

Project 1.4. Identifying electrophysiological correlates of visual awareness by a single-trial EEG analysis

Supervisor: dr Michał Bola; dr hab Michał Wierzchoń, prof. UJ

Laboratory: Laboratory of Brain Imaging

WWW: <https://lobi.nencki.gov.pl/team/20/>;

Background: Understanding how consciousness of our surrounding and ourselves is generated through the activity of our brains is one of the toughest mysteries of science. Through the last thirty years, we have learnt a lot about how consciousness works and how it benefits our functioning, yet we are still far from a complete scientific explanation. The complex and multidimensional nature of consciousness, which does not stem from activity of one brain region nor is a consequence of one particular mode of cortical processing, remains the most difficult obstacle to overcome. Our research project will approach this problem following a well-established research line searching for neural correlates of consciousness through combining cognitive science and neuroimaging methods. However, it differs and expands the field in three key aspects. Firstly, we plan to perform a thorough examination of basic properties of conscious visual perception with diverse set of experimental tasks (to better capture the mentioned complex nature of consciousness). Secondly, our project involves much bigger number of participants than is usually tested (to increase the precision of our measurements and reliability of results). Lastly, our studies will be a part of a much bigger international research endeavour aiming at capturing the phenomenon of consciousness with various paradigms, neuroimaging methods and state-of-the-art analyses.

Aim: In the planned experiments brain activity will be recorded using EEG, while participants will perform perceptual tasks, and using novel signal analysis methods to identify correlates of perceptual consciousness. At the same time, structural MRI data will be collected from the same participants in a related project. Thus, integration and joint analysis of sMRI and EEG data will be a key task.

PhD student's tasks will thus be designing and programming experimental procedures, collecting and analyzing various data types, and preparation of the manuscripts.