**"Pattern Formation in Spatial Iterated Prisoner's Dilemma Games:
The emergence of interspecific mutualism in a cellular automata approach"**

by Ben Cassell

Abstract: In this study I explore the conditions governing theappearance of patterns evidencing interspecific mutualism in a spatialIPD (iterated prisoner's dilemma) game. To this end a cellular automata approach with six strategy species, always cooperate (COOP), always defect (DEFECT), grim trigger (TRIG), reverse grim trigger (RTRIG), tit-for-tat (TFT), and reverse tit-for-tat (tit-for-tat that plays defect as its first move) (FTF), was employed. An environmental pressure was enforced such that individuals failing to meet the specific criterion would select a new strategy to become in the next round. Two different pressure criteria were considered, a constant minimum payout criterion, and a criterion dependent upon the average payoff of all individuals in the population. It was found that in systems comprised of COOP, DEFECT, RTRIG, and FTF, complex structures of COOP and RTRIG and COOP and FTF emerged to the mutual benefit of both species. Additionally, depending on certain parameters, pattern formation could be induced in TRIG and TFT strategies though this was much less common and these pattern structures were often unstable. A wide variety of patterned phenomena were observed, presenting the opportunity for future quantification of the necessary and sufficient conditions for the occurrences of interspecific structures in spatial IPDs.