Title: Evolving Dominance Hierarchies and Naming Conventions

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Abstract: This talk will be about research done with my last two Mathematical Behavioral Science PhD students, Drs. Alex Strashny and Giorgio Gosti. Alex's work concerned the development of *dominance hierarchies*, and Giorgio's work concerned the evolution of *naming conventions*. Dominance hierarchies can be studied in a situation where members of a set of entities engage repeatedly in binary contests over discrete trials. One is interested in conditions under which in the limit a linear dominance order develops that perfectly predicts the winner of each contest. The evolution of naming conventions can be studied in a network digraph, where on each trial an arc is selected, and one entity proposes a word for an object to another entity. Depending on the suggested word and possible reactions, changes take place in probabilities of various names for the object. One is interested in conditions under which in the limit all entities in the network come to use the same name for the object. The central element in both projects is the use of the *linear operator model* of Bush and Mosteller, first proposed in the early 1950s. Their model was designed to predict the response behavior of a simple organism in a real time learning experiment, where on each trial the organism must choose one of a fixed set of response options. The goal of the model was to explain changes in the organism's response probabilities as a function of experimenter delivered reinforcing events. The model has an unusual property, namely if an organism is reinforced for whichever response it makes on a trial, then in the limit one of the responses comes to dominate all the others. One interpretation of this reinforcement condition is that it is a form of *uninstructed learning* in the sense that making a response acts as its own reinforcement to strengthen its probability. Both projects make creative use of this property of the linear operator model, along with other assumptions, to develop interesting limiting theorems.