CEA - Saclay 91191 Gif-sur-yvette Cedex
Service de Physique de l'Etat Condensé
SÉMINAIRE

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Orme des Merisiers SPEC Salle Itzykson, Bât.774

Genetic Feed Back Regulation in Time and Space

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Genetic circuits have been studied quite intensively inrecent years. We have focused on oscillatorypatterns in eucaryotic systems related to negativefeed-back loops inside single cells [1,2,3]. In many casesit is of interest to study how cells communicate with eachother when cells are arranged in certain spatial structures,like biofilms and tissues. We have attacked this problem bymeans of a repressor-lattice where single repressilators(closed feed-back loops) are placed on ahexagonal lattice [4]. Such systems can be build without anyinternal frustration and can in most cases exhibitstable, oscillating states. Commensurability effects howeverplay a role and may lead to internal frustration causingbreaking of symmetries and solutions of many differentphases. Eventually, also chaotic solutions may be present [3].With bi-directed interactions the tissues locallyexhibit switch-like behavior. During growth the tissues maydevelop 'defects' and we have found that mutations havea larger effect in such cases than in ordered tissues.[1] S. Pigolotti, S. Krishna and M.H. Jensen,"Oscillation patterns in negative feedback loops",Proc.Nat.Acad.Sci. 104, 6533-6537 (2007).[2] S. Pigolotti, S. Krishna and M.H. Jensen,"Symbolic dynamics of biological feedback networks",Phys. Rev. Lett. 102, 088710 (2009).[3] B. Mengel, A. Hunziker, L. Pedersen, A. Trusina,M.H. Jensen and S. Krishna, "Modeling oscillatory controlin NF-kB, p53 and Wnt signaling", Current Opinion in Geneticsand Development, doi:10.1016/j.gde.2010.08.008 (2010).[4] M.H. Jensen, S. Krishna and S. Pigolotti,"The Repressor-Lattice: Feedback, Commensurability,and Dynamical Frustration, Phys. Rev. Lett. 103, 118101(2009).
