CURRICULUM VITAE

Svetlana R. Amirova

College of Engineering, Mathematics and Physical Sciences,
Mathematics Research Institute , University of Exeter,
Harrison Building, North Park Road, Exeter EX4 4QF, UK.

Phone: +44 (0)1392-72 3988
Email: S.Amirova@exeter.ac.uk
Web: http://empslocal.ex.ac.uk/people/staff/sa376/index.html

Nationality: Russian; Date of Birth: 4 May 1982;
Languages: English (fluent), French (fair), Russian (native).

Education

Ph.D. (2008), University of Keele UK (Professor G.A. Rogerson, thesis advisor),
M.S. (2005) and B.S. (2003), Moscow Institute of Physics and Technology (MIPT),
State University, Russia.

Professional Experience

2010 - Research Associate Fellow, Mathematics Research Institute, University of Exeter UK.
2008-2010 Research Assistant, Engineering Department, University of Leicester UK.
2006-2008 PhD Student and Part-time Teaching Assistant, Mathematics Department, University of Keele, UK.
2005-2006 PhD Student and Part-time Teaching Assistant, Mathematics Department, University of Salford, UK.

Research Interests

Mathematical biology, systems and synthetic evolutionary biology, nonlinear control and systems theory, statistical computational molecular biology, theoretical dynamic elasticity, mathematical modeling of traveling waves, mathematical analysis and design of bio and micro sensors.

Honours

2005 – 2008 Overseas Research Students Awards Scheme PhD Grant, UK.
2005 M.S in Applied Mathematics and Physics, with distinction.
2003 B.S in Applied Mathematics and Physics, with distinction.
2005 ETS Test of English as a Foreign Language (TOEFL), computer based test 253/300, granted by Educational Testing Serving, Princeton, NJ 08541 USA.

Key skills

Research	**Applied Mathematics** Systems and synthetic evolutionary biology of yeast metabolism, nonlinear control and systems theory for design principles of regulatory molecular mechanism of yeast, theoretical dynamic elasticity; mathematical modeling of traveling waves in solids (analytical and numerical techniques), solid mechanics. **Applied Statistics** Protein structure prediction and analysis; statistical methods in molecular biology, protein and drug design. **Applied Physics** Mathematical modeling of environmental eco systems and climate control systems (analytical and computational techniques); theoretical and computational investigations of physic fiber-optic and bio-sensors. **Engineering** computational modeling in molecular biology and biotechnology involving DNA and proteins investigation, MD simulations of proteins; simulations of the processes in wave guides; *more details in Publications and Conferences sections.*
Teaching	Mathematical methods: theoretical and applied; tutorial, demonstrations, marking course, also taught courses on various aspects of computing and graphical design.
Software	LaTex, Maple, Matlab, NLREG, SigmaPlot, Table Curve 2D and 3D, C/C++, HTML, MD simulation package (ICM), MS Office, Adobe Photoshop.
Leadership	I play a key role in the management of the mathematical side of systems and synthetic biology of two research projects between Exeter, Aberdeen and Leicester Universities, UK; I made important decisions on methodology, research strategies, and conference meetings to facilitate collaboration with research groups in the UK and abroad; I assist in the supervision and consultation for PhD students in related fields. I have many ideas for the development of own research grant proposals based on my research in above projects.

Professional Activities

2008-Present

Research Associate on BBSRC BB/F019602/1 Project: "*Post-transcriptional feedback control of polyamine metabolism in yeast: an integrated modelling and experimental investigation*" PI's Professor Declan Bates (University of Exeter), Dr. I. Stansfield and Dr Heather Wallace, (University of Aberdeen).

New aspects of research

I play a key role in developing a new complete predictive model of the polyamine metabolism in the yeast Saccharomyces cerevisiae using a Systems Biology approach incorporating enzyme kinetics, statistical analysis, control engineering and experimental molecular biology of translation. This quantitative model of the polyamine control system reproduces experimental data and predicts polyamine content under normal conditions and at various decease-induced scenarios that cannot be seen from experiments. Another novel feature of our approach is coupling in one systems external and internal cellular control of polyamines. Also our model bridges the gaps for development of evolutionary studies of programmed ribosomal frameshifting in wide range of species. In addition our integrated modelling and experimental investigation provide basis for further development of projects on synthetic biology of polyamines, namely applications of polyamine analogues. *Possible applications of our research are in pharmacology; toxicology, preclinical drug development for cancer and neurodegenerative disorders; further studies of the anti-cancer drug DFMO, Snyder-Robinson Syndrome.*

Techniques

Top down and bottom up molecular modeling approaches using Michaels-Menten, mass action kinetics, non linear dynamics (including both transient behavior and steady state analysis) and statistical inference methods; in particular statistical methods of kinetic parameter inference using true non linear regression analysis (NLREG, SigmaPlot, Table Curve 2D and 3D) including development of new statistical algorithms, numerical simulations of biochemical pathway reactions of MATLAB.

Publications

Nucleic Acids Research to appear (2010), proceedings of ICSB (2010), BAMC (2010) Edinburgh UK, proceedings of CSHL Engineering Principles in Biological Systems, (2009), Cambridge UK; poster at ISS Autumn Symposium at Imperial College London (2009); research presentations and talks at University of Exeter (2010), Centre for Genomic Regulation, Barcelona, Spain (2010), MCISB Manchester, UK (2010), LICSB (2010) and (2009) University of Warwick UK.

2009-Present

Collaboration in Systems and Synthetic biology of RTK Signalling with acknowledgments to Medical Research Council UK

Institutions: Brindle Lab in Department of Cardiovascular Sciences University of Leicester, Centre for Systems, Dynamics and Control at University of Exeter, University of Glasgow.

Participants: Deborah Alawo, Prof Nick Brindle, Dr Svetlana Amirova, Dr Jongrae Kim, Prof Declan Bates.

New aspects of research Receptors tyrosine kinases (RTK) have essential roles in controlling cellular proliferation, migration, differentiation and gene expression, and defects in RTK signalling underlie numerous diseases, including cancer, heart disease and stroke. However, the underlying mechanisms of signal integration are still poorly understood. We aim to develop quantitative models of specific RTK signal regulatory mechanisms. Synthetic Biology approaches to re-engineer these design principles in order to test and refine the models. My role is to assist in supervising PhD students in related topics and to facilitate emergence of grant proposals for further research funding in this field. *Possible applications of our research are in pharmacology, toxicology, therapeutic manipulation of signalling pathways relevant to ischemic disease, inflammation and antigenic pathologies.*

Techniques Bottom up molecular modeling approaches using Michaels-Menten, mass action kinetics, non linear dynamics; numerical simulations of biochemical pathway reactions of MATLAB and Cell Designer.

Publications *Poster at LICSB (2010), University of Warwick UK; attendance of ISS Autumn Symposium at Imperial College London (2009).*

2005- 2008

PhD project "*The influence of a simple shear deformation on a long wave motion in pre-stressed incompressible elastic layer*", performed in **Applied Mathematics Group, supervisor Prof G.A. Rogerson.**

New aspects of research New analytical dynamic models were constructed to describe propagation of traveling waves in an incompressible elastic layer subject to initial simple shear deformation. We consider 2D motion of long dispersive waves in low and high frequency regimes, the wave length is large in comparison to layer thickness. The resulting conditions yield the lack of symmetry, the absence of symmetric and anti-symmetric motion and hence no analogous of bending and extension motions. Three types of boundary value problems were considered: layer with free, fixed and one fixed one free face. An asymptotic and numeric analysis of corresponding dispersion relations was performed. It was shown that both in the layer with fixed faces and one fixed one free face there are no fundamental modes. All analytical results are in the excellent agreement with the numerical simulations in Matlab.
Possible applications: geo-mechanics and bio-mechanics

Techniques Various perturbation methods, asymptotic analysis of systems with small parameter, application of theories of dynamic elasticity: Kirchhoff plate theory, refined Timoshenko-Reissner theory, asymptotic integration method, numerical methods to solve non-linear equations: Newton-Rapson and bracketing-bisection method.

Publications *Mechanics of Solids, accepted (2008), Journal of Mechanics of Materials and Structures, (2008), proceedings: CanCNSM (2008)*

Canada, BAMC (2008) UK, attended: Euromech Colloquium 481 (2007) UK, Experiments in Space and Beyond, Brussels, Belgium (2007), BAMC (2006) UK, CISM course (2006) Italy.

September 2003- July 2005

MSc thesis "*Protein secondary structure prediction based on statistical method of discriminant analysis*". performed in **Laboratory of Bioinformatics and Structural Biology, supervisor Prof V.G.Tymanian**

New aspects of research The novel approach to predict with high accuracy various elements (alpha-helix, beta-structure, beta-turns, ordered and disordered regions) in the spatial structure of globular and membrane proteins, to identify disordered regions and the active centers in proteins. The high accuracy in structure prediction was achieved without using any kind of (multiple) sequence alignment. The advantage of our method is the possibility to derive the protein physical-chemical properties which affects the formation of certain types of structure. *Possible applications: molecular and drug design.*

Techniques Application of statistic methods non linear regression analysis, linear discriminant analysis and Monte Carlo techniques to develop algorithms, which were implemented on C/C++, computational MD simulations (Monte-Carlo techniques), working with PDB database, participation in creating of website to make the predictive method available online.

Publications *Journal of Biomolecular Structure and Dynamics (2007), Journal Biofizika (2005), proceedings: MCCMB (2005), BGRS (2004).*

September 2002 – July 2003

BSc Thesis "*Molecular constructions based on double-stranded nucleic acid liquid crystals: formation, properties, practical application*", performed in the **Laboratory of Condensed State of Nucleic Acids, supervisor Dr. S.G.Scuridin.**

New aspects of research Participation in developing of novel type of biological sensors based on liquid crystals of double-stranded molecules of nucleic acids, simple thermodynamic model was derived to describe the formation of liquid crystals. This work is done in context of biotechnological project: determining of metabolite homocystine to improve treatment of thromboses in human arteries.*Possible applications: biological and medical sensors, purifying systems.*

Techniques Experiments and computational simulations of assembling the liquid crystals and obtaining molecular constructions based on double-stranded nucleic acids with implemented molecules of Cu and antibiotics. Theoretical analysis of the formation of molecular construction in liquids from the positions of thermodynamics and stability.

Publications *Journal of Liquid crystals and their practical realization (2003).*

September 1999- July 2005

Moscow Institute of Physics and Technology (MIPT), State University
Specialization in Mathematics and Physics

New aspects of research Novel mathematical models were derived for non-linear dynamic process in atmosphere and ocean with applications in the field of climate control and eco-systems. These projects include theoretical and numerical investigation of non-linear waves in ocean and atmosphere. Also investigation of non-linear waves in fiber-optic sensors was performed and new models were proposed. *Possible applications: climate systems, medical sensors and purifying systems.*

Techniques Construction of dynamic models; analytical and numerical methods to solve equations and systems of equations; computational simulations of non-linear processes.

Publications *Journal of Applied Physics (2008), Proceeding of SPIE (2006), (2004), (2002), Sensors and Actuators (2001), Rus. J. Science Technologies (2007), Preprint of IPM (2003), Laser Physics (2000).*

Teaching

2006- 2008 Part time Teaching Assistant, mathematics demonstrator at **University of Keele UK**, example classes and marking on Mathematical Methods, Money Matters.

2005- 2006 Part-time Demonstrator at **University of Salford UK**, tutorials in Mathematics.

2004- 2005 Teacher of Computer science at **MIPT Fizteh College, Moscow**; modulus: Programming C/C++, HTML, Web-design, Computer graphics, MS Office.

References

1. **Prof Declan Bates,** *PI of Research Grant***,** Professor of Biological Systems Engineering, Centre for Systems, Dynamics and Control, University of Exeter, Harrison Building, North Park Road, Exeter EX4 4QF, UK, Tel: +44(0)1392723655 Email: D.G.Bates@exeter.ac.uk.
2. **Dr Ian Stansfield,** *PI of Research Grant***,** School of Medical Sciences, University of Aberdeen, Institute of Medical Sciences, Foresterhill, Aberdeen AB25 2ZD, UK, Tel: +44 (0)1224 555806 Email: i.stansfield@abdn.ac.uk.
3. **Dr Heather Wallace,** *PI of Research Grant***,** School of Medical Sciences, University of Aberdeen, Institute of Medical Sciences, Foresterhill, Aberdeen AB25 2ZD, UK, Tel: +44 (0)1224 552481; Email: h.m.wallace@abdn.ac.uk.
4. **Prof Graham A. Rogerson**, *Supervisor of PhD*, Head of School, School of Computing and Mathematics Colin Reeves Building, Keele University, Keele, Newcastle, Staffordshire, ST5 5BG, UK, Tel: +44 (0)1782583270, Email: g.a.rogerson@maths.keele.ac.uk.

Journal Articles and Papers

Molecular Systems Biology and Bioinformatics

1. Claudia Rato, Svetlana Amirova, Declan G. Bates, Ian Stansfield, Heather M. Wallace (2010), "Translational frameshifting as a feedback controller of polyamine synthesis", accepted for publication in *Nucleic Acids Research*.

2. Svetlana R. Amirova, Juri V. Milchevsky, Ivan V. Filatov, Natalia G. Esipova, Vladimir G. Tumanyan (2007), "Study and Prediction of Secondary Structure for Membrane Proteins", *Journal of Biomolecular Structure and Dymanics*, Vol. 24 (4), p. 421-428, ISSN 0739-110, PubMed: 17206856.

3. S R. Amirova, Juri V. Milchevsky, N. G. Esipova, V. G. Tumanyan (2005), "Study of β-Turns in Globular Proteins", *Biofizika*, Vol. 50 (6), pp 1150-1152, ISSN: 0006-3029, PubMed: 16358798.

4. S.G.Scuridin, S.R.Amirova, N.A.Grigorenko, B.S.Efimov, G.B.Lortkipanidze, M.A.Zakharov, Yu.M. Yevdokimov (2003), "Molecular constructions based on double-stranded nucleic acid liquid crystals: formation, properties, practical application, J. Liquid crystals and their practical realization", No.3, pp.48-68.

Dynamic Elasticity and Solid Mechanics

5. S.R.Amirova and G.A.Rogerson (2008), "The influence of simple shear deformation on long-wave motion in an elastic layer", *Journal of Mechanics of Materials and Structures* (JoMMS) Vol.3 (5), pp. 831-851, ISSN: 1559-3959.

6. G.A.Rogerson and S.R.Amirova (2008), "Long wave dispersion in a neo-Hookean layer subject to simple shear", *Proceedings of 3rd Canadian Conference on Nonlinear Solid Mechanics*, pp.85-92, CanCNSM 2008, Toronto, Canada.

Mathematical Modelling in Applied Physics: Climate and Micro Sensors

7. Tamara Tulaikova, Anatoly Gladun, Minetada Osano, Svetlana Amirova (2008), "A method to increase the Arctic sea ice cover", *Journal of Applied Physics* No. 103, 064506, ISSN 0021-8979.

8. G.A.Gurchonok, I.A.Djodjua, S.R.Amirova, T.V.Tulaikova (2001), "Using fiber gratings in the short-length sensors based on micromechanical vibrations", *Sensors and Actuators* A 93, p.197-203, ISSN: 0924-4247.

9. Tamara V. Tulaikova, Svetlana R. Amirova (2006), "The method to develop the artificial ice for north seas", Proceedings of the Society of Photo-optical Instrumentation Engineers (SPIE), Vol. 6360, pp.636300T-10, ISSN: 0277-786X.

10. Tamara V. Tulaikova, Svetlana R. Amirova (2006), "Theoretical optimization of artificial ice for Arctic seas", *Proceedings of the Society of Photo-optical Instrumentation Engineers* (SPIE), Vol.6312, pp.636312U1-12, ISSN: 0277-786X.

11. Tamara V. Tulaikova, Svetlana R. Amirova (2006), "Diffraction gratings to reduce tsunami waves", *Proceedings of the Society of Photo-optical Instrumentation Engineers* (SPIE), Vol.6363, pp.6363G0-10, ISSN: 0277-786X.

12. Tamara Tulaikova, Svetlana Amirova, Hannes Bleuler and Philippe Renaud (2004), "Optical-Mechanical Method for Measurements in Micro-Technologies"**,** *Proceedings of the Society of Photo-optical Instrumentation Engineers* (SPIE), Vol. 5553, pp.338-347, ISSN 0277-786X.

13. G.A.Gurchonok, I.A.Djodjua, S.R.Amirova, T.V.Tulaikova**,** "Fiber optic short-length sensors based on micromechanical vibrations; fiber grating registration", *Proceedings of the Society of Photo-optical Instrumentation Engineers* (SPIE), Vol. 4481 (2002), p. 299-310, ISSN 0277-786X.

14. S.R.Amirova, Minetada Osano, A.D.Gladun, A.V.Lebedev, T.V.Tulaikova, A.D.Kondratiev (2007), "The method of the increase of Arctic ice as one possible mechanism for the climate recovery**"**, *Rus. J. Science Technologies*, Vol. 8 (7), p.3-17.

15. T.V. Tulaikova, A.V. Michtchenko, G.A. Gurchonok, S.R. Amirova (2003), "The output optimization during nonstationary vibration in fiber-optic sensor", Preprint N.723 of the Institute for Problems in Mechanics of the Russian Academy of Sciences, Moscow.

16. T.V. Tulaikova, A.I. Paskhin, R.R. Karle, S.R. Amirova (2000), "Analysis of the sensitivity of vibrating fiber-optic diffraction-grating sensors"**,** *Journal Laser Physics* Vol. 10 (4), pp.927-931, ISSN: 1054-660X.

Books

1. T.V. Tulaikova and S.R. Amirova (2009), *Introductory Course on Special Functions for Postgraduate Physicists*, Moscow: Kniga i business, ISBN: 978-5-212-01107-5 (in Russian).

2. T.V. Tulaikova, A.V. Michtchenko and S.R. Amirova (2010), *Acoustic Precipitations*, Moscow: Fizmat kniga, ISBN: 978-5-212-01134-1 (in Russian).

Conferences, Symposiums and Workshops

1. Evolution of Microbial Cooperation, University of Bath, UK, 20-21 January 2011.

2. Bath-Exeter-London-Southampton Control Meeting, University of Exeter, 6-7 January 2011.

3. 2nd Annual Meeting The Human Dimension of Risk: Perception, Behaviour, and Decision Making in Risk Management, The Centre for Risk Studies, Cambridge Judge Business School, 8-9 December 2010.
4. Climate Change Question Time, *Isaac Newton Institute for Mathematical Sciences in collaboration with Knowledge Transfer Network in Industrial Mathematics and the Centre for Science and Policy*, 24 November 2010, The Willis Building, 51 Lime Street, London EC3M 7DQ UK.

5. Institute of Chemical Biology- Colloquium, *Imperial College London*, 11 November 2010.

6. Institute of Systems and Synthetic Biology - Autumn Symposium, *Imperial College London*, 10- 11 November 2010.

7. Complexity and Statistics: tipping points and crashes, *Royal Statistical Society*, London, 22 October 2010.

8. 11th International Conference on Systems Biology, *University of Edinburgh*, UK, 10-16 October 2010.

9. Workshop on Oscillation Dynamics in Neural & Biochemical Systems, *University of Exeter*, UK, 30 September 2010.

10. Frontiers of Multidisciplinary Research: Mathematics, Engineering, and Biology, *University of Exeter*, UK, 21-24 September 2010.

11. Invited Talk at Evolutionary Genomics Group, *Centre for Genomic Regulation*, Barcelona, Spain, 8 September 2010.

12. British Mathematics Colloquium and British Applied Mathematics Colloquium, *University of Edinburgh*, UK, 6-9 April 2010.

13. Invited Talk at Manchester Centre for Integrative Systems Biology, Manchester Interdisciplinary Biocentre, *University of Manchester*, UK, 31 March 2010.

14. EPSRC Symposium Workshop on Learning and Inference in Computational Systems Biology, *University of Warwick*, UK, 30-31 March 2010.

15. Digital Signal Processing in Bioengineering Research Day, *University of Leicester*, UK, 15 December 2009.

16. Institute of Systems and Synthetic Biology - Autumn Symposium, *Imperial College London*, 11-12 November 2009.

17. Cold Spring Harbor Laboratory/ Wellcome Trust Conference Engineering Principles in Biological Systems, *Wellcome Trust Genome Campus* in Hinxton, Cambridge UK, 14 -16 October 2009.

18. Workshop on Indistinguishability and Model Discrimination in Systems Biology, *University of Warwick*, UK, 29 September 2009.

19. International Conference and LMS Workshop, Mathematical Models of Collective Dynamics in Biology and Evolution- MDBE'09, *University of Leicester*, UK, 11-13 May 2009.

20. Mathematical and Statistical Aspects of Molecular Biology, 19th annual MASAMB Workshop, *Imperial College London*, 2-3 April 2009.

21. British Applied Mathematics Colloquium, *University of Nottingham*, UK, 7-9 April 2009.

22. Talk at Control Seminars at Engineering Department, *University of Leicester*, UK, 25 March 2009.

23. Invited Talk at *Schlumberger Moscow Research Centre*, 26 August 2008.

24. LMS-EPSRC Short Course "Advanced Methods in Linear and Nonlinear Elasticity", *Keele University*, UK, 28 July-1 August 2008.

25. 2nd European Postgraduate Fluid Dynamics Conference, *Keele University*, UK, 21-23 July 2008.

26. 3rd Canadian Conference on Nonlinear Solid Mechanics, CanCNSM 2008, *University of Toronto*, Toronto, Ontario, Canada, 25-29 June 2008.

27. Mathematical Conference Magic Liverpool, *University of Liverpool*, UK, 23-24 June 2008.

28. British Applied Mathematics Colloquium, *University of Manchester*, UK, 31 March-3 April 2008.

29. Postgraduates Seminars at Mathematical Department, *Keele University*, UK, 22 June 2007.
30. Euromech Colloquium 481, Recent advances in the theory and application of surface and edge waves, 11-13 June 2007, *Keele Universtiy* UK.
31. Experiments in Space and Beyond, *Microgravity Centre, Brussels Open University*, 12-13 April 2007, Belgium.
32. Waves in Non-linear Pre-stressed Materials, *CISM International Center for Mechanical Sciences*, Udine, Italy, 4-8 September 2006.
33. British Applied Mathematics Colloquium, *Keele University*, UK, 24-27 April 2006.
34. International Moscow Conference on Computational Molecular Biology, *Department of Bioinformatics and Bioengineering, Moscow State University*, 18-21 July, 2005, Russia
35. The Fourth International Conference on Bioinformatics of Genome Regulation and Structure, *Institute for Cytology and Genetics, Novosibirsk*, 25-30 July, 2004, Russia.
36. Graduate Student Conference, Department of Molecular and Biological Physics, *Moscow Institute of Physics and Technology*, Moscow, 22-25 September 2003**.**