Nils Bertschinger
when strategy fluctuations reach a threshold such that imitation of the
global setting this can lead to full predominance of one strategy
monomorphic clusters each playing a different strategy. In contrast, in
local information treatment people tend to converge to two separated
current fraction of strategies in the population. We observe that in the
tion as before but they possess also the global information about the
eight cells that are their spatial neighbors in the grid and they can
the behavior of humans in the laboratory when they play a pure coor-
dition of society. In fact, many frequent social and economic activities
Pure coordination games arise in many situations that affect the func-
tion of this behavior represents a conundrum itself. Here we aim specifi-
cally at providing an evolutionary explanation of moody conditional cooperation.
To this end, we perform an extensive analysis of differ-
ent evolutionary dynamics for players’ behavioral traits—ranging from
standard processes used in game theory based on payoff comparison to
others that include non-economic or social factors. Our results show
that only a dynamic built upon reinforcement learning is able to give rise
to evolutionarily stable moody conditional cooperation, and at the
end to reproduce the human behaviors observed in the experiments.

SOE 18.1 Thu 11:00 GÖR 226
Learning dynamics explains human behavior in Prisoner’s Dilemma on networks — GIULIO CINZI1 and ANGEL SÁNCHEZ1,2
1Grupo Interdisciplinar de Sistemas Complejos (GISC), Universidad
Carlos III de Madrid, 28911 Leganés, Madrid, Spain — 2Instituto
de Biocomputación y Física de Sistemas Complejos (BIFI), Universidad
dez de Zaragoza, 50018 Zaragoza, Spain
Cooperative behavior lies at the very basis of human societies, yet its evolu-
progress in games as well as the optimality of cooperative strategies
in networked Prisoner’s Dilemmas. We find that cooperation increases when
strategy fluctuations reach a threshold such that imitation of the global
setting this can lead to full predominance of one strategy. In contrast, in
local information treatment people tend to converge to two separated
current fraction of strategies in the population. We observe that in the
vention as before but they possess also the global information about the
ight cells that are their spatial neighbors in the grid and they can
the behavior of humans in the laboratory when they play a pure coor-
dition of society. In fact, many frequent social and economic activities
Pure coordination games arise in many situations that affect the func-
tion of this behavior represents a conundrum itself. Here we aim specifi-
cally at providing an evolutionary explanation of moody conditional cooperation.
To this end, we perform an extensive analysis of differ-
ent evolutionary dynamics for players’ behavioral traits—ranging from
standard processes used in game theory based on payoff comparison to
others that include non-economic or social factors. Our results show
that only a dynamic built upon reinforcement learning is able to give rise
to evolutionarily stable moody conditional cooperation, and at the
end to reproduce the human behaviors observed in the experiments.

SOE 18.2 Thu 11:15 GÖR 226
Human coordination in the presence of local and global infor-
mation: A laboratory experiment — ALBERTO ANTONIONI1,2, MARCO TOMASSINI1, and ANGEL SÁNCHEZ1 — 1University of Lau-
sanne, Switzerland — 2Universidad Carlos III de Madrid, Spain
Pure coordination games arise in many situations that affect the func-
tioning of society. In fact, many frequent social and economic activities require individuals to coordinate their actions on a common goal since
in many cases the best course of action is to conform to the standard
behavior. In particular, social coordination can be studied through co-
ordination games between individuals located in space. Here we study the
behavior of humans in the laboratory when they play a pure coor-
dination game in a setting in which subjects are situated in a virtual
two-dimensional grid space and can move around. We compare a lo-
cal information setting situation to one in which global information is
available. In the local information treatment subjects can see only the
eight cells that are their spatial neighbors in the grid and they can
decide if they want to move and/or pay a cost to switch to the other
strategy type. In the global treatment subjects are in the same condi-
tion as before but they possess also the global information about the
current fraction of strategies in the population. We observe that in the
local information treatment people tend to converge to two separated
monomorphic clusters each playing a different strategy. In contrast, in
the global setting this can lead to full predominance of one strategy
when strategy fluctuations reach a threshold such that imitation of the
majority sets in.

SOE 18.3 Thu 11:30 GÖR 226
Differential value of information in non-cooperative games — NILS BERTSCHINGER1, DAVID H. WOLPERT1, ECKEHARD OLRICH1, and JÜRGEN JOST1,2 — 1Max Planck Institute for Mathematik in den Naturwissenschaften, Leipzig — 2Santa Fe Institute, NM, USA
We study how players value changes in the information structure of
non-cooperative games with imperfect information.
We use the functionals central to Shannon’s information theory to
quantify amounts of information study how changes in the values of
those functionals are related to changes in the expected utility of the
players. Our approach is based on the Multi-Agent Influence Diagram
representation of games, and is based on a generalization of the con-
cept of marginal utility in decision scenarios to apply to infinitesimal
changes of the channel parameters in non-cooperative games. Using
that framework we derive general conditions for the possibility of a
negative value of information, and show that generically, these condi-
tions hold in all games unless one imposes a priori constraints on the
allowed changes to information channels. In other words, in any game
in which a player values some aspect of the game’s specification beyond
the information provided in that game, there will be an infinitesimal
change to the parameter vector specifying the game that increases the
information but hurts the player.
We demonstrate these results numerically for a leader-follower game
discuss their general implications.

SOE 18.4 Thu 11:45 GÖR 226
Stability of Zero-Sum Games in Evolutionary Game Theory — JOHANNES KNEBEL, TORBEN KRÜGER, MARKUS F. WEBER, and ERWIN FREY — Ludwig-Maximilians-Universität, München, Deutschland
Evolutionary game theory has evolved into a successful theoretical con-
cept to study mechanisms that govern the evolution of ecological com-
munities. On a mathematical level, this theory was formalized in the
framework of the celebrated replicator equations (REs) and its stochas-
tic generalizations.
In our work, we analyze the long-time behavior of the REs for zero-
sum games with arbitrarily many strategies, which are generalized ver-
sions of the children’s game Rock-Paper-Scissors (1). We demonstrate
how to determine the strategies that survive and those that become extinct in the long run. Our results show that extinction of strate-
gies is exponentially fast in generic setups, and that conditions for the
survival can be formulated in terms of the Pfaffian of the REs’ anti-
symmetric payoff matrix. Consequences for the stochastic dynamics,
which arise in finite populations, are reflected by a generalized scaling
law for the extinction time in the vicinity of critical reaction rates.
Our findings underline the relevance of zero-sum games as a refer-
ence for the analysis of other models in evolutionary game theory.

SOE 18.5 Thu 12:00 GÖR 226
Opportunistic strategies and the emergence of responsible
punishment — ARNE TRAULSEN — Max-Planck-Institute for Evo-
lutionary Biology, Evolutionary Theory Group, Plön, Germany
One way to promote cooperation among selfish actors is to allow for
the opportunity to punish those peers who do not cooperate. However,
the vast majority of models and behavioral experiments considers sit-
suations in which actors cannot assess whether it is likely that they will
be punished. If this information is available, opportunistic strategies
that act according to this information become possible and lead to
the emergence of responsible punishment targeted at non-cooperators
only, without the problems of antisocial punishment, second order free-
riding or spite. Also for institutional, so called pool punishment, such
opportunistic strategies are successful, which implies that the presence
of punishment institutions should be made public.