FELASA-B or similar) is a plus
Microsurgical skill is an advantage.
Very good knowledge of English.
Independent, responsible and flexible working hours.
7. Key words:
Electron microscopy, cortical reorganisation, cell death, image analysis.
8. Enclosures: The following documents must be enclosed with your application as a **single pdf file**: updated CV with publications, motivation letter, copies of degree certificates

Information for the applicant: For any updates and further information (for e.g.: change of deadline of the application), please visit the consortium website career section: www.sfb1158.de