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A Bifurcation Problem for Matrix Difference Equations or Why Do Cicadas Synchronize?

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Abstract: Under certain biologically relevant circumstances, matrix difference equation models for the dynamics of biological populations possess a non-generic bifurcation. This poses interesting and challenging mathematical problems which, although arising in a mathematic exceptional case, have important ecological applications. A long standing problem in population biology concerns the reasons why species adopt the life history characteristics that they do. A fundamental distinction is between species whose individuals reproduce once and die (semelparity) and those whose individuals reproduce more than once (iteroparity). I will discuss a general class of matrix models for semelparity and what these models imply about the population dynamic consequences of this life history strategy. The mathematical methods employed include bifurcation theory, perturbation techniques, monotone flows, and average Lyapunov functions. If time permits, I will also discuss extensions of the models that include the dynamics of heritable traits. These extended models can be used to study questions concerning the evolution of semelparity or iteroparity.

MMS 130
2:10–3:00pm
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