Description
Slow oscillations (SOs), the hallmark of Slow-Wave Sleep (SWS), play a major role in neural plasticity and sleep-dependent memory formation, including learned motor tasks. SOs consist of an upstate where neurons synchronically depolarize and have an increased excitability, followed by a downstate where neurons are hyperpolarized and silenced. Previous studies in humans established that targeting auditory pulses to SOs’ upstate – in-phase modulation – constitutes a privileged time window for improvement in memory reactivation and produce behavioral benefit, whereas intervening SOs’ downstate – out-of-phase modulation – seems to disrupt slow oscillatory patterns and diminish recall performance. In this project, we hypothesize that in-phase acoustic stimulation in rodents can increase SWS activity therefore improving behavioral gains in motor skills while out-of-phase stimulation offers the opposite effect.

Our group established an auditory closed-loop protocol for rodents to specifically target SOs’ upstate or downstate phases and deliver acoustic stimuli with great time accuracy. In our model, sleep is recorded by electroencephalography/electromyography (EEG/EMG) while acoustic stimulation is applied to enhance or disrupt SOs and ultimately modulate deep sleep (equipment from Tucker-Davis Technologies, USA). For that, a real-time NREM detection feature runs alongside a predictive phase-locked loop as a function of the endogenous EEG/EMG signal (Synapse®). We are searching for a highly motivated and ambitious individual who will participate in the study of the effect of acoustic modulation of SOs for boosting or inhibiting delta activity in SWS on motor learning in rats, as a way to complete a Master’s degree.

Education / Requirements
An ideal candidate should have a bachelor degree and some background in biomedical engineering, computational biology, bioinformatics, or related field. Good programming experience with MATLAB and Simulink is mandatory. Familiarity with other languages like Python, R and/or C/C++ is a bonus. Experience in working with experimental animals (rats) would also be an advantage but not essential. Good English language skills required, German optional.

Starting date
January to February 2018

To apply
Please contact Dr. Daniela Noain (daniela.noain@usz.ch; http://www.sleep.uzh.ch/people/) sending your CV, motivation letter and the name and contact information of at least one reference.