Complexity

Special Issue on

Nonlinear Dynamics of Biological Nanostructures

CALL FOR PAPERS

A basic feature of each biosystem is presence of weak chemical bonds, primarily hydrogen ones. These interactions should be modelled by anharmonic potential energies like Morse potential, W-potential, Toda potential, and so on. Therefore, these weak chemical bonds are sources for nonlinear effects. Examples of nonlinear biological nanostructures include nucleic acids, microtubules, and actin filaments. The best known and interesting is DNA. Its double helix was discovered in 1953, while the first nonlinear dynamical model was introduced almost 30 years later. A single strand is a linear system but, due to the weak hydrogen interactions between the chains, the molecule as a whole is nonlinear.

The second example that should be mentioned is cellular microtubule (MT). Interestingly, this year represents the 50th anniversary of its discovery. Microtubules are a crucial part of cytoskeleton and represent roads for motor proteins carrying important cargos within cells. The first nonlinear model of microtubule dynamics was introduced about a quarter of century ago and at least three of them were during the past six years. This is rapidly expanding branch of nonlinear sciences have intensive medical application. There are ideas and, reportedly, evidences that neuronal MTs are responsible for processing, storage, and transduction of biological information in a brain.

Common dilemma among most physicists is quantum versus classical physics. Of equal importance is another question that is linear versus nonlinear physics. A purpose of this special issue is to point out the latter question and to demonstrate that, for the biological systems, nonlinear models are inevitable. We invite authors to contribute original research and review articles that will demonstrate the continuing effort to understand complex dynamics, behaviour, impact on medical research, self-organisation, and other aspects of the biological nanostructures. We do believe that Complexity, being a cross-disciplinary journal focusing on the rapidly expanding science of complex systems, is the best forum for this.

Potential topics include but are not limited to the following:

- Nonlinear models of biological nanostructures
- Chaotic behaviour and bifurcations in biological nanostructures
- Experimental studies supporting results of mathematical modelling
- Statistical methods in theoretical investigations of biological nanostructures
- Mathematical procedures (differential equations, solitons, polaritons, mathematical modelling, etc.)
- Microtubules and DNA as nonlinear electrical transmission lines
- Protein-protein, protein-DNA, and similar interactions
- Medical applications
- Influence of environmental factors on the behaviour patterns of nanostructures

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/complexity/ndbn/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

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