

Editorial

BIOMATH 2011

The strong and meaningful interaction between mathematical and life sciences is one of the defining characteristics of the current development for both areas [1]. This interaction is accelerated by forums where mathematicians and biologists meet together. The International Conference on Mathematical Methods and Models in Biosciences (BIOMATH, [2]) is an annual event devoted to recent research in biosciences based on applications of mathematics as well as mathematics applied to or motivated by biological applications. It is a multidisciplinary forum for researchers who develop and apply mathematical and computational tools to study phenomena in the broad fields of life sciences, such as biology, ecology, medicine, biotechnology, bioengineering, environmental science, etc.

The 2011 International Conference on Mathematical Methods and Models in Biosciences and School for Young Scientists (BIOMATH 2011,[3]) held in Sofia, 15-18 June 2011 was truly an international meeting that gathered researchers from four different continents and 16 different countries. BIOMATH 2011 continues a tradition of scientific meetings on biomathematics held at the Bulgarian Academy of Sciences (BAS) in Sofia since 1990. Selected papers presented at the international conference BIOMATH-95 were published in vol. 32 of this journal [4] as well as in J.UCS [5]. The BIOMATH 2011 conference was supported by several research units of BAS and three Bulgarian Universities as well as by the Union of Bulgarian Mathematicians. The Conference was dedicated to the memory of Dr Roumen Tsanev — a prominent biologist and a pioneer of bio-mathematical modeling in Bulgaria.

About 70 scientific lectures were presented at BIOMATH 2011. This special issue contains a selection of 19 scientific papers focused on mathematical, numerical and computational tools with particular attention on differential equation models and their numerical analysis (finite difference method, finite element method). All papers have been subjected to the usual peer-review process of the journal based on the reports of at least two independent anonymous reviewers. Papers presented at BIOMATH 2011 focusing on biotechnological processes are published in a special issue of the Journal “Biotechnology & Biotechnological Equipment”.

According to their biological applications the papers in the present issue can be conditionally classified in four groups, as follows.

Epidemiological models, ecosystems, populations dynamics

Azmy Ackleh, Keng Deng, Xing Yang, Sensitivity Analysis for a Structured Juvenile-Adult Model.

Angel G. Angelov, Maroussia N. Slavtchova-Bojkova, Bayesian Estimation of the Offspring Mean in Branching Processes: Application to Infectious Disease Data.

Roumen Anguelov, Yves Dumont, Jean M.-S. Lubuma, Mathematical Modeling of Sterile Insect Technology for Control of Anopheles Mosquito.

Antonio Gomez Corral, Martin Lopez Garcia, On the Number of Births and Deaths During an Extinction Cycle, and the Survival of a Certain Individual in a Competition Process.

Bacterial growth, biotechnological and biochemical processes, enzyme kinetics

Rene Alt, Svetoslav Markov, Theoretical and Computational Studies of Some Bioreactor Models.

Maria Angelova, Krassimir Atanassov, Tania Pencheva, Purposeful Model Parameters Genesis in Simple Genetic Algorithms.

Milen Borisov, Neli Dimitrova, Venko Beschkov, Stability Analysis of a Bioreactor Model for Biodegradation of Xenobiotics.

Michael Chapwanya, Jean M.-S. Lubuma, Ronald E Mickens, From Enzyme Kinetics to Epidemiological Models with Michaelis-Menten Contact Rate: Design of Nonstandard Finite Difference Schemes.

Cell biology, physiology, biological fluids and membranes

Luis Almeida, Patrizia Bagnerini, Abderrahmane Habbal, Modeling Actin Cable Contraction.

Gergana Bencheva, Computer Modelling of Haematopoietic Stem Cells Migration.

Peter Djondjorov, Vassil Vassilev, Ivailo Mladenov, Deformation of Injected Cells Adhering to Flat Substrates.

Thomas Guillon, Yves Dumont, Thierry Fourcaud, Numerical Methods for the Biomechanics of Growing Trees.

Rumjana Ivanova, Georgi Simeonov, A Formula for the Oxygen Uptake of Thin Tissue Slice in Terms of Its Surface Oxygen Tension.

Alicia Prieto-Langarica, Hristo V. Kojouharov, Benito Chen-Charpentier, Discrete and Continuous Approaches to Modeling Cell Movement in the Presence of a Foreign Stimulus.

Robert Strehl, Andriy Sokolov, Stefan Turek, Efficient, Accurate and Flexible Finite Element Solvers for Chemotaxis Problems.

Molecular dynamics, protein structures, biomedical applications

Gaik Ambartsoumian, Inversion of the V-Line Radon Transform in a Disc and Its Applications in Imaging.

Ivan Cimrak, Markus Gusebauer, Thomas Schrefl, Modelling and Simulation of Processes in Microfluidic Devices for Biomedical Applications.

Dessislava Jereva, Ilza Pajeva, Tania Pencheva, Data Extraction Module – A Supplementary Tool for AMMOS_PROTLIG Software Package.

Elena B. Lilkova, Genoveva A. Nacheva, Peicho S. Petkov, Petko S. Petkov, Stoyan Markov, Nevena Ilieva, Leandar B. Litov, Metadynamics Study of Mutant Human Interferon-Gamma Forms.

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- [1] Cohen, J. E., Mathematics is Biology’s next Microscope, only better; Biology is Mathematics’ next Physics, only Better. PLoS Biol 2(12) (2004): e439. doi:10.1371/journal.pbio.0020439
- [2] <http://www.biomath.bg>
- [3] <http://www.biomath.bg/2011>
- [4] Ullrich, Ch., S. Markov (Guest Editors), BIOMATH-95, Computers & Mathematics with Applications 32 (11), December 1996, 123 pp. <http://www.sciencedirect.com/science/journal/08981221/32/11>
- [5] Markov, S., Ch. Ullrich (Guest Editors), BIOMATH-95, J. UCS, 2, 2, February 1996, 58–95, <http://www.jucs.org/doi?doi=10.3217/jucs-002-02>

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