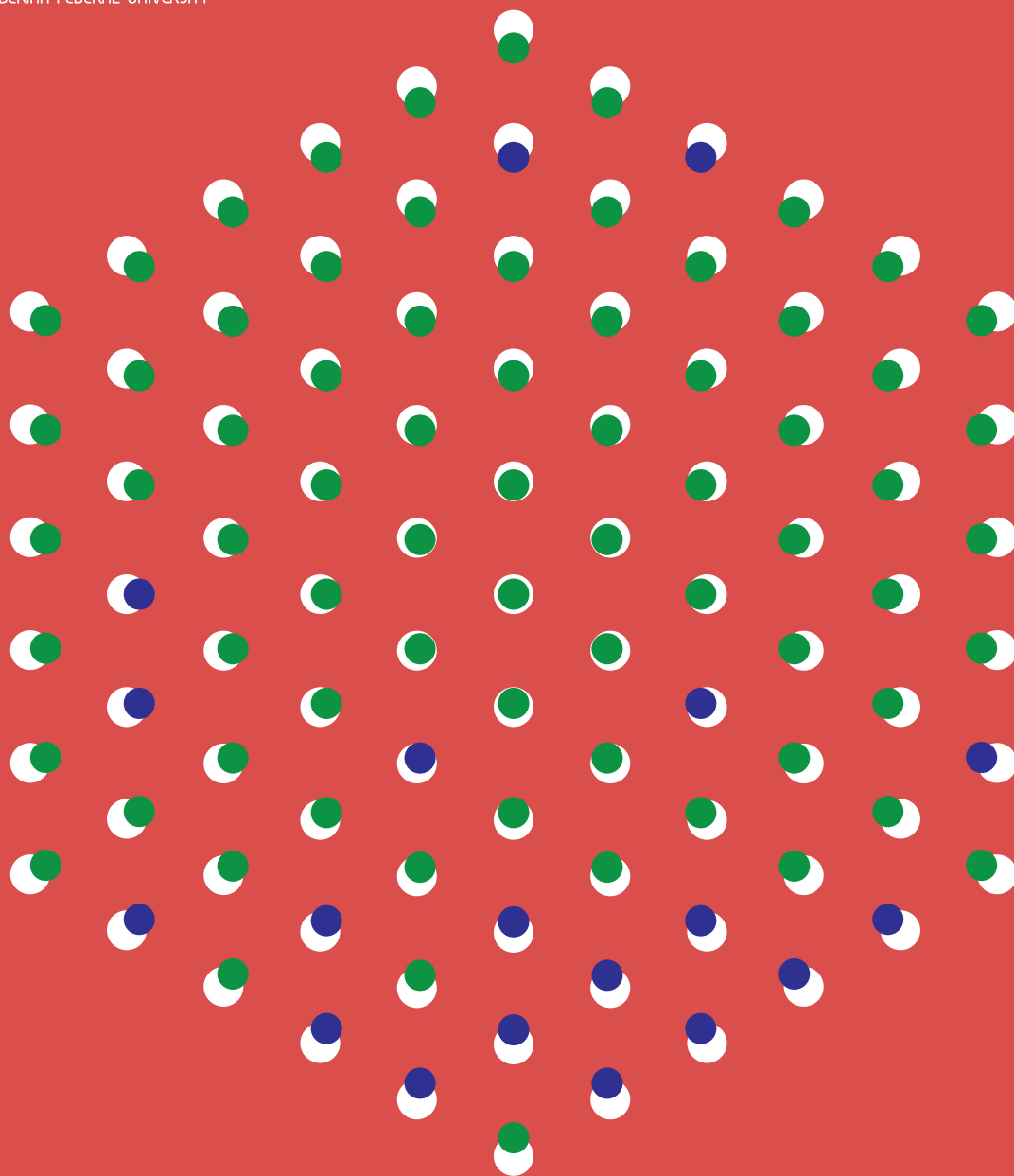




СИБИРСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ  
SIBERIAN FEDERAL UNIVERSITY



# PhD

Optics and Quantum Chemistry

## Key Information

### Duration:

4 years (this period can be shorter depending on completing a PhD thesis)

### Language:

English

### Entry Requirements:

- 1) Master's degree in Chemistry (Quantum Chemistry), or in Physics (preferably in Optics), or in Biophysics;
- 2) an adequate level of English proficiency (certificate or another document)

### Tuition fees (2015/2016):

€ 1 850 (the cost does not include accommodation and living expenses).

Talented students get SibFU's internal scholarship to cover tuition fee and provide an additional sum of 500 euro a month.

### Accommodation:

on-campus accommodation is available.

### Costs (2015/2016):

single ensuite room: € 45 per month,

twin ensuite room: € 30 per month.

### Practicalities:

airport transfer, an invitation letter to apply for a Russian study visa and an optional survival course of Russian as a foreign language are provided by Siberian Federal University.

### Further details:

SibFU's Graduate School  
aspirantura@sfu-kras.ru,  
tel.: +7 391 291-28-31

## Overview

Doctoral students will be involved in research projects at the Laboratory for Nonlinear Optics and Spectroscopy under the supervision of the laboratory head Dr. Sergey Polyutov.

Research can be focused on

- 1) Chemical Physics in Biology (artificial photosynthesis, light harvesting, molecular aggregates, exciton theory).
- 2) Nonlinear Optics (laser pulse propagation through nonlinear media, multi-photon processes, etc.)
- 3) Spectroscopy (2D optical Fourier-spectroscopy, photon echo spectroscopy, resonant x-ray spectroscopy, etc)
- 4) Quantum Chemistry (applying QC to the problems in 1-3).
- 5) any interesting topic the candidate may propose related to the topics discussed in 1-4.

## Contacts

Dr. Sergey Polyutov,  
Laboratory for Nonlinear Optics  
and Spectroscopy, Siberian Federal University  
Tel.: +7 965 906 2187  
E-mail: polyutov@mail.ru



## Programme Leader

### Research experience

- Head of Laboratory for Nonlinear Optics and Spectroscopy, Siberian Federal University, Krasnoyarsk, Russia
- Researcher (Wissenschaftlicher Mitarbeiter) at the “Molecular quantum dynamics laboratory”, Rostock University/Institute for Physics, Rostock, Germany
- Postdoctoral research position at the department of Chemical Physics, Lund University, Lund, Sweden
- University Lecturer at the Department of Physics, Rostov-on-Don State University of Transport Communications, Rostov-on-Don, Russia
- Research Assistant and PhD student at Theoretical Chemistry Department, the Royal Institute of Technology, Stockholm, Sweden
- Junior Researcher at the Laboratory of Mathematical Problems of Laser Physics, Institute of Computational Modeling SB RAS, Krasnoyarsk, Russia

Dr. Polyutov’s research interests are quite broad and include the following:

*Spectroscopy, Nonlinear Optics and Photonics:*

2D Spectroscopy, Photon Echo, Light Propagation in Non-Linear Media;  
Dynamics of Multi-Photon Processes; Photobleaching. Light Harvesting.

*Mathematical Modeling* of various physical effects (in particular, those related to solving stiff and non-stiff systems of differential equations).

*X-ray Physics:*

Calculations of X-ray Raman and Auger scattering and absorption spectra.

*Atomic Optics:*

Laser cooling and trapping of atoms. Kinetics of particles in resonant light fields.

*Quantum Chemistry.*

# Publications

Peer-reviewed journals:

Physics Reports, Physical Review Letters, JETP letters, Phys. Rev. A, Phys. Rev. B, JOSA B, Chem. Phys, J. Phys. Chem. A, J. Phys. B: At. Mol. Opt. Phys., JETP, Russian Physics Journal, Computational Technologies.

Polyutov, S., Kühn, O., Pullerits, T. Exciton-vibrational coupling in molecular aggregates: Electronic versus vibronic dimer, Chem. Phys., iss.1, v. 394 (2012) (Journal cover paper)

Schroter, M., Ivanov, S.D., Schulze, J., Polyutov, S.P., Yan, Y., Pullerits, T., Kuhn, O. "Exciton-Vibrational Coupling in the Dynamics and Spectroscopy of Frenkel Excitons in Molecular Aggregates", Physics Reports, v. 567 (2015), pp. 1–78 (2015) (Review)

Baev, A., Kimberg, V., Polyutov, S., Gelmukhanov, F., Ågren, H. Bi-directional description of amplified spontaneous emission induced by three-photon absorption, J. of Opt. Soc. of Am. B 22, 385-393 (2005)

Polyutov, S., Minkov, I., Gelmukhanov, F., Ågren, H. Interplay of one- and two-step channels in electro-vibrational two-photon absorption, J. Phys. Chem. A 109, 9507 (2005)

Kimberg, V., Polyutov, S., Gelmukhanov, F., Ågren, H., Baev, A., Zheng, Q., He, G. Dynamics of cavityless lasing generated by ultra-fast multi-photon excitation, Phys. Rev. A, 74, 033814 (2006)

Kikas, A., Kaambre, T., Saar, A., Kooser, K., Nõmmiste, E., Martinson, I., Kimberg, V., Polyutov, S., Gelmukhanov, F. Resonant inelastic x-ray scattering at the F 1s photoabsorption edge in LiF: Interplay of excitonic and conduction states, and Stokes' doubling, Physical Review B, 70, 085102 (2004)

Hennies, F., Polyutov, S., Minkov, I., Pietzsch, A., Nagasono, M., Gelmukhanov, F., Triguero, L., Piancastelli, M.-N., Wurth, W., Ågren, H., Föhlisch, A. Dynamic Interpretation of Resonant Inelastic X-ray Scattering: Ethylene and Benzene, Phys. Rev. A 76, 032505 (2007)

Gavriluk, A.P., Krasnov, I.V., Polyutov, S.P., Shaparev, N.Ya., Resonance laser actions is an effective method of control of the gas and plasma substance, Russian Physics Journal, v.42, p.744 (1999)

Gavriluk, A.P., Krasnov, I.V., Polyutov, S.P., Shaparev, N.Ya., The optical membrane in a gas flow (in Russian), Computational Technologies, v.4, N7 (1999)

## Further details

The Laboratory for Nonlinear Optics and Spectroscopy of Siberian Federal University warmly welcomes any talented students to join our Lab. You will get an extensive research experience and become involved in the international projects we are doing together with our colleagues worldwide. You will be able to attend various PhD courses related to the lab's research. We are a young and developing research group of talented students and postdocs and you will have much fun if you join the team. Our students tend to attend international conferences and visit international research centers. The visits are supported through internal funding and external grants.