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Pattern Formation in Nature: What Could Be Behind It

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Pattern formation in nature is a ubiquitous and fascinating phenomenon. A simple description will be given of one possible mechanism among many: spatial nonlocality in competitive interactions [1-2]. A tutorial explanation will be presented of random walks or diffusion, then of the logistic equation, then of their combination to produce the Fisher equation, and finally of a generalization of the Fisher equation with spatial nonlocality which is capable of producing patterns. The role of diffusion in the pattern formation process will be discussed with possibilities of a remarkable shape shifting consequence of controlled motion that we have discovered recently [3].

[1] Nonlocal Interaction Effects on Pattern Formation in Population Dynamics, M. A. Fuentes, M. N. Kuperman, and V.M. Kenkre: Phys. Rev. Lett. 91, 158104-1 (2003).
[2] Analytical Considerations in the Study of Spatial Patterns Arising from Nonlocal Interaction Effects, M. A. Fuentes, M. Kuperman, and V. M. Kenkre: J. Phys. Chem. B 108, 10505-10508(2004).
[3] Shape Shifting in Patterns Produced by Control of Diffusion: Theoretical Considerations, M. Kuperman and V. M. Kenkre, Consortium Preprint, UNM (2012).