Biomath Communications

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Workshop "Mathematical Modelling and Scientific Computing", December 09–11, 2015, Velingrad, Bulgaria[1]

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The workshop was organized by the Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, the South-West University "Neofit Rilski", Blagoevgrad, Bulgaria, and sections "Blagoevgrad" and "Biomathematics and Scientific Computing" of the Union of Bulgarian Mathematicians.

The Workshop follows the traditions of the previous MMSC'09, MMSC'02, MMSC'01 and MMSC'93 conferences. The aim of the workshop is to bring together scientists from diverse areas of mathematics and computer science, as well as their application in biology, biotechnology, ecology, medicine, engineering etc.

Among the goals of the workshop is the stimulation of new research cooperations which would lead to novel results. We expect free exchange of ideas and results to inspire further developments and to motivate new research directions in computational and applied mathematics

The workshop took place in the balneo-recreation center of the Bulgarian Parliament, Velingrad, "Vela Peeva" bul. 35, Bulgaria.

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The program of the workshop comprised three sessions consisting of 21 talks as follows:

Session 1. *Mathematical modelling*, chaired by: E. Popova and I. Bazhlekov

- **M. Mincheva** (Northern Illinois University) (invited lecture): *Multistationarity in a MAPK network model.*
- **N. Dimitrova**, M. Borisov, I. Simeonov (IMI-BAS): *Mathematical modelling of anaerobic digestion with hydrogen and methane production.* **S. Markov**, N. Kyurkchiev (IMI-BAS): *On the Approximation of the Cut and Step Functions by Sigmoid Functions.*
- **K. Ivanov** (IMI-BAS): *Harmonic Besov spaces on the d-dimensional unit ball.*
- **I. G. Ivanov** (Sofia University): *On the iterative solution to a perturbed stochastic algebraic Riccati equation*
- **E. Popova** (IMI-BAS): *Statics of Particles under Uncertainties – an Interval Model*

Session 2. *Project DFNI-I02/9: "Theoretical and Numerical Investigation of Nonlinear Mathematical Models"*, chaired by: K. Ivanov and N. Kutev

- **M. Todorov** (TU Sofia): *Soliton Dynamics and Interaction of Vector Schroedinger Equation. Consistency and Integrability*
- **N. Kutev**, N. Kolkovska, M. Dimova (IMI-BAS): O*rbital stability of solitary wave pulses in biomembranes*
- **N. Kolkovska** (IMI-BAS): *Numerical computation of the critical energy constant for two-dimensional Boussinesq equations*
- **M. Dimova**, N. Kutev, N. Kolkovska (IMI-BAS): *Improved concavity method and application to nonlinear dispersive equations*

- I. Hristov, R. Hristova, **S. Dimova** (Sofia University): *Cavity and background oscillations in Intrinsic Josephson Junctions*

- **E. Bazhlekova** (IMI-BAS): *Fractional order equations in the modelling of unidirectional viscoelastic flows*

- **I. Bazhlekov**, D. Vasileva (IMI-BAS): *Mathematical modeling of the effect of biosurfactants in multiphase flows*

- **P. Boyvalenkov** (IMI-BAS) (jointly with P. Dragnev, D. Hardin, E. Saff, M. Stoyanova): *Energy bounds for codes and designs on Euclidean spheres*

Session 3. *Mathematical modelling*, chaired by P. Milanov and S. Markov

- M. Traykov, I. Trenchev (SWU): *Explicit description of DNA*

- R. Mavrevski (SWU): *Steps in modeling of biological data with GraphPad Prism*

- G. Koroleova, I. Kanelov, S. Stefanov, N. Pencheva (SWU): *Mathematical modelling of biomechanical relationships of flexors and extensors*

- I. Todorin (SWU): *Different approaches in placing amino acids in HP model*

- N. Yanev, P. Milanov, B. Urukov, R. Mavrevski, A. Stoilov (SWU): *Measurements for molecular docking in virtual screening*

- P. Milanov, F. Sapundzhi, N. Pencheva (SWU): *Mathematical models of pharmacological agonism*

- F. Sapundzhi, T. Dzimbova, N. Pencheva (SWU): *Relationship between biological activity of delta-selective enkephalin analogues and the results of docking experiments*

In the frames of the workshop the following three project meetings took place:

- Project meeting Biomath'2016: Discussions on the organization of the Biomath'2016 international conference 19-25 June 2016 in Blagoevgrad jointly by SWU and IMI-BAS.
- Project meeting DFNI IO 02/9: Theoretical and Numerical Investigation of Nonlinear Mathematical Models
- Project meeting DFNI IO 02/16: Bioinformatics Research: Protein Folding, Docking and Prediction of Biological Activity