On January 30, 2013, PED Seminar Series Presents

The dynamical process of group selection

by Professor Burt Simon

I will derive the dynamical equations for stochastic (Markov chain) and deterministic (differential equation) models of one- and two-level population processes, and show how the deterministic dynamics can be obtained from the stochastic dynamics by taking certain "large-population" limits. The dynamics will be illustrated by three kinds of numerical animations. The deterministic dynamics for a two-level population process is governed by a PDE which can be used to charactarize individual-level and group-level effects in the model. Group selection can be defined in terms of the long-run outcome of the dynamical processes. The PDE can also be used to show why a "reductionist approach" to two-level selection (e.g., inclusive fitness theory) is not "dynamically sufficient", and therefore is not mathematically equialent to group selection, which yields nicely to dynamical analysis.