SIMION STOILOW INSTITUTE OF MATHEMATICS OF THE ROMANIAN ACADEMY

IMAR Monthly Lecture

Discontinuous Patterns in Reaction-Diffusion Models from Mathematical Biology

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IMAR, *Miron Nicolescu* Amphitheater

Abstract: In the first part of the talk, I will present an introduction to the mathematical modeling of biological phenomena using partial differential equations. Then, I shall review recent results on a certain class of reaction-diffusion systems from Mathematical Biology, where ordinary differential equations are coupled with a single reaction-diffusion equation. Such systems may have regular (i.e. continuous) stationary solutions, but all of them are unstable. We showed that solutions to such problems may behave in a singular way for large values of time and converge towards discontinuous stationary solutions.

References:

– A. Marciniak-Czochra, G. Karch, and K. Suzuki, *Instability of Turing patterns in reaction-diffusion-ODE systems*, J. Math. Biol. 74 (2017), 583–618.

– S. Cygan, A. Marciniak-Czochra, G. Karch, and K. Suzuki, *Instability of all regular stationary solutions to reaction-diffusion-ODE systems*, J. Differential Equations 337 (2022), 460–482.

– S. Cygan, A. Marciniak-Czochra, G. Karch, and K. Suzuki, *Stable discontinuous stationary solutions to reaction-diffusion-ODE systems*, Comm. Partial Differential Equations 48 (2023), no. 3, 478–510.