

Positive Feedback and Synchronized Bursts in Neuronal Culture

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Synchronized bursts (SBs) are common in neuronal cultures. Although the origin of SBs is still unclear, they have been studied for their information processing capabilities. Here, we investigate the properties of these SBs in a culture on multi-electrode array system. We find that characteristics of these SBs can be used to represent the different developmental stages of the cultures. A mean-field model based on short term synaptic plasticity and recurrent connections has been developed to understand these characteristics. A phase diagram obtained from this model shows that networks exhibiting SBs are in an oscillatory state due to large enough positive feedback provided by synaptic facilitation and recurrent connections. Our finding suggests that networks with SBs have too many recurrent connections and might have very little information processing capabilities.