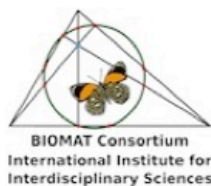# BIOMAT 2019

19th International Symposium on Mathematical and Computational Biology

Bolyai Institute, University of Szeged / Hungarian Academy of Sciences, Hungary October 21 - 25, 2019

BIOMAT International Institute for Interdisciplinary Sciences
http://www.biomat.org, biomatconsortium2019@gmail.com

BIOMAT 2019 – 19th International Symposium on Mathematical and Computational Biology

Bolyai Institute, University of Szeged, Hungarian Academy of Sciences, Szeged, Hungary, October 21 – 25, 2019

President of the BIOMAT Consortium – Prof. Rubem P. Mondaini, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

President of the BIOMAT 2019 Local Organizing Committee – Prof. Gergely Röst, Bolyai Institute, University of Szeged, Hungary

BIOMAT 2019	Monday October 21 Acad.of Sciences	Tuesday October 22 Acad.of Sciences	Wednesday October 23 Bolyai Institute	Thursday October 24 Acad. of Sciences	Friday October 25 Bolyai Institute
08:00 -09:00	Registration				
09:00 - 09:15	Opening Session				
09:15 – 10:10	KT1/KTT1 Goriely	KT4 Moghadas	KT7 Dragovich	KT10 Venturino	KT12 István Z. Kiss
10:10 –10:35	CT1 Gbolahan Bolarin	CT9 Coura Balde	CT17 Elalaoui	CT24 Neogrády-Kiss	CT30 Péter Boldog
10:35 – 10:55	Coffee Break				
10:55 - 11:20	CT2 Attila Dénes	CT10 Tanvi Tanvi	CT18 E.V. Kislukhina	CT25 V.V. Kislukhin	CT31 Noémi Gyúró
11:20 – 11:45	CT3 Tamás Varga	CT11 István Balázs	CT19 Rajiv Aggarwal	CT26 Rodrigo Cardoso	CT32 Mahmoud A. Ibrahim
11:45 – 12:10	CT4 Sadegh Marzban	CT12 János Karsai	CT20 Asha H. Kizulwa	CT27 Saumen Barua	CT33 Ferenc Bartha
12:10 – 13:10	Lunch				
13:10 – 14:05	KT2/KTT2 Röst	KT5 Berec	KT8 Lorenzi	KT11 Samares Pal	KT13 Lucia Maddalena
14:05 - 14:30	CT5 Gabriella Vas	CT13 Farid Arenas	CT21 Khalil Muqbel	CT28 István Z. Kiss	CT34 Rodrigo Cardoso
14:30 - 14:55	CT6 Tibor Krisztin	CT14 Bornali Das	CT22 Tamás Tekeli	CT29 Kyeongah Nah	CT35 Tibor Nyári
14:55 – 15:15	Coffee Break			Excursion: Ópusztaszer National Memorial Park Conference Dinner	Coffee Break
15:15 – 15:40	CT7 Gábor Iztván Benedek	CT15 Péter Simon	KT9 Mondaini		KT14/KTT3 Horvath
15:40 - 16:05	CT8 Monika Polner	CT16 Sara Mkango	CT23 Simão Albuquerque Neto		
16:05 – 16:20	KT3 Bratus	KT6 Dorothy Wallace	Social Programme Soccer,Bowling Sightseeing walk		Closing Session
16:20 – 17:00					
17:00	Wine & Cheese Party	BIOMAT General Assembly			
		Director Board Meeting			

KT = Keynote Talk, KTT = Keynote Tutorial Talk , CT = Contributed Talk

Oct 21, Monday, 08:00 am – 09:00 am – Registration – Academy of Sciences

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Oct 21, Monday, 09:00 am - 09:15 am – Opening Session – Academy of Sciences

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Oct 21, Monday, 09:15 am – 10:35 am – 1st Session – Academy of Sciences

09:15 am – 10:10 am – KT1/KTT1 – "MODELLING DEMENTIA"- Alain Goriely, - University of Oxford, Mathematical Institute, UK.

10:10 am – 10:35 am - CT1 – "MATHEMATICAL MODELLING AND ANALYSIS OF MONKEY POX INFECTION DYNAMICS INCORPORATING SYMPTOMATIC AND ASYMPTOMATIC INFECTIOUS STAGES" - Gbolahan Bolarin – Federal University of Technology, Minna, Niger State, Nigeria.

Chair: Gergely Röst

Oct 21, Monday, 10:55 am – 12:10 pm – 2nd Session – Academy of Sciences

10:55 am – 11:20 am – CT2 - GLOBAL ANALYSIS OF A CANCER MODEL WITH DRUG RESISTANCE DUE TO MICROVESICLE TRANSFER" - Attila Dénes, Gergely Röst – Bolyai Institute, University of Szeged, Hungary.

11:20 am – 11:45 am – CT3 - "DYNAMIC CHARACTERISATION OF THE UNIFORMLY EVOLUTIONARY STABLE STRATEGY"- Tamás Varga – Bolyai Institute, University of Szeged, Hungary.

11:45 am – 12:10 pm – CT4 – "A MATHEMATICAL MODEL OF THE EFFECT OF TRANSCRANIAL DIRECT CURRENT STIMULATION IN MOTOR FUNCTION IN PARKINSON'S DISEASE" – Sadegh Marzban – Bolyai Institute, University of Szeged, Hungary, F. Towhidkhah – Amirkabir University of Technology, Tehran, Iran, B. Forogh – Iran University of Medical Sciences, Tehran, Iran.

Chair: Ludek Berec

Oct 21, Monday, 01:10 pm – 02:55 pm - 3rd Session – Academy of Sciences

01:10 pm – 02: 05 - KT2/KTT2 - "BLOWFLY EQUATIONS: HISTORY, CURRENT RESEARCH AND OPEN PROBLEMS" – Gergely Röst – Bolyai Institute , University of Szeged, Hungary.

02:05 pm – 02:30 pm – CT5 – "HYDRA EFFECT FOR DELAY DIFFERENTIAL EQUATIONS"- Gabriella Vas, Tibor Krisztin, Mónika Polner – Bolyai Institute, University of Szeged, Hungary.

02:30 pm – 02:55 pm - CT6 – "STABLE PERIODIC ORBITS FOR THE MACKEY-GLASS EQUATION" - Tibor Krisztin – Bolyai Institute, University of Szeged, Hungary.

03:15pm - 03:40 pm – CT7 – "PERIODIC AND CONNECTING ORBITS FOR MACKEY-GLASS TYPE DIFFERENTIAL-DELAY EQUATIONS"- Gábor István Benedek , Tibor Krisztin – Bolyai Institute, University of Szeged, Hungary.

03:40 pm – 04:05 pm – CT8 – "DELAYED NEURAL FIELD EQUATIONS IN TWO-DIMENSIONAL SPATIAL DOMAINS" - Mónika Polner, Bolyai Institute, University of Szeged, Hungary, K. Dijkstra, L. Spek, S.A. Van Gils, University of Twente, The Netherlands.

Chair: Branko Dragovich

Oct 21, Monday, 04:05 pm – 05:00 pm – 4th Session – Academy of Sciences

04:05 pm - 05:00 pm – KT3 – "EVOLUTIONARY ADAPTATION OF THE PERMANENT REPLICATOR SYSTEM" S. Drozhzhin, Alexander Bratus – Lomonosov Moscow State University, Russia, T. Yakushkina – National Research University, Higher School of Economics, Moscow, Russia.

Chair: Alain Goriely

Oct 22, Tuesday, 09:15 am - 10.35 am – 5th Session – Academy of Sciences

09:15 am – 10:10 am – KT4 - "MODELLING THERAPEUTIC VACCINES"- Elaheh Abdollahi, Agent-Based Modelling Laboratory, York University, Canada, Affan Shoukat – Center for Infectious Disease Modeling and Analysis, Yale School of Public Health, USA, Seyed M. Moghadas – Agnt-Based Modelling Laboratory, York University, Canada.

10:10 am – 10:35 am – CT9 – "CONTACT VACCINATION STUDY USING EDGE BASED COMPARTMENTAL MODEL (EBCM)"- Coura Balde, Mountaga Lam – University Cheikh Anta Diop, Dakar, Senegal, Samuel Bowong – University of Douala, Cameroon.

Chair: Rubem P. Mondaini

Oct 22, Tuesday, 10:55 am – 12:10 pm - 6th Session – Academy of Sciences

10:55 am - 11:20 am - CT10 – "DYNAMICS OF HIV-TB CO-INFECTION WITH DETECTION AS OPTIMAL INTERVENTION STRATEGY" – Tanvi Tanvi, Rajiv Aggarwal – University of Delhi, New Delhi, India.

11:20 am – 11:45 am – CT11 – "PERIODIC SOLUTIONS OF A STEM CELL POPULATION MODEL WITH STATE-DEPENDENT DELAY"- István Balázs – Bolyai Institute, University of Szeged, Hungary, Ph. Getto – Technische Universität Dresden, Germany, G. Röst – Bolyai Institute, University of Szeged, Hungary.

11:45am 12:10 pm – CT12 – "ON THE MODELLING OF VARICELLA TRANSMISSION IN HUNGARY"- János Karsai, R. Csuma-Kovács, T. Borsos, J. Dudás, G. Röst, Bolyai Institute, University of Szeged, Á. Dánielisz, Z.S. Molnár, National Public Health Center, Budapest, Hungary.

Chair: Alexander Bratus

Oct 22, Tuesday, 01:10 pm – 02:55 pm – 7th Session – Academy of Sciences

01:10 pm – 02:05 pm – KT5 – "IMPACTS OF INFECTIONS AND PREDATION ON DYNAMICS OF SEXUALLY REPRODUCING POPULATIONS"- Ludek Berec – Centre for Mathematical Biology, University of South Bohemia, Czech Republic.

02:05 pm – 02:30 pm – CT13 – "RECOGNITION OF PROTEIN INTERACTION REGIONS THROUGH TIME-FREQUENCY ANALYSIS"- Ailan Farid Arenas – Laboratory for Biomedical Sciences, G.E. Salcedo, M.D. Garcia, N. Arango, University of Quindio, Colombia.

02:30 pm – 02:55 pm – CT14 – "DELAY LINEAR CHAINS IN MATHEMATICAL BIOLOGY: STEM CELL MATURATION, MIGRATORY BIRDS, AND INTRACELLULAR CHLAMYDIA INFECTION"- Bornali Das, Gergely Röst – Bolyai Institute, University of Szeged, Hungary.

Chair: János Karsai

Oct 22, Tuesday, 03:15 pm – 05:00 pm – 8th Session – Academy of Sciences

03:15 pm – 03:40 pm – CT15 – "BIFURCATIONS IN APPROXIMATING NETWORK EPIDEMIC MODELS"- Péter L. Simon – Institute of Mathematics, Eötvös Loránd University, Budapest, Hungary.

03:40 pm – 04:05 pm – CT16 – "OPTIMAL CONTROL AND COST EFFECTIVENESS ANALYSIS FOR BREAST CANCER TREATMENT"- Sara Mkango, Nyimvua Shaban, Eunice Mureithi, Department of Mathematics, University of Dar es Salaam, Twalib Ngoma, Department of Clinical Oncology, University of Health and Allied Sciences, Dar es Salaam, Tanzania.

04:05 pm – 05:00 pm – KT6 – "COMPETITION BETWEEN TWO TUFTED C4 GRASSES: A MATHEMATICAL MODEL"- Dorothy Wallace, Department of Mathematics, Darthmouth College, Hanover, NH, USA.

Chair: Lucia Maddalena

Oct 23, Wednesday, 09:15 am – 10:35 am – 9th Session – Bolyai Institute

09:15 am – 10:10 am - KT7 – "MODELING THE GENETIC CODE: P-ADIC APPROACH"- Branko Dragovich, Institute of Physics, University of Belgrade, Mathematical Institute, Serbian Academy of Sciences and Arts, Natasa Z. Misic, Research and Development Institute Lola Ltd., Belgrade, Serbia.

10:10 am – 10:35 am – CT17 – "ANALYSIS OF AN AGE STRUCTURED MULTI-STATES CELL CYCLE MODEL VIA TRANSLATION SEMIGROUPS"- Youssef Elalaoui, Department of Mathematics, Mohammed V University, L. Alaoui, International University of Rabat, Morocco.

Chair: Dorothy Wallace

Oct 23, Wednesday, 10:55 am – 12:10 pm 10th Session – Bolyai Institute

10:55 am – 11:20 am - CT18 – "MICROCIRCULATION'S INFLUENCE ON DELIVERY OF OXYGEN"- Evgeniia Kislukhina. Sklifosovsky Institute for Emergency Medicine, Viktor Kislukhin, Medisonic, Moscow, Russia.

11:20 am – 11:45 am – CT 19 – "ASSESSING THE EFFECTS OF HOLLING TYPE-II TREATMENT RATE ON HIV-TB CO-INFECTION" – Rajiv Aggarwal, Tanvi Tanvi, University of Delhi, New Delhi, India, Támas Kovács, Institute for Theoretical Physics, Eotvos University, Budapest, Hungary

11:45 am – 12:10 pm – CT20 – "OPTIMAL CONTROL OF ONCHOCERCIASIS WITH SOME INTERVENTION STRATEGIES"- Asha Hassan Kizulwa, Nyimvua Shaban, Department of Mathematics, Fred Chibwana, Department of Zoology, University of Dar es Salaam, Tanzania.

Chair: Attila Dénes

Oct 23, Wednesday, 01:10 pm – 02:55 pm - 11th Session – Bolyai Institute

01:10 pm – 02:05 pm – KT8 – "DISSECTING THE EVOLUTIONARY AND SPATIAL DYNAMICS OF CANCER THROUGH NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS"- Tommaso Lorenzi, School of Mathematics and Statistics, University of St. Andrews, UK.

02:05 pm – 02:30 pm – CT21 – "OPTIMAL TEMPORARY NON-PHARMACEUTICAL INTERVENTION STRATEGIES FOR EPIDEMIC OUTBREAKS"- Khalil Muqbel, Gergely Röst, Bolyai Institut, University of Szeged, Hungary.

02:30 pm – 02:55 pm – CT22 – "STABILITY AND OSCILLATIONS OF MULTISTAGE SIS MODELS DEPEND ON THE NUMBER OF STAGES" – Tamás Tekeli, Gergely Röst, Bolyai Institute, University of Szeged, Hungary.

Chair: Ezio Venturino

Oct 23, Wednesday, 03:15 pm – 04:05 pm – 12th Session – 12th Session – Bolyai Institute

03:15 pm – 03:40 pm - KT9 – "GENERALIZED KHINSHIN-SHANNON INEQUALITIES FOR "NON-ADDITIVE" ENTROPY MEASURES"- Rubem P. Mondaini, Federal University of Rio de Janeiro, Brazil.

03:40 pm 04:05 pm – CT23 – "ANOVA STATISTICAL ANALYSIS OF THE ASSOCIATION OF PROTEIN DOMAIN FAMILIES INTO CLANS"- Simão C. De Albuquerque Neto, Federal University of Rio de Janeiro, Brazil.

Chair: István Zoltán Kiss

Oct24, Thursday, 09:15 am – 10:35 am – 13th Session – Academy of Sciences

09:15 am – 10:10 am – KT10 – "A MORE REALISTIC FORMULATION OF HERD BEHAVIOR FOR INTERACTING POPULATIONS" – D. Borgogni, L. Losero, <u>E. Venturino</u>, Department of Mathematics, Giuseppe Peano, University of Turin, Italy.

10:10 am – 10:35 am – CT24 – "THE EFFECT OF INHIBITORY NEURONS ON A CLASS OF NEURAL NETWORKS"- <u>Martón Neogrády-Kiss</u>, Péter L. Simon, Institute of Mathematics, Eötvös Loránd University, Budapest, Hungary.

Chair: Seyed Moghadas

Oct 24, Thursday, 10:55 am – 12:10 pm – 14th Session – Academy of Sciences

10:55 am – 11:20 am - CT25 – "MATHEMATICAL DESCRIPTION OF SYSTEMIC AND MICRO CIRCULATIONS" – <u>Viktor Kislukhin</u>, Medisonic , Moscow, Evgeniia Kislukhin Sklifosovsky Institute for Emergency Medicine, Moscow, Russia.

11:20 am – 11:45 am - CT26 – "USING A STOCHASTIC SIR MODEL TO DESIGN OPTIMAL VACCINATION CAMPAIGNS VIA MULTIOBJECTIVE OPTIMIZATION"- A.C.S. Dusse, <u>Rodrigo T.N. Cardoso</u>, CEFET – MG, Brazil.

11:45 am – 12:10 pm - CT27 – "HYDRODYNAMICS OF MICROALGAE AND CO_2 FLOW IN A TUBULAR PHOTOBIOREACTOR AND CONSEQUENT EFFECTS ON MICROALGAE GROWTH"- <u>Saumen Barua</u>, Bolyai Institute, University of Szeged, Hungary, U.K. Deb, Department of Mathematics, Chittagong University of Engineering & Technology Pahartoli, Bangladesh.

Chair: Tommaso Lorenzi

Oct 24 , Thursday, 01:10 pm – 02:05 pm – 15th Session – Academy of Sciences

01:10 pm – 02:05 pm – KT11 – "A PREY-PREDATOR MODEL WITH PATHOGEN INFECTION ON PREDATOR POPULATION"- S. Pramanick, Dept. of Mathematics, University of Kalyani, J. Bhattacharyya, Dept of Mathematics, Karimpur Pannadevi College, <u>Samares Pal</u>, Dept. of Mathematics, University of Kalyani, India.

02:05 pm – 02:30 pm – CT28 – "THEORETICAL AND NUMERICAL CONSIDERATIONS OF THE ASSUMPTIONS BEHIND TRIPLE CLOSURES IN EPIDEMIC MODELS ON NETWORKS"- Nicos Georgious, <u>István Zoltán Kiss</u>, University of Sussex, UK, Peter Simon, Eötvös Lóránd University, Budapest, Hungary.

02:30 pm – 02:55 pm – CT29 – "NORMALIZATION OF A PERIODIC DELAY IN A DELAY DIFFERENTIAL EQUATION" - <u>Kyeongah Nah</u>, Jianhong Wu, Department of Mathematics and Statistics, York University, Canada.

Chair: Péter Horvath

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Oct 25, Friday, 09:15 am – 10:35 am – 16th Session – Bolyai Institute

09:15 am – 10:10 am – KT12 – NETWORK INFERENCE FROM POPULATION-LEVEL OBSERVATION OF EPIDEMICS" – F. Di Lauro, J.-C. Croix, M. Dashti, L. Berthouze, I.Z. Kiss, University of Sussex, UK.

10:10 am – 10:35 am – CT30 – "MEAN-FIELD MODELS OF GO-OR-GROW TYPE WITH REALISTIC CELL CYCLE LENGTH DISTRIBUTIONS"- Péter Boldog, G. Röst – Bolyai Institute, University of Szeged, Hungary, R. Baker – Wolfson Centre for Mathematical Biology, University of Oxford, UK.

Chair: Samares Pal

Oct 25, Friday, 10:55 am – 12:10 pm – 17th Session – Bolyai Institute

10:55 am – 11:20 am – CT31 – "ON AN INVASIVE SPECIES MODEL WITH HARVESTING" – Sándor Kovács, Sylvia György, Noémi Gyúró, Eötvös Loränd University, Budapest, Hungary.

11:20 am – 11:45 am - CT32 – "THRESHOLD DYNAMICS IN A MODEL FOR ZIKA VIRUS DISEASE WITH SEASONALITY" – Mahmoud A. Ibrahim, A. Dénes, Bolyai Institute, University of Szeged, Hungary.

11:45 am - 12:10 pm – CT33 – "ON THE STABILITY OF A SYSTEM OF DELAYED LOGISTIC EQUATIONS WITH PATCH STRUCTURE"- Ferenc A. Bartha, Gergely Röst, D. Knipl, Bolyai Institute, University of Szeged, Hungary, X. Zou – Department of Applied Mathematics, University of Western Ontario, Canada.

Chair: Péter Simon

Oct 25, Friday, 01:10 pm – 02:55 pm – 18th Session – Bolyai Institute

01:10 pm – 02:05 pm – KT13 – "ON NETWORKS SIMILARITIES AND THEIR APPLICATIONS"- I. Granata, M.R. Guarracino, Lucia Maddalena, I. Manipur, - National Research Council, ICAR, Naples, Italy; P.M. Pardalos – University of Florida, CAO, Gainesville, USA.

02:05 pm – 02:30 pm – CT34 – "TWO-DIMENSIONAL DIFFUSION-REACTION MODEL FOR THE *AEDES AEGYPTI* TRANSMISSION AND CONTROL" – J.S. Lima, Rodrigo T. N. Cardoso, CEFET – MG, Brazil, A.M. Loaiza, Education University GMME, Uniquindio, Colombia.

02:30 pm – 02:55 pm – CT35 – "GENERALIZED LINEAR MODELS TO INVESTIGATING CYCLIC TRENDS"- Tibor András Nyári – Department of Medical Physics and Informatics, University of Szeged, Hungary.

Chair: Gergely Röst
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Oct 25, Friday, O3:15 pm – 04:05 pm - 19th Session – Bolyai Institute

03:15 pm – 04:05 pm – KT14/KTT3 – "LIFE BEYOND THE PIXELS: SINGLE-CELL ANALYSIS USING MACHINE LEARNING AND IMAGE ANALYSIS METHODS"- Peter Horvath, Institute for Molecular Medicine of Finland, Biology Research Centre of Szeged, Hungary.

Chair: Rubem P. Mondaini

Oct 25, Friday, 04:05 pm – 04:20 pm – Closing Session