Titolo: Spontaneous brain rhythms in the predictive coding of natural stimuli.

Betti V.

The regularity of the physical world and the biomechanics of the human body movements generate distributions of highly probable states that are internalized by the brain in the course of a lifetime. In Bayesian terms, the brain exploits prior knowledge, especially under conditions when sensory input is unavailable or uncertain, to predictively anticipate the most likely outcome of upcoming stimuli and movements. These internal models, formed during development, yet still malleable in adults, continuously adapt through the learning of novel stimuli and movements. Traditionally, neural beta (β) oscillations are considered essential for maintaining sensorimotor and cognitive representations, and for temporal coding of expectations. However, recent findings show that fluctuations of β band power in the resting state strongly correlate between cortical association regions. Moreover, central (hub) regions form strong interactions over time with different brain regions/networks (dynamic core). β band centrality fluctuations of regions of the dynamic core predict global efficiency peaks suggesting a mechanism for network integration. Furthermore, this temporal architecture is surprisingly stable, both in topology and dynamics, during the observation of ecological natural visual scenes, whereas synthetic temporally scrambled stimuli modify it. We propose that spontaneous β rhythms may function as a long-term “prior” of frequent environmental stimuli and behaviors.