明治大学グローバルCOEプログラム【現象数理学の形成と発展】

第35回 MEE seminar

Mathematical Ecology & Evolution

2012年7月5日(木) 16：30〜17：30
明治大学生田キャンパス第二校舎A館: A207

July 5, 2012. 16:30〜17:30 Meiji Univ. Ikuta campus A207

小田急小田原線 「生田駅」から徒歩10分
又は「向ケ丘遊園」駅北口から「明治大学正門前」行きバスで15分終点下車
詳しくは、**http://www.meiji.ac.jp/koho/campus_guide/** をご覧下さい

The role of phenotypic fluctuation in evolution: Baldwin effect under multi-peaked landscape

Nen Saito, *Tokyo University*

Abstract: Phenotypic fluctuations or phenotypic plasticity are common in various living organisms (e.g., stochasticity in cell or the solitary/gregarious phase of desert locust). Can phenotypic plasticity accelerate evolutionary rate? -Several studies addressed the question. At the first glance, phenotypic changes acquired during life cycle do not seem to affect evolutionary processes because only genotype, rather than phenotype, is heritable to the next generation. However, non-heritable phenotypes can be fixed into genotype through natural selection that acts on phenotypes, and thus can affect evolution. This process is called Baldwin effect [1,2]. However validity of this Baldwin effect is still controversial. Some of subsequent studies showed that phenotypic plasticity decelerates evolutionary rate [3,4], while others claimed that phenotypic plasticity accelerates evolution [5,6]. We study evolutionary population dynamics of a quantitative genetic model to evaluate the validity of the Baldwin effect under a multi-peaked fitness landscape. We provide analytical expressions of the evolutionary rate and of the average fitness over population. These results indicate that under a multi-peaked fitness landscape phenotypic fluctuation always accelerates evolutionary rate but decreases average fitness. We also show that as an extreme case of the trade-off relation, phenotypic fluctuation causes the error catastrophe, where population fails to concentrate a peak of fitness and thus to keep a high fitness value.

[1] J. Baldwin, 1896. Am. Nat. 30: 441-451.
[2] G.G. Simpson, 1953 Evolution, 7(2):110-117
[3] L. Ancel, 2000. Theor. Popul. Biol. 58: 207-319.
[4] R. Anderson, 1995. J. Theor. Biol. 175: 89-101.
[5] G. Hinton. and S. Nowlan, 1987. Complex Systems 1: 495-502.
[6] I. Borenstein, et al., 2006 J. Evol. Biol. 19(5):1555-1570

参加自由です。皆様のお越しをお待ちしております。

MEEセミナー世話人：若野友一郎 <joe@math.meiji.ac.jp>
岡嶌亮子 <ryokookajima6@gmail.com>