Studying regenerative sprouting of the corticospinal tract in a rat spinal cord injury model

Project outline:
A spinal cord injury interrupts ascending and descending nerve tracts in the spinal cord leading to sensory, motor and vegetative deficits such as loss of sensation or inability of performing voluntary movements.
Spontaneous functional recovery after incomplete spinal cord injury is observed in rodents as well as in humans. Evidence supports axonal sprouting being one mechanism underlying this recovery. In this context the corticospinal tract (CST), which is important for fine motor skills, is a common experimental model.

We showed with neuroanatomical tracing experiments, where fluorescent dyes are injected into the spinal cord and motor cortex, that axotomized CST neurons start growing collaterals at cervical levels in response to a thoracic spinal cord injury. This process is accompanied by substantial reorganisation of the hind limb motor cortex and the appearance of fore limb movements upon electrical micro-stimulation of the hind limb motor cortex. Despite intensive research this plastic remodelling process is not yet completely understood.

This project aims to provide answers to crucial questions of axonal sprouting using a well-acknowledged rat spinal cord injury model. A series of experiments are planned to characterize in detail the temporal and spatial anatomical changes of sprouting CST axons in the spinal cord. In parallel the corresponding cortical rearrangements of hind limb pyramidal neurons will be studied. In addition to this also functional aspects of axonal sprouting will be investigated.

Techniques to learn:
Our lab is equipped with state-of-the art devices and techniques (Professor Martin Schwab, http://www.hifo.uzh.ch/research/schwab.html). The student will learn a wide variety of lab techniques including mainly *in vivo* work: Animal handling, behaviour and surgery (under supervision), tissue processing, histology and immunohistochemistry; epifluorescence and bright-field microscopy, data processing (ImageJ, Photoshop, Neurolucida 3D reconstructions), and statistical analysis (GraphPad, Python).

This Master thesis offers a possibility for a co-authorship publication in a peer-reviewed journal.

Location, supervision:
The project will be located at the Irchel Campus in the research group of Professor Martin E. Schwab, laboratory of Neural Regeneration and Repair, Brain Research Institute, University of Zürich and ETH Zürich.
The student will be directly supervised by Natalie Russi, a second year PhD student.

Duration:
6 (for ETH students) or 12 (for UZH students) months.
Start date between January and June 2015.

Student's profile:
Ambitious, motivated students with accurate working skills can send their application including a letter of motivation, a CV and Bachelor scores to russi@hifo.uzh.ch .