

fMRI on Rodents and the Reeler Model

in Cooperation with Prof. J. Staiger (SFB 780)

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Synaptic circuits bind together functional modules of the neocortex. These functional columns form a topographically ordered map of the sensory periphery which is called somatotopy in the primary somatosensory or barrel cortex.

Our rodent model is formed by the two basic principles of cortical organization, i.e. layers and columns, and how these relate to their assumed functions. This will be probed by comparing normal cortex (in wild type mice) with disorganized cortex (in genetically altered animals like reeler or barreless mutants).

It will be very interesting to study this topography, its development and mutability by sensory manipulations in longitudinal studies using in-vivo imaging methods.

This is why we will develop and apply magnetic resonance methods for non-invasive characterization of brain structure and function in living mice at 9.4 T. This is why we will develop and apply magnetic resonance methods for non-invasive characterization of brain structure and function in living mice at 9.4 T.

We will perform:

- Voxel-based morphology to map the regional differences of cortical organization and disorganization with high-resolution MRI and to correlate barrel cortex architecture defined by histological methods with multiparametric MRI-maps.
- With Diffusion Tensor Imaging (DTI) (Fig. 2) we will measure differences in axonal connectivity between sensory areas and thalamus by probability mapping (Fig. 3) to measure disorganization of cortical layers with high resolution DTI.
- With functional Magnetic Resonance Imaging (fMRI) we want to measure the correlation of barrel cortex structure with its functional activation by selectively stimulating a set of whiskers.

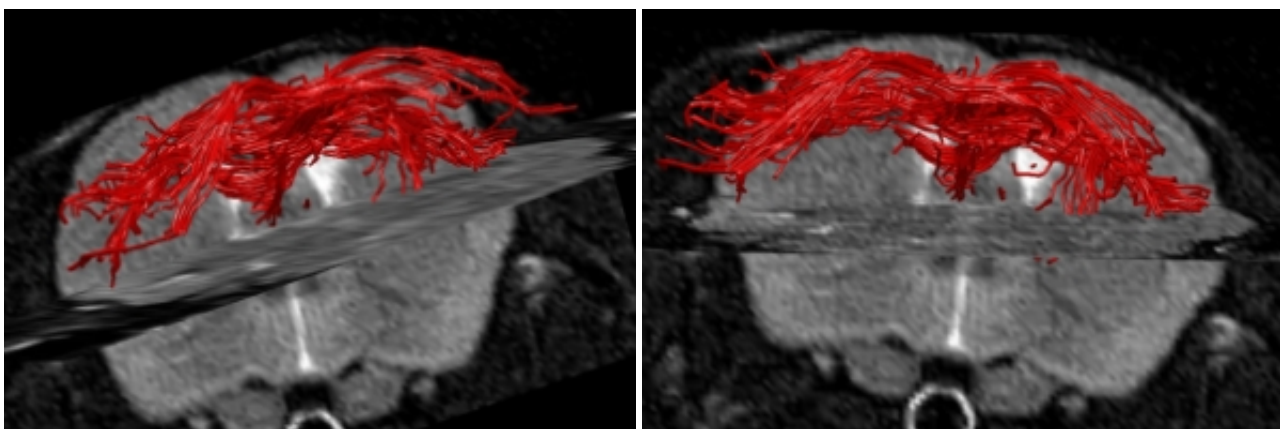


Fig. 2: Diffusion Tensor Imaging of a Mouse Brain

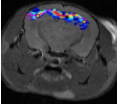


Fig. 3: Probability mapping of two Areas in the Somatosensory cortex