BP 12: Evolutionary Game Theory I (joint SOE/BP/DY)

Time: Monday 15:00–15:45 Location: MA 001

BP 12.1 Mon 15:00 MA 001

Dynamics of human behaviour in prisoner dilemma games — •Martin Spanknebel and Klaus Pawelzik — Institute for Theoretical Physics, University of Bremen, Germany

When playing simple games humans sometimes fail to achieve maximally possible earnings, which is often considered to reflect 'irrationality'. Such behaviour has been attributed to accessory objectives or emotional biases. For instance, recently humans were found to cooperate far less than required for optimizing mean payoff when playing prisoner dilemma games against extortion strategies. But against generous strategies humans performed to optimise their behaviour properly. Here we propose an alternative explanation based on preference shifts towards choices that proved more rewarding in the immediate past. This 'melioration' is found to account for human behaviour in prisoner dilemma games with opponents exhibiting different degrees of extortion and generosity. In particular, melioration explains reduced cooperation in extortion and high cooperation in generous games and reproduces the broad distributions of choice rates in ensembles of players. These results indicate that the alleged irrationality of human behaviour could be the consequence of elementary learning mechanisms and not necessarily involves auxiliary motives.

BP 12.2 Mon 15:15 MA 001

When do microscopic assumptions determine the outcome in evolutionary game dynamics? — •Bin Wu[1], Bebedikt Bauer[1], Tobias Galla[2], and Arne Traulsen[1] — [1]Department of Evolutionary Theory, Max Planck Institute for Evolutionary Biology, Ploen, Germany — [2]Theoretical Physics, School of Physics and Astronomy, The University of Manchester, Manchester M13 9PL, United Kingdom

The modelling of evolutionary game dynamics in finite populations requires microscopic processes that determine how strategies spread. The exact details of these processes are often chosen without much further consideration. Different types of microscopic models, including in particular fitness-based selection rules and imitation-based dynamics, are often used as if they were interchangeable. We challenge this view and investigate how robust these choices on the micro-level really are. Focusing on a key macroscopic quantity, the probability for a single mutant to take over a population of wild-type individuals, we show that there is a unique pair of a fitness- based process and an imitation process leading to identical outcomes for arbitrary games and for all intensities of selection. This highlights the perils of making arbitrary choices at the micro-level without regard of the consequences at the macro-level.

BP 12.3 Mon 15:30 MA 001

Social particles. On the common roots of aggression, altruism, co-operation and grouping — •Karl Kalveram — Tu Darmstadt and Uni Duesseldorf

We are accustomed of the strange outcome of the interaction of particles: particles that annihilate if meeting each other and/or re-emerge from vacuum. Some attract and some refute others. Their overall demeanor, however, is, temporal stationarity presumed, only describable statistically, and governed by equations proposed by Schroedinger or Heisenberg. Now we look at another type of particles interacting, too, with randomly varying outcomes. Their properties, however, can change over time, some rules of which being formulated first by Darwin. Here I present a mathematical formalism describing behavior and evolution of a selection called 'social particles'.

The formalism considers population dynamics as dependent on the particles' average birth and death rate, the average outcome of social interactions as influencing this ratio, and the reproduction ratio (birth rate/death rate) as fitness. A special 'gene setting' passed to offspring determines a particle's behavior in encounters. Following Dawkins, particles sharing the same gene setting (here called gene-relatives) should favor each other or exempt from harm in an encounter, but type one and type two errors hamper a correct behavioural decision. Inserting pay-off matrices characterizing aggression, altruism, co-operation or grouping into the formalism reveals, how the respective social particles' frequency develops in domains with limited resources.