What is adaptive dynamics?

Adaptive dynamics is a mathematical theory that explicitly links population dynamics to long-term evolution driven by mutation and natural selection. It provides methods of model formulation, methods of model analysis as well as mathematical theorems that relate phenomena on an evolutionary time scale to processes and structures defined in ecological and population dynamical terms.

Adaptive dynamics combines processes on two separate time scales: an ecological time-scale and an evolutionary time scale. The ecological time scale concerns the question which mutant phenotypes that are not yet present in a population could invade if they were produced by a mutation, and what would be the outcome of such an invasion in terms of which phenotypes will remain in the population and which will be eliminated. The evolutionary time scale concerns the long-term consequences of many such successive invasion-elimination events in terms of changes in the phenotypic composition of the population.

Adaptive dynamics is a new but rapidly developing theory that poses various interesting and mathematically challenging problems. From an applications point of view, a great strength of adaptive dynamics is its capability to model evolution in systems with complex ecological interactions. Adaptive dynamics is therefore being applied by a growing number of researchers to a wide variety of concrete ecological-evolutionary problems.

For an extensive list of references to both theory and applications of adaptive dynamics, see the website *http://mathstat.helsinki.fi/∼kisdi/addyn.htm*.