



## Master Thesis Opportunity: Investigating the Physiological and Physical Confounds in MRI

The **Brain States for Plasticity group** (PI Dr. Svenja Brodt) invites applications from highly motivated Master students (m/f/d) to join our team at the [Max Planck Institute for Biological Cybernetics](#) in Tübingen, Germany. In the **SWEEP** project, we aim to assess the influence of “real-world” variation in brain MRI.

A comprehensive review of the literature revealed no studies that investigated the interaction of Physiological and Physical changes in MRI signal. In this project, we aim to establish and refine the use of MRI sequences and to disentangle the effects of time-of-day (ToD), physical factors (such as temperature and gravity), and physiological changes (such as daily and induced hormonal oscillations) on MRI metrics. To estimate ToD seven magnetic resonance imaging (MRI) scans will be acquired over a 24-hour period. The potential interferences of gravity and temperature are evaluated by manipulate subject’s posture before laying down into the scanner and by intra-MRI measure of body and head coil temperature oscillations. The MRI data will be complemented by behavioral, metabolic, and biological data. The impact of stress is studied by using Maastricht acute stress test.

We are currently offering **Master theses on this project in two main areas:**

### Topic 1: Increase of signal-to-noise ratio (SNR) in DWI processing:

- The movement of water molecules within the brain is influenced by a complex interplay of physical and chemical factors. These factors can introduce bias and interference into MRI data, making DWI particularly susceptible to post-acquisition processing.
- The objective of this research is to **the efficacy of various preprocessing tools in order to improve the signal-to-noise ratio**

### Topic 2: Effects of stress on brain microstructure and blood flow:

- **Hormonal fluctuations, metabolic processes**, blood flow and pressure, and hydration can influence the structure and function of the human brain.
- The objective of this study is to gain a deeper insight into the relationship between sympathetic activity and brain function by **the evaluation of MRI data, behavioral and biological samples.**

### Who we are looking for:

- Preferably students studying neuroscience, psychology, cognitive science, or a related field.
- Proficient in German and English.
- Experience with Python and/or MATLAB recommended.
- Interested in state-of-the-art cognitive neuroscience research and motivated to work in a fun and engaging team!

Theses are available **starting from summer/fall 2024.**

If you are interest in writing your thesis in the SWEEP project, get in touch with project leader **Manfre Alberti** via [manfredi.alberti@tuebingen.mpg.de](mailto:manfredi.alberti@tuebingen.mpg.de)