## 1176-92-23 Daniel B Cooney\* (dbcooney@sas.upenn.edu), Department of Mathematics, University of Pennsylvania, 209 S. 33rd Street, Philadelphia, PA 19104, and Yoichiro Mori, Department of Mathematics, University of Pennsylvania, 209 S. 33rd Street, Philadelphia, PA 19104. Long-Time Behavior of a PDE Replicator Equation for Multilevel Selection in Group-Structured Populations.

In many biological systems, there is an evolutionary conflict between the incentive of individuals to cheat and the collective incentive to establish cooperation within groups of individuals. In this talk, we consider a PDE describing two-level competition in which individual-level replication favors cheaters and between-group competition favors groups featuring cooperation. We derive a threshold level of the strength of between-group competition such that defectors take over the population below the threshold while cooperation weakly persists in the long-time population above the threshold. Under stronger assumptions on the initial distribution of group compositions, we prove that the population converges to a steady state density supporting cooperation for between-group selection strength above the threshold. When groups are best off with intermediate levels of cooperation is achieved even in the limit of infinitely strong between-group competition. In these cases, individual-level selections casts a long shadow on the dynamics of multilevel selection: no level of between-group competition can erase the effects of the individual incentive to defect. (Received January 02, 2022)