Characterizing the mechanisms underlying first and second order consciousness

How do we become conscious of weak visual stimuli? One scientific approach to this question is to compare conscious and unconscious brain activity in order to find the so-called neural correlates of consciousness (*NCC*). Although various *NCC*s have been found during the last 30 years, we still do not have a good understanding of the underlying brain mechanisms that they represent. This project aims at better understanding the neural mechanisms of perceptual consciousness by linking electroencephalographic (EEG) data to a computational model of decision-making.

We have developed a paradigm to systematically compare situations in which a conscious percept occurs with closely matched situations in which it does not (i.e., unconscious processing). In brief, participants see visual “noise” on the computer screen which may contain an embedded picture of a face. Participants are then asked whether they saw a face or not (first-order consciousness) and how confident they are about their answer (second-order consciousness). The intensity of the face defines task difficulty, with high intensity faces being often detected and low intensity faces only seldom detected. False alarms (when participants report seeing a face although there was no face) will allow us to study perceptual hallucinations, a case of conscious experience independent from sensory stimulation. Our approach will be to record few participants over several experimental sessions in order to collect extensive data. During some sessions, we will also record EEG data. The computational model will be used to make predictions about the relationship between the different variables (stimulus intensity, participants’ answers and confidence, timing of the occurrence of a stimulus, trial length, etc…) which we will verify by analyzing the behavioral and EEG data.

The selected candidate will collect and analyze behavioral and electrophysiological data and interpret these data with respect to the predictions that were made by the model. Applicants should be comfortable programming with MATLAB and have basic knowledge of statistics and/or signal processing.

Applicants should speak basic French in order to interact with the participants of the study. Applicants with a background in engineering, computer science or physics are also encouraged to apply.

The work will take place at the *Laboratoire de Psychologie et Neurocognition* in Grenoble.

Contact: nathan.faivre@univ-grenoble-alpes.fr

Website: https://nfaivre.netlify.com