1086-65-893 **Jean M-S Lubuma*** (jean.lubuma@up.ac.za), Dept of Mathematics & Applied Mathematics, University of Pretoria, Pretoria, 0002, South Africa, and **Ronald E Mickens** (rohrs@math.gatech.edu), Department of Physics, Clark Atlanta University, Atlanta, GA 30314.
Diffusion versus cross diffusion in Biosciences: challenges in designing nonstandard finite difference schemes.

We consider a class of reaction-diffusion equations the solutions of which enjoy the positivity and boundedness properties. Furthermore, we consider two examples of cross diffusion equations, which have positive solutions. The first example is a model for malignant invasion. The second example is a convective predator-prey pursuit and evasion model. For the class of reaction-diffusion equations, we design nonstandard finite difference (NSFD) schemes that are dynamically consistent with respect to the positivity and the boundedness of solutions. This is achieved by coupling Mickens' rules with a suitable functional relation between the time and the space step sizes. When applied to the two cross diffusion models, it is shown that this approach leads to NSFD schemes which are not dynamically reliable. We then obtain dynamically consistent NSFD schemes for the cross-diffusion models by an alternative strategy which, apart from Mickens' rules, consists in using a special nonlocal approximation of the diffusion terms, the step sizes varying independently from one another. We provide numerical experiments that support the reliability of the NSFD schemes for the relevant continuous models. (Received September 15, 2012)