

平成 22 年 8 月 2 日

応用物理学会北海道支部
会員各位

応用物理学会北海道支部講演会のお知らせ

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演題： Networking beta-cells: The role of cell-to-cell network topology in bursting oscillations patterns
講師： Prof. Dean Korosak 氏
(University of Maribor, Slovenia)
日時： 平成 22 年 8 月 23 日 (月) 16:00～17:30
場所： 北海道大学工学部物理工学系大会議室 (A1-17)
主催： 応用物理学会北海道支部

講演の要旨

Network theory helped uncover the common scale-free structure of different cellular processes in living organisms that is robust against random errors but highly sensitive to targeted attacks on most connected nodes. However, apart from the neuronal and brain network models, few attempts have been made so far to consider the changes in structure and function of living tissues from the network perspective.

In this talk we shall consider the use of spatial complex networks to quantify the functional role of endocrine pancreatic tissue architecture. We will introduce coupling between beta-cells based on the spatially embedded complex network cytoarchitecture model of an intact islet. Using a fitness network model approach complex networks were constructed by connecting the beta-cells based on their ability to communicate with other cells in the islet. Bursting patterns of the membrane potential of networked beta-cells were then computed in regular lattices with nearest neighbor interactions and in networks with complex topologies. We will show that long range communication between beta-cells emerging from the scale-free topology of the islet cytoarchitecture can have important consequences for the beta-cells bursting patterns. Furthermore, we shall introduce the tissue complexity, expressed as the function of node-node link correlations of the underlying network, and show that it decays extremely fast under targeted attacks on beta-cells in islets with heterogeneous network structure, whereas the more homogeneously organized islets display increased tolerance to progressive beta-cell death.

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