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*Periodic Travelling Waves in Field Vole Populations*

**Abstract:** This talk concerns the use of mathematics to understand spatiotemporal patterning in ecology; it is intended for a general mathematical audience. Field voles are a classic example of a cyclic population, meaning that there are large amplitude oscillations in population density, with a period of several years. Recent spatiotemporal data from Kielder Forest (UK) indicate that these oscillations are spatially organised into a specific pattern known as a periodic travelling wave. The pattern is selected from a one-parameter family of waves, and I will discuss established results and some open problems associated with this wave selection mechanism. In some cases the selected wave is actually unstable as a solution of the governing partial differential equations, in which case the long term behaviour is highly disordered spatiotemporal oscillations. I will describe a new method of numerical continuation that enables wave stability to be determined, via computation of the essential spectrum. This enables prediction of whether a given set of parameter values result in regular or disordered behaviour in the long term. I will end by discussing the ecological implications of the work, and the key challenges for future mathematical research.