Eugene Wigner Colloquium

joint event of GRK 1558 and SFB 910

Dr. Jens Christian Claussen

Jacobs University, Bremen

"Social humans, economic agents and bacterial games - and how game payoffs control the stability: From microscopic interactions to macroscopic evolutionary dynamics"

Economic system states have often been described as equilibria or fixed points of ordinary differential equations derived from a game-theoretic model. In absence of Adam Smith's invisible hand, equilibria would have to be explained by decisions of single agents (microscopic dynamics). This requires firstly appropriate models for the behaviour of the single agents and secondly the derivation of macroscopic equations of motion from the microscopic model as described in (PRL 95, 238701) to describe the evolutionary dynamics in finite populations based on the microscopic dynamics. Here one arrives at Fokker-Planck equations which have replicator-type equations as limit of infinite populations. This framework can be readily extended (PRE 85, 041901) to describe the evolutionary dynamics of an arbitrary number of genetic types (or behavioral strategies) in finite populations based on stochastic differential equations (SDEs). For large, but finite populations this allows to include demographic noise without requiring explicit simulations. Illustrative examples are economic cycles for cooperate – defect – tit for tat, mating behaviour of lizards, and bacterial games which all can be described by cyclic games of rock-scissors-paper dynamics, a beautiful model where one can study explicitly how the stability of coexistence is controlled by payoffs, behavioural model and population size.

Thursday, 08.05.14 · 16:15h · EW 202

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