Nonstandard finite difference models of some differential equations in Life Science

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The Nonstandard Finite Difference (NSFD) method was introduced by Ronald Mickens three decades ago. The method has shown great potential in gaining useful insights on the solutions of differential equations models that arise in Science, Engineering and Technology, and replicating their underlying dynamics. In this talk, we construct, analyse and implement NSFD schemes for some deterministic models defined by ordinary and partial differential equations for biological processes. The NSFD schemes are reliable in four directions. They are topologically dynamically consistent for one-dimensional models. They replicate the dynamics of two models for the Ebola virus disease. They preserve the decline (e.g. Colony Collapse Disorder) phenomenon of honeybee colonies. They preserve positivity and boundedness of solutions of reaction-diffusion equations of Fisher-KPP (Kolmogorov, Petrovsky, Piscounoff) type for mutant-gene propagation, as well as of cross-diffusion equations that arise in the modelling of cancer growth.