Building Blocks of Consciousness ? assessing correlates of consciousness with EEG microstates and simultaneous EEG/fMRI

The ELSC Neuroimaging Unit and The Consciousness Reading Group is happy to invite you to a special seminar hosting

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Building Blocks of Consciousness ? assessing correlates of consciousness with EEG microstates and simultaneous EEG/fMRI

Thursday, November 21ST, 3pm, at the ELSC seminar room

Silverman Life Science building, wing 3, 6th floor

Abstract:
The EEG topography is a global measure of the momentary brain state, and its configuration remains stable for brief periods (~70 ? 100 ms), the so- called EEG microstates. One characteristic feature of EEG microstates is the rapid transition from one stable scalp field topography into another. Their temporal dynamics and local syntax are altered in different neurological and psychiatric conditions, and they are malleable by psychotropic drugs, which lead to the hypothesis that they constitute the "basic building blocks of cognition" or "atoms of thought" underlying spontaneous conscious cognitive activity.

I will report data using two complementary approaches using EEG microstates to assess correlates of consciousness. One approach assesses how the momentary brain state indexed by the pre-stimulus microstate determines differences in perceptual awareness for physically identical stimuli such as perceptual reversals of ambiguous figures and during binocular rivalry and the emergence of awareness of near-threshold stimuli. The other approach assesses how the intrinsic spatio-temporal dynamics of the EEG microstate sequences can be related to differences in consciousness. Using simultaneous EEG/fMRI, we identified EEG microstates as the electrophysiological correlate of four fMRI resting state networks, this link could be established because the EEG microstates are mono-fractal and show scale-free properties from tenths of seconds to tens of seconds. Their sequence is neither random nor determined but chaotic: it follows clearly defined rules without being predictable, analogous to how all natural languages follow a generative grammar. This may be the key feature that permits the brain to rapidly adjust to unexpected events and to successfully interact with the environment, which can be considered as a necessary
prerequisite for consciousness. This property changes with changes of consciousness during anesthesia in monkeys and humans.

References:


Pitts MA, Britz J. (2011) Insights from intermittent binocular rivalry and EEG. Frontiers in Human Neuroscience, 5 Special Topic "Binocular rivalry: a gateway to consciousness"


Van de Ville D, Britz J, Michel CM. (2010) EEG microstate sequences in healthy humans at rest reveal scale-free dynamics, Proceedings of the National Academy of Sciences, USA 107(42):18179-84

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