Rory Smead
Department of Logic and Philosophy of Science
University of California Irvine

"The Reduction of Strategic Plasticity: Evolution, Game Theory, and the Baldwin Effect"

Recent research into the evolution of higher cognition has rekindled an interest in the effect of natural selection on the ability of creatures to respond to their environment (phenotypic plasticity). Human learning (which appears to have been selected for) represents one interesting type of phenotypic plasticity. It is believed that environmental variation is required for plasticity to evolve in cases where the ability to be plastic is costly. We investigate one form of environmental variation: frequency dependent selection where an individuals fitness is determined by the proportions of other types in the population. Using tools of game theory, we investigate a few models of plasticity and outline the cases where selection would be expected to maintain it. Ultimately we conclude that frequency dependent selection is likely insufficient to maintain plasticity given reasonable assumptions about its costs. This result is very similar to the well-discussed Baldwin effect, where plasticity is first selected for and then later selected against. We show how in these models one would expect plasticity to grow in the population and then be later reduced. Ultimately we conclude that if one is to account for the evolution of learning in this way, one must appeal to a very particular sort of external environmental variation.