

*International Conference*

# **Instabilities and Control of Excitable Networks: From macro- to nano-systems**

*Dolgoprudny, Moscow Area, RUSSIA*

*May 25 - 30, 2012*

## **Conference Program**

**25<sup>th</sup> May**

### **9.00 – Registration of participants**

### **9.30 – Opening ceremony**

N.N. Kudryavtsev, *Rector of Moscow Institute of Physics and Technology*

V.G. Savchenko, *Director of National Research Centre for Haematology*

### **9.45 – Excitable Networks: general concepts (Chair: K.I. Agladze)**

1. W. Ebeling, *Humboldt University, Institute of Physics, Berlin*

**Solitonic excitations and control in nonlinear chains and networks**

2. E. Bodenschatz, *Max Plank Institute for Dynamics and Self-Organization, Goettingen*

**Spiral wave selection in excitable media with a phase wave at the wave back**

*11.05 – Coffee break*

### **11.20 – Excitable Networks in cardiology (Chair: A. Panfilov)**

1. L.V. Rosenshtraukh, *Institute of Experimental Cardiology, Russian Cardiological Research and Production Complex, Moscow*

**The Cholinergic Non-Excitability Phenomenon and Its Role in the Regulation of the Sinus Rhythm**

2. A.M. Pertsov, *SUNY Upstate Medical University, New York*

**Paradox of Electrical Defibrillation**

12.40 – Lunch

**14.00 – Control of excitable biological networks (Chair: A.M. Pertsov)**

1. K.I. Agladze, *Kyoto University and Moscow Institute of Physics and Technology*

**Photo-controlled engineered cardiac tissue**

2. N. Bursac, *Duke University, Durham*

**Engineering of Excitable Cells from Scratch**

15.20 – Coffee break

**15.35 – Nonlinear waves in excitable systems (Chair: M.Tsyganov)**

1. V.N. Biktashev, *University of Liverpool*

**Asymptotic dynamics and control of spiral and scroll waves**

2. M.E. Mazurov, *Moscow State University of Economics, Statistics and Information*

**On nonlinear vortex autowaves and arrhythmias in the two-dimensional and three-dimensional active medium of heart, their generation, synchronization, the methods of the controlled annihilation**

16.55 – Coffee break

**17.10-17.30**

3. O.A. Dudchenko, *Moscow Institute of Physics and Technology*

**Self-sustained peristaltic transport in biological systems: A theoretical study**

26<sup>th</sup> May

**9.30 – Self-organization in excitable networks (Chair: E. Bodenschatz)**

1. A.V. Panfilov, *Ghent University, Belgium*  
**Anatomical modeling of electrical and mechanical function of the heart**
2. B.Cerruti, A. Puliafito, A.M. Shewan, W. Yu, K.E. Mostov, L. Primo, G.Serini, A. Celani, A. Gamba  
**Geometry, topology, and out-of-equilibrium dynamics in epithelial morphogenesis**

*10.50 – Coffee break*

**11.05 – (Chair: O. Steinbock)**

3. E.A. Katrukha, *Utrecht University, Netherlands*  
**Self-organization of transport network in cells**
4. Y. Sumino, *Aichi University of Education, Japan*  
**Large scale vortex lattice of self-propelled microtubules induced by local interaction**

*12.25 – Coffee break*

**12.40**

5. A.A. Polezhaev, *P.N. Lebedev Physical Institute, Moscow*  
**Patterns in active media caused by diffusion instability**

*13.20 – Lunch*

### **14.30 – Identification problems in biology networks (Chair: N. Bursac )**

1. M. Poptsova, *Moscow State University*

#### **The cancer biomarker identification problems**

2. A.V. Khalyavkin, *Inst of Biochemical Physics, Inst for Systems Analysis, Gerontological Society, Moscow*

#### **Systems Biology on Emergence, Development and Control of Aging From macro- to nano-systems and back in search of the primary cause and control of aging**

### **15.30 – Threshold phenomena in excitable regulatory networks**

**(Chair: W. Ebeling)**

1. M.Tsyganov, *Institute of Theoretical and Experimental Biophysics, Pushchino, Russia*

#### **Quasisolitons in excitable systems with cross-diffusion**

2. P. Padilla, *IIMAS, University of Mexico, UNAM*

#### **Synchronization in biological systems: bacteria make the Mexican wave**

3. K.Guria, A.Gagarina, *Moscow Institute of Physics and Technology*

#### **Instabilities in fibrinolytic regulatory system**

*16.30 – Coffee break*

### **16.45-18.45 – Round Table "Fiztech-future and Fiztech networks",**

**Moderator: Prof. A. Kaplan**

27<sup>th</sup> May

**9.30 – Skolkovo Round Table, Moderator Prof. I. Goryanin**

*11.30 – Coffee break*

**11.45 – Poster Session**

*13.45 – Lunch*

15.00 – Excursion to Moscow

19.00 – Banquet

28<sup>th</sup> May

**9.30 – Novel approach to stem cells application in medicine**

**(Chair: L. Rosenshtraukh)**

1. V.G. Savchenko, *National Research Center for Haematology, Moscow*  
**Multipotent mesenchymal stromal cells for the prophylaxis of acute graft-versus-host disease. Recent advances**
2. V.E. Mamonov, *National Research Center for Haematology, Moscow*  
**Resorbable calcium phosphate ceramics with fibrin content for tissue engineering of bone**

*10.50 – Coffee break*

**11.05 – Transport Biological networks (Chair: S.S. Simakov )**

1. A.P.Favorsky, *Moscow State University*  
**Mathematical modeling of blood flow in net of vessels**
2. K.G. Gainullin, *Russian Federal Nuclear Centre – VNIIEF, Sarov*  
**The Dichotomic Scaling Model for “Closed” Blood Circulatory System Simulations**

12.25 – Coffee break

**12.40**

3. A.G.Ioilev, *Russian Federal Nuclear Centre – VNIIEF, Sarov*  
**ES-HCVS: Expert System for CFD-modeling of Blood Flow in  
a Human Cardio-Vascular System**

13.20 – Lunch

**14.30 – Cardiovascular network modeling (Chair: K. Gainullin)**

1. S.S. Simakov, *Moscow Institute of Physics and Technology*  
**Global blood flow and matter transport in regulated  
cardiovascular network**
2. A.S. Rukhlenko, *Moscow Institute of Physics and Technology*  
**Threshold activation of coagulation cascade in intensive flow  
and formation of fibre-like fibrin polymer networks**

**15.10 – Novel approach to communication networks**

**(Chair: A. Kaplan)**

1. A.S. Dmitriev, *Institute of Radioengineering and Electronics, Moscow*  
**Ultra wide band wireless body area networks**
2. M. Antonenko, *Institute for Computer Aided Design RAS/ Moscow  
Institute of Physics and Technology/ NetCracker Technology*  
**Actual Problems of Telecommunication Networks and Solving  
Methods**

16.10 – Coffee break

**16.25-17.25 – Round Table: Scientific Advantages for Medicine.**

**Department of "Physics of Living Systems" in MIPT.**

**Moderators: M.S. Khubutia, V.M. Zaiko**

29<sup>th</sup> May

**9.00 – Registration of participants**

**9.30 – Biological network architectures and cognitive facilities**

**(Chair: A. Raigorodsky)**

1. K.V. Anokhin, *Kurchatov Institute, Moscow*

**Network architectures and cognitive computing in biological nervous systems**

2. G.Th. Guria, *National Research Center for Haematology, Moscow*

**Sudden avalanche-like phenomena in kinetic-cascade networks of human blood coagulation**

*10.50 – Coffee break*

**11.05 – Internet and transport networks: models and applications**

**(Chair: K. Anokhin)**

1. A.M. Raigorodskii, *Moscow Institute of Physics and Technology*

**Models of the Internet: theoretical questions and practical impact**

2. V. A. Malyshev, *Moscow State University*

**Mathematical classes of networks**

*12.15 – Coffee break*

**12.30**

3. A.V. Gasnikov, O.S. Fedko, *Moscow Institute of Physics and Technology*

**About possible dynamics in Google's PageRank and Tomlin's Internet traffic static models**

4. A.V. Gasnikov, E.V. Gasnikova, *Moscow Institute of Physics and Technology*

**A conception of equilibrium of macrosystem in application to the traffic flow distribution in large transport networks**

*13.30 – Lunch*

**14.30 – (Chair: A. Raigorodsky)**

5. M.S. Gelfand, *A.A.Kharkevich Institute of Information Transmission Problems, Moscow*

**Networks in molecular biology**

6. A.B. Kupavskiy (Yandex, MIPT, MSU)

**Using random graphs for modeling link structure of sites**

*16.00 – Coffee break*

**16.15**

7. A.V. Savvateev, D.V. Musatov (NES, MIPT, Yandex)

**A game-theoretic model of geometric graphs, with application to the Internet**

**16.45 – (Chair: A. Gasnikov)**

8. E.A. Grechnikov, G.G. Gusev, L.A. Ostroumova, Y.L. Pritykin, M.E. Zhukovskii, A.M. Raigorodskii, D.V. Vinogradov (Yandex, MIPT, MSU)

**Empirical Validation of the Buckley–Osthus Model for the Web Host Graph**



9. E.A. Grechnikov, L.A. Ostroumova, A.B. Kupavskiy, Pr. Tetali  
(Yandex, MIPT, MSU, Georgia Tech)

**The distribution of second degrees in random web graph models**

*17.45 – Coffee break*

**18.00-19.00**

- 10.A.A. Ryabchenko, E.A. Samosvat (Yandex, MIPT)

**New model in the class of preferential attachment models of the Internet**

- 11.A.V. Leonidov, *Moscow Institute of Physics and Technology, Lebedev Physical Institute*

E. L. Rumyantsev, *Moscow Institute of Physics and Technology*

**Russian interbank network: main characteristics and stability with respect to contagion**

30<sup>th</sup> May

**9.30 – Dynamic models of social networks (Chair: G.Th. Guria)**

1. D.A. Novikov, *Institute of Control Sciences, Moscow*

**Dynamic Models of Informational Control in Social Networks**

2. M.A. Herrero, *University Complutense, Madrid*

**Mathematical models in social dynamics**

3. V.E. Zakharov, *Lebedev Physical Institute, Moscow*

**Analytical models of concurrence**

*11.30 – Coffee break*

**11.45 – Pattern formation from nano- to macro-systems (Chair: M. Herrero)**

1. A.E. Kaplan, *Johns Hopkins University, USA*

**Nano-strata, giant resonances, magic numbers, and optical bistability in atomic nano-lattices**

2. D.I. Iudin, *Institute of Applied Physics, Nizhny Novgorod, Russia*

**Percolation effects in Excitable Networks**

*13.05 – Lunch*

**14.30 – General discussion**

**15.30 – Closing ceremony**