

East Carolina University®

Department of Physics

Colloquium

Friday, September 6th, Room N109, Howell Science Complex
3:15 p.m. (Refreshments at 3:00 p.m.)

Professor Maciej Majka
Jagiellonian University, Poland

Biophysics of Gene Expression Pattern Formation in Developmental Systems

The development of complex organism from a single, fertilized cell is possible thanks to the division and differentiation of cells. While divisions increase the number of cells, differentiation turns initially identical cells into more specialized types, suitable for their future role in the organism. Differentiation happens via activating or deactivating the expression of specific genes in the cell. However, cells determine their faith by reading external chemical signals called morphogens. In the development of embryo, this leads to the formation of gene expression patterns (GEPs), which are the regions where cells simultaneously activate certain genes. For the correct development, this process must be highly precise, robust and coordinated in time and space. In this talk, I will introduce the biophysical paradigms behind GEP formation, especially the concepts of reaction-diffusion dynamics (Turing, 1952) and positional information (Wolpert, 1969). Further, I will discuss the typical approaches and challenges in the modeling of GEPs. Finally, I will present my own research on the phase transition nature of GEP formation, conditions for pattern stabilization and their applications to multi-gene systems.

WebEx Link:

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