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Interdependencies of Neural Impulse Pattern and Synchronization[1] HANS BRAUN, SVETLANA POSTNOVA, HORST SCHNEIDER, University of Marburg — Neuronal synchronization plays a crucial role in many physiological functions such as information binding and wake-sleep transitions as well as in pathophysiological processes like Parkinson's disease and epileptic seizures. The occurrence of synchronized activity is often associated with significant alterations of the neuronal impulse pattern, mostly with a transition from tonic firing to burst discharges. We have used Hodgkin-Huxley type simulations to study how alterations of individual neurons' dynamics influence the synchronization in electrotonic coupled networks. The individual neurons have been tuned from tonic firing to bursting with chaotic dynamics in between. Our results demonstrate that these transitions have significant impact on the neurons' synchronization. Vice versa, the synchronization state can essentially modify the impulse pattern. The most remarkably effects appear when the individual neurons operate in a periodically tonic firing regime close to the transition to chaos.

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