W10-04

# MESOSCOPIC BRAIN DYNAMICS AND MENTAL DISORDERS

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Mesoscopic brain dynamics, typically studied with electro- and magnetoencephalography (EEG and MEG), display a rich complexity of oscillatory and chaotic-like states, including many different frequencies, amplitudes and phases. Presumably, these different dynamical states correspond to different mental states and functions, and studying transitions between such states could provide valuable insights into brain-mind relations that should also be of clinical interest. We use computational methods to investigate these transitions, with the objective of finding relations between structure, dynamics, and function. In particular, we have developed models of paleo- and neocortical structures, in order to study their mesoscopic neurodynamics, as a link between the microscopic neuronal and macroscopic mental events and processes. I will describe several types of models that emphasize network connectivity and structure, but which also include molecular and cellular properties at varying detail, depending on the particular problem and experimental data available. We use these models to study how phase transitions can be induced in the mesoscopic neurodynamics of cortical networks by internal (natural) and external (artificial) factors. I will discuss the models, and relate the simulation results to macroscopic phenomena, such as arousal, attention, anaesthesia, learning, and certain mental disorders.

https://doi.org/10.1016/S0924-9338(11)73927-X Published online by Cambridge University Press