# CDB SEMINAR

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Tuesday, January 11, 2011
16:30~17:30   C1F CDB Auditorium

## Evolutionary design of robust oscillatory genetic networks

**Summary**

We numerically study the design and statistical properties of dynamical gene expression networks. In our model problem, we aim to design genetic networks which would exhibit stable periodic oscillations with a prescribed temporal period. While no rational solution of this problem is available, we show that it can be effectively solved by running a computer evolution of the network models. In this process, structural rewiring mutations are applied to the networks with inhibitory interactions between genes and the evolving networks are selected depending on whether, after a mutation, they closer approach the targeted dynamics. We show that, by using this method, networks with required oscillation periods, varying by up to three orders of magnitude, can be constructed by changing the architecture of regulatory connections between the genes. Statistical properties of designed networks, including motif distributions and Laplacian spectra, are considered. Also, we show that the same evolutionary optimization method can be used to increase the robustness of the networks against several types of noise such as link deletions, node deletions, and static random perturbation of link weights.

Reference: Y. Kobayashi, T. Shibata, Y. Kuramoto and A. S. Mikhailov,Eur. Phys. J. B 76, 167-178 (2010)

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