Dr. Alexander Uvarov

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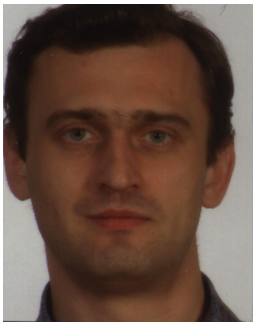

Personal data

Name	Alexander Uvarov (Aliaksandr Uvarau)
Date & place of birth	September 9, 1975/ Nesvish, Minsk region, Belarus
Martial status	Married, one child
Citizenship	Belarus
Private address	Rohrbacher Str. 69/1–App14, D–69115, Heidelberg, Germany
Languages	Russian, Belarussian, English, German (basic)

Educational background

May 02 – July 06 — Institut für Physik, Universität Kassel, Kassel, Germany
Degree: Ph.D. (Dr. rer. nat), *Summa Cum Laude*, July 2006
Thesis: *"A semi–phenomenological approach to the structure and transport properties of macromolecules in solution"*
Supervisors: Prof. Dr. Stephan Fritzsche; Prof. Dr. Burhard Fricke

Nov. 97 – May 02 — Institute of Molecular and Atomic Physics,
National Academy of Sciences of Belarus, Minsk, Belarus

Sept. 92–July 97 — The Belarussian State University, Department of Physics, Belarus
Degree & Major: Master of science/ Theoretical Physics, (Diploma on July 1997)
Thesis: *"Investigation of both the amplitude and the shape of the magnetic induction at the not–uniformly magnetized ferromagnetic"*
Supervisor: Prof. Dr. Vladimir Matuk (IAP, NANB, Minsk, Belarus)

Research experience

from Oct 07	Scientific collaborator [Post-Doc], Max–Planck–Institut für Kenphysik (Theorie), Heidelberg, Germany. `Field of research:` Quantum Brownian motion, Brownian motors; Soft Condensed Matter; Biophysics;
July 06 – Sep. 07	Post–Doc Researcher, Institut für Physik, Universität Kassel, Germany. `Field of research:` Condensed & Soft Condensed Matter; Biophysics; Chemical physics
May 02 – July 06	PhD Researcher, Institut für Physik, Universität Kassel, Germany. `Field of research:` Chemical physics; Condensed & Soft Condensed Matter
Nov. 97 – May 02	Junior Scientist, Institute of Molecular and Atomic Physics, National Academy of Sciences of Belarus, Minsk, Belarus. `Field of research:` (Optics; Biophysics;)
Nov. 96 – July 97	Research Fellow, Institute of Applied Physics, National Academy of Sciences of Belarus, Minsk, Belarus `Field of research:` Material physics
Nov. 96 – July 97	Student Researcher, Belarussian State University, Minsk, Belarus `Field of research:` Elementary particle physics; Material physics

Teaching experience

Spring 2005	Universität Kassel, Three laboratory parcticums on physics

Professional membership

from 1999	European Physical Society (EPS)

Research and computer skills

Theor. methods	Thermodynamics, Condensed and Soft Matter Theories, Statistics & Probability theory, Group theory, Theory of chaotical systems, Fractals, Dynamical simulation methods, Theory of numerical calculations.
Computer skills	`OS`: Linux, Windows `Languages`: Maple, Mathematica, Fortran77/90, C++, Delphi `Text processing`: TeX/LaTeX, AbiWord, Word, HTML `Other`: CorelDRAW, Autocard, 3DMax, Origin

Other activities

Programming

Development of the computer Monte Carlo simulation code [**NANOJET-MCsim**] for studying transport and kinetic properties of atomic gas flow through the nozzle with different aspect ratios. The programm is used to determine and optimize the radicals transport parameters and optimal etching capability in Nanonozzle Plasma Jet Microfabrication Technology (NANOJET).

Development of the computer code [**RotRelProp**] for (Molecular Dynamic) simulation of the rotation dynamics of complex macromolecules immobilized on surface. The programm is used to calculate the rotational properties of the macromolecuels which are measured in NMR and Fluorescence Depolarization experiments.

Development of the computer code [**HYDROTranspProp**] for (Brownian Dynamic) simulation of the translational and diffusion properties of non–rigid macromolecules with different toppological structure (chain–, ring–, dendrimer–type of the macromolecules). The programm is used to calculate the transport coefficients (diffusion, conductivity, ect) of macromolecules in solution as well as to *'parametrize'* the macromolecule–solvent interactions.

Current scientific interest and activity [23/01/2008]

My scientific interests revolves especially around the study of various classical and quantum aspects of the (non–)equilibrium properties of complex systems (for instance, macromolecule, polymer or colloid as well as the macromolecular solution as whole) by means of thermodynamics and statistical theory as well as of various methods of computer simulations, including Dynamical and Monte Carlo simulation.
Below, a list of short abstracts summarizes my current research interests more precisely:

⇒ Equilibrium and nonequlibrium thermodynamic processes in condensed&soft matter

- ↦ Role of the rigid constraints in the orientation–relaxational properties macromolecule.
- ↦ Effects of various interactions on the dynamics of non–rigid macromolecular solution.
- ↦ Hydrodynamic interaction and friction in macromolecular solution. Various mode correlations.
- ↦ Molecular, Brownian and Monte Carlo simulation: support of the theoretical investigation.

⇒ "Chaos&Fractal" properties of mixtures

- ↦ Fractal structure of the macromolecules as well as macromolecular solvent.
- ↦ Chaotic properties of polymer mixtures: transport coefficients vs Lyapunov exponents.
- ↦ Transport properties of polymers via Kolmogorov-Sinai entropy and Lyapunov instability.

⇒ Quantum and Relativistic Brownian Motion

- ↦ Properties of the macromolecular liquids: effects of quantum nature.
- ↦ Quantum aspects of the Brownian motion. In application to the Brownian motor.
- ↦ Quantum approaches to the relaxation properties of the macromolecules in solution.
- ↦ Properties of the macromolecules: quantum nature and fluctuation dissipation theorem.

References

1 Prof. Dr. Stephan Fritzsche
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3 Dr. Alexander Blokhin
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4 Dr. Maxim Gelin
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for more references, please let me know by the e--mail:
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List of publications

Refereed publications

⋆ *Anomalous transport properties of macromolecules in solution.*
A semi-phenomenological Fokker–Planck approach.
A. Uvarov and S. Fritzsche,
The European Physical Journal-Special Topics, **151**, 95–103 (2007)

⋆ *High–order correlation contributions to the friction of macromolecules in solution:*
A semi–phenomenologicsal Fokker–Planck approach.
A. Uvarov and S. Fritzsche,
The Europhysics Letters, **79**, 68001-1–5 (2007)

⋆ *The low-lying level structure of atomic lawrencium (Z = 103):*
Energies and Absorption rates.
S. Fritzsche, C.Z. Dong, F. Koike and A. Uvarov,
The European Physical Journal **D45**, 107–115 (2007)

⋆ *Restricted rotational diffusion of nonrigid dumbbell macromolecules on a surface: Interplay of the bead–bead and bead–surface interactions.*
A. Uvarov and S. Fritzsche,
Chemical Physics Letters, in print, (2007)

⋆ *Friction of N–bead macromolecules in solution. Effects of bead-solvent interaction.*[1]
A. Uvarovand and S. Fritzsche,
Physical Review, **E73**(1), 011111—1–12, (2006).

⋆ *Restricted rotational diffusion of non–rigid macromolecules on surfaces: Effects of the bead–bead and bead–surface interaction.*
A. Uvarovand and S. Fritzsche,
Progress in Colloid and Polymer Science, **133**, 95–99, (2006).

⋆ *Radical Transport Modelling in NANOJET.*
O.Rabinovych, A. Uvarov, D. Filenko and I. W. Rangelow,
Applied Physics, **A81**(8), 1661–1666, (2005)

⋆ *A semi–phenomenological approach to the transport and diffusion of small spherical macromolecules in solution.*
A. Uvarov and S. Fritzsche,
Chemical Physics Letters, **401**(3), 296–301, (2005)

⋆ *Effects of the bead–bead interaction on the restricted rotational diffusion of the nonrigid macromolecules.*[2]
A. Uvarov and S. Fritzsche,
Journal of Chemical Physics, **121**(13), 6561–6572, (2004)

⋆ *Effects of the bead–solvent interaction on the dynamics of macromolecules, 1 The dumbbell molecule.*
A. Uvarov and S. Fritzsche,
Macromolecular Theory and Simulations, **13**(3), 241–256, (2004)

⋆ *Dynamics of macromolecules in the bath of harmonic oscillators.*
A. V. Uvarov, M.F. Gelin and A.P. Blokhin,
Nonlinear Phenomena in Complex Systems, **6**(1), 572–576, (2003)

⋆ *Polarized fluorescence of nonrigid macromolecules in the solution.*
A.V. Uvarov, A.P. Blokhin and M.F. Gelin,
Laser physics and photonics. Saratov, Russia. Refereed Proc. SPIE Int. Soc. Opt. Eng., **4002**, 255–260, (2000)

⋆ *Does the harmonic oscillator bath induce dissipative dynamics of dumbbells?*
A.V. Uvarov, A.P. Blokhin and M.F. Gelin,
Max Planck Institute for the Physics of Complex Systems,
preprint, **mpi-pks/0105004**, (2000)

⋆ *Orientation relaxation of macromolecules immobilized on a surface.*
A.P. Blokhin, M.F. Gelin and A.V. Uvarov,
Nonlinear Phenomena in Complex Systems, **2**(3), 72–82, (1999)

[1]This article has been selected for the Virtual Journal of Biological Physics Research, **11**(3), (2006).
[2]This article has been selected for the Virtual Journal of Biological Physics Research, **8**(7), (2004).

Submitted & 'soon to be published' manuscripts

☑ *Microscopic insight into the validity of the Stokes-Einstein relation: The diffusion coefficient of glycerol at low temperature.*
A. Uvarov and S. Fritzsche,
submitted to the Europhys. Lett., (2008)

☑ *Time dependent friction memory function via solvation properties of the macromolecules in solutions: microscopic view point.*
A. Uvarov and S. Fritzsche,
submitted to the New Journal of Physics, (2008)

☑ *Friction theory of macromolecules in solution*
I. Time evolution of the phase–space distribution function of N–bead macromolecules.
A. Uvarov and S. Fritzsche,
submitted to the Phys. Rev. E, (2008)

☑ *Friction theory of macromolecules in solution*
II. Properties of the friction tensors.
A. Uvarov and S. Fritzsche,
submitted to the Phys. Rev. E, (2008)

□ *Phenomena of the anomalous diffusive motion from classical microscopic approaches.*[3]
A. Uvarov and S. Fritzsche,
to be published in the Phys. Rev. Lett., (2008)

□ *Classical versus quantum microscopical approaches for friction of the macromolecules in solution.*[3]
A. Uvarov and S. Fritzsche,
to be published in the Phys. Rev. A, (2008)

□ *Transport properties of macromolecules in solution via Kolmogorov–Sinai entropy.*[3]
A. Uvarov and S. Fritzsche,
to be published in the Phys. Rev. E, (2008)

□ *Correlation between fractal structure and diffusion of the macromolecules in solution.*[3]
A. Uvarov and S. Fritzsche,
to be published in the Macromolecular Theory and Simulation, (2008)

[3] preliminary title

Selected non–refereed publications

2007-2008

• Relaxation and transport properties of the macromolecules in solution: effects of the hydrodynamic friction interaction.
A. Uvarov and S. Fritzsche, Proc. of the "71. Annual Meeting of the Deutsche Physikalische Gesellschaft and DPG - spring meeting of the Division Condensed Matter", Regensburg, Germany, 2007

• A microscopic view on the Stokes--Einstein relation: anomalous translational and rotational motion of macromolecules in solution.
A. Uvarov and S. Fritzsche, Proc. of the "71. Annual Meeting of the Deutsche Physikalische Gesellschaft and DPG - spring meeting of the Division Condensed Matter", Regensburg, Germany, 2007

• Study of the anomalous translational and rotational diffusion properties of macromolecules in solution: microscopic view point.
A. Uvarov and S. Fritzsche, Proc. of the 382th Wilhelm und Else Heraeus Seminar "Thermal Transport and Relaxation: Foundations and Perspectives", Bad Honnef, Germany, 2007.

1999–2006

• Study of the anomalous translational and rotational diffusion properties of macromolecules in solution: microscopic view point.
A. Uvarov and S. Fritzsche, Proc. of the 373th Wilhelm und Else Heraeus Seminar "Anomalous Transport: Experimental Results and Theoretical Challenges", Bad Honnef, Germany, 2006.

• Friction of macromolecules in solution: Effect of high-order correlations.
A. Uvarov and S. Fritzsche, Proc. of the "DPG-spring meeting of the Division Condensed Matter; EPS-21st General Conference of the Condensed Matter Division", Dresden, Germany, 2006.

• Effect of the bead-surface interaction on the restricted rotational dynamics of the nonrigid immobilized macromolecules.
A. Uvarov and S. Fritzsche, Proc. of the "DPG-spring meeting of the Division Condensed Matter; EPS-21st General Conference of the Condensed Matter Division", Dresden, Germany, 2006.

• Restricted Rotational Diffusion of Non - Rigid Macromolecules on Surface: Effects of the Bead - Bead and Bead - Surface Interactions.
A. Uvarov and S. Fritzsche, Proc. of the 42nd Meeting of the German Colloid Society "Smart materials: foams, gels and microcapsules", Aachen, Germany, 2005

• Study of the Transport and diffusion properties of macromolecules in solution.
A. Uvarov and S. Fritzsche, Proc. of the "Understanding the Self-Organization of Charged Polymers", Bad Honnef, Germany, 2005.

• Transport and diffusion properties of macromolecules in solution.
A. Uvarov and S. Fritzsche, Proc. of the "69. Jahrestagung der Deutschen Physikalischen Gesellschaft (DPG) mit allen Fachverba"nden und der Astronomischen Gesellschaft (AG) im World Year / International Year of Physics 2005. SYMPOSIUM: Dynamics of multi-component fluids", Berlin, Germany, 2005.

• Rotational Dynamics of Nonrigid Biomolecules in Solution: Influence of the Bead--Bead Interactions
A. Uvarov and S. Fritzsche, Proc. of the "Proc. of the "69. Jahrestagung der Deutschen Physikalischen Gesellschaft (DPG) mit allen Fachverba"nden und der Astronomischen Gesellschaft (AG) im World Year / International Year of Physics 2005. SYMPOSIUM: Dynamics of multi-component fluids", Berlin, Germany, 2005.

• Influence of the Bead--Bead and Bead--Solvent Interactions on the Dynamics of Nonrigid Biomolecules in Solution.
A. Uvarov and S. Fritzsche,
Proc. of the Minerva-Gentner Symposium on "Optical Spectroscopy of Biomolecular Dynamics", Kloster Banz (Staffelstein), Germany, 2004

• Influence of the Bead--Bead Interaction on the Rotational Dynamics of Nonrigid Macromolecules in Solution.
A. Uvarov and S. Fritzsche, Proc. of the "68. Physikertagung und Frhjahrstagung des Arbeitskreises Atome, Moleküle, Quantenoptik und Plasmen (AMOP) der DPG " of the Germany Physical Society (Deutsch Physikalische Gesellschaft-DPG), München, Germany, 2004.

• Effects of bead--solvent interaction on the diffusion of macromolecules.
A. Uvarov and S. Fritzsche,
Proc. of the International Workshop on "Proteomics: Protein Structure, Function and Interactions, Trieste, Italy, 2003

• Study on the effects of bead--solvent potentials on the dynamics of macromolecules.
A. Uvarov and S. Fritzsche, Proc. of the 298. WE-Heraeus Seminar "New Approaches and Perspectives in Polymer Physics", Bad Honnef, Germany, 2003

• Effects of macromolecule--solvent potential on the dynamics of macromolecules.
A. Uvarov and S. Fritzsche, Proc. of the "Symposium Simulation and experiment - spanning the bridge between microscopic and macroscopic scales (SYSE)" of the Germany Physical Society (Deutsch Physikalische Gesellschaft–DPG), p.560, Dresden, Germany, 2003

• Effects of bead--solvent potential on the dynamics of macromolecules.
A. Uvarov and S. Fritzsche, Proc. of poster competition of the Kassel university, Kassel, Germany, 2003

• Dynamical Behaviour of Macromolecules Immersed in Heat Bath: Exact Results.
A. V. Uvarov, Proc. of the European Conference "Physique en Herbe 2001", Strasbourg, France, 2001

• Dynamics of dumbbells in Gaussian solution: exact results.
A. V. Uvarov, Proc. of the "Middle-European Cooperation in Statistical Physics", Prague, Czechia, 2001

• Theoretical approach and computer simulation of depolarization of fluorescence of nonrigid biomolecules.
A. V. Uvarov, Proc. of the "3rd Prague's Workshop on Molecular Photophysics and Dynamics", Prague, Czechia, 2001

• Computer simulation and theoretical approach in the Brownian dynamics with rigid constraints.
A. V. Uvarov, AIP Conference Proceedings 574 "Modeling Complex system, Sixth Granada Seminar on Computational Physics", Granada, Spain, 2001

• Polarized fluorescence as a tool for studying macromolecular dynamics.
A. V. Uvarov, A.P. Blokhin, M.F. Gelin, Proc. of the International Conference for Young Scientists and Engineers, "LOYS-2000 ",p.168, St. Petersburg, Russia, 2000

• Inertial effects in the Brownian dynamics with rigid constraints.
A. V. Uvarov, Proc. of the "1318th Conference of the Condensed Matter Division of the EPS", p.252 Montreux, Switzerland, 2000

• Depolarization of fluorescence of subunit macromolecules.
A. V. Uvarov, Proc. of the International Conference for Young Scientists and Engineers, "Optics' 99", p.41, St. Petersburg, Russia, 1999

• About description of conformational dynamics of nonrigid macromolecules in a condensed matter (in Russian).
A. V. Uvarov, Proc. of the "7th Conference on Physics of Condensed Matters", p.132, Grodno, Belarus, 1999