

Master project, Alain Destexhe lab, CNRS, Paris-Saclay Institute of Neuroscience

“Brain turbulence”

Brain dynamics displays distinct states of activity, such as wakefulness, sleep, anesthesia, or coma. The complexity of these states systematically follows the level of consciousness, with the highest complexity found for awake states, as measured by entropies or attractor dimensions. In this project, we would like to draw a parallel with fluid dynamics, which also display different states ranging from laminar flow, weakly turbulent flows, up to developed turbulence. The onset of turbulence is marked by an increase of transport, such as heat or diffusion. In brain dynamics, we would like to measure the transport of Shannon information, and see whether highly chaotic states of activity, are also characterized by an increase of information transport. This property may be paralleled with the information processing capabilities of networks, and may explain the systematic relation between complexity and information processing capabilities in the brain.

The project will be supervised by Alain Destexhe (HDR), together with two postdocs in the lab. It may be continued as a PhD thesis, as a function of the interest of the candidate.

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