

第1回 MEE SEMINAR

MATHEMATICAL ECOLOGY & EVOLUTION

2009年6月16日(火) 14:40~16:10

明治大学生田キャンパス第二校舎A館：A207

小田急小田原線 「生田駅」から徒歩10分

又は「向ヶ丘遊園」駅北口から「明治大学正門前」行きバスで10分終点下車

詳しくは、http://www.meiji.ac.jp/koho/campus_guide/ をご覧下さい

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Meiji Univ. Ikuta campus A207

Spatial dynamics of ecological public goods

Joe Yuichiro Wakano
(Meiji University)

Abstract:

Question: Does space stabilize or destabilize maintenance of cooperation ?

Background and Previous Models: The emergence and abundance of cooperation in nature poses a challenging puzzle to evolutionary biology. Traditional approaches to studying the problem of cooperation assume constant population sizes and thus neglect the ecology of the interacting individuals. Ecological public goods game considers dynamics of group size in public goods game. As multiplication rate (total return on investment) is fixed, cooperation is adaptive strategy when public goods game is played by fewer members (because the return is shared by fewer members). We assume the average number of players in each public goods game is determined by population density. Then, low density facilitates evolution of cooperation and high density facilitates evolution of defection. On the other hand, large ratio of cooperators to defectors results in effective population growth. Thus, the system has a tendency toward coexistence of cooperators and defectors.

Model: We allow cooperators and defectors to diffuse in two-dimensional space. The spatial ecological public goods game is denoted by reaction-diffusion equations.

Results: Coexistence region always expands when both extinction and coexistence are locally stable without space. Coexistence is sometimes achieved by spatially heterogeneous pattern. Furthermore, spatial coexistence is achieved for some parameters that do not allow coexistence without space. Such spatial effect is often achieved by spatially chaotic dynamics (Many interesting movies are shown in the talk). Coexistence is favored when defectors diffuse faster than cooperators. The underlying mechanism is partly understood by Turing instability.

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>

中橋渉 <n_wataru@isc.meiji.ac.jp>

