Annual Report 2011/2012

German-Russian Interdisciplinary Science Center

Freie Universität Berlin

G-RISC
German-Russian Interdisciplinary Science Center

Санкт-Петербургский государственный университет

DAAD Deutscher Akademischer Austausch Dienst
German Academic Exchange Service

Auswärtiges Amt

Deutsch-Russisches Jahr der Bildung, Wissenschaft und Innovation 2011/12
Российско-Германский год образования науки и инноваций 2011/12

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Editorial from the Scientific Coordinators


photograph: G-RISC

This is the second Annual Report of the German-Russian Interdisciplinary Science Center (G-RISC), which is a Center of Excellence that focuses on the fields of physics, geophysics, physical chemistry, and mathematics. G-RISC was founded in 2009 and officially opened on March 22, 2010, at a ceremony that was held at St. Petersburg State University.

The first Annual Report was published in Fall 2011 and was mostly devoted to information on the center and its goals. About one year later, the scientific communities in Russia and Germany already began to see results from all that was being done under the umbrella of G-RISC. The goals of G-RISC have been further defined and worked on by the many people who have become involved in G-RISC projects. There has been much exchange of young scientists between Russia and Germany and participation in interdisciplinary conferences, as well as excellent teaching by experienced scientists. The number of people, who participated in these activities, has grown to more than 750, whereby the majority has participated in scientific conferences that were held either in Russia or in Germany. Nevertheless, about 150 people have participated in extended research stays of more than one month abroad.

The scientific work and exchange of scientists within G-RISC has almost become routine. Seven calls for proposals have been made and an eighth one will be prepared for April 2013. Numerous scientific results have been achieved so far. This Annual Report compiles the results of our intense work and gives a sample of the breadth and quality of all the activities, that are being funded by G-RISC. A common goal, which is for scientists from Russia and Germany to work together on interdisciplinary projects, whereby preference is given to young researchers, is already being met.

We are specifically grateful that such a substantial number of young scientists can benefit from funding by G-RISC, which would be entirely impossible without the generous financial support by the German Academic Exchange Service (DAAD) and the Federal Foreign Office of Germany. We are also grateful to the dedication of our hosting institutions, St. Petersburg State University and Freie Universität Berlin, which are always greatly supporting G-RISC. These two strong institutions have helped us make our Center of Excellence a powerful institutional reality.

The federal concept of G-RISC has been proven to be fully realizable and operational. The scientific communities in both countries have responded to calls for proposals every six months, whereby the number of submitted proposals is constantly increasing. This increases the competition but also the quality of the joint scientific work between German and Russian scientists. We are happy that our concept has been broadly accepted and that the requests to receive long-term support have stopped. Everybody appears to be grateful that flexible and open structures have been created, which allow new groups and new collaborations to join G-RISC. We notice that research institutions from almost all parts of Russia and Germany are active in G-RISC and we hope that this development will continue.

G-RISC and its concept have gained recognition even from outside the natural science communities in Russia and Germany. We hope G-RISC will provide a good example which can be used by other communities beyond the narrow scope of G-RISC, so that the scientific work between Russia and Germany will become even more tight and successful than today.

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Alexander M. Shikin
St. Petersburg, November 2012

Eckart Rühl
Berlin, November 2012

Key Facts

Detailed information on the German-Russian Interdisciplinary Science Center (G-RISC) can be found at **www.g-risc.org**. Here, we summarize the essential key points in order to motivate those who are not yet involved in G-RISC to become active in this German-Russian Center of Excellence.

Scope

G-RISC is a research and educational platform for collaborative and interdisciplinary work between Russia and Germany. Natural sciences (physics, geophysics, physical chemistry, and mathematics) are the focus of G-RISC.

Scientific Excellence

The best and most experienced groups from Russia and Germany are encouraged to contribute to G-RISC by performing joint, interdisciplinary research.

Calls for Proposals

Calls for proposals are issued every six months, typically in October and April. They are publicly accessible, as they are officially advertized via the internet at the official web-site of G-RISC www.g-risc.org. Clear instructions are published with the calls for proposals. In general, there is a strict two-page limit for proposals. This helps to limit the work required for the submitters as well as the reviewers who select the best proposals for funding.

Mobility and Scientific Exchange

Mobility and Scientific Exchange are primarily funded by G-RISC, where preference is given to young scientists who can do research abroad for up to two months.

Conferences and Workshops

Meeting other scientists is essential for the success of G-RISC. G-RISC funds initiatives for organizing conferences and workshops which are devoted to interdisciplinary research in science within the scope of G-RISC.

Education

Educational programs are offered by excellent and distinguished teachers. G-RISC funds teachers who give lectures supporting interdisciplinary education.

Central Projects

G-RISC has defined areas that are of interest. These are the German-Russian Laboratory at the synchrotron radiation facility BESSY II (Berlin), which is a multi-user facility for structural research, as well as the coordinated education for young scientists, and the development and use of electronic media for teaching and education, such as E-chalk and video broadcasts.

Organization of G-RISC

This Center of Excellence is organized in a federal bottom-up structure for the benefit of the scientific communities in both countries, whereby an effort has been made to keep administration as small and efficient as possible. Two G-RISC coordination units at St. Petersburg State University and Freie Universität Berlin make sure that the scientific exchange runs smoothly with the help of scientific and administrative coordinators. A Steering Committee with established scientists from Germany and Russia, covering all fields of G-RISC, is responsible for selecting the best proposals and the future development of G-RISC.

Map of cities in Germany and Russia already involved in G-RISC (only exchange program without G-RISC conferences).

Who is Who in G-RISC

G-RISC Coordination Unit at St. Petersburg State University

G-RISC team at St. Petersburg State University (from left to right): T. Zalialiutdinov, A. Rybkina, A.M. Shikin, E. Serova

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Anna Rybkina, Elena Serova, and Timur Zalialiutdinov

G-RISC Coordination Unit at Freie Universität Berlin

G-RISC team at Freie Universität Berlin (from left to right): E. Rühl, N. Kolanovska.

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Prof. Dr. Eckart Rühl
Administrative Coordinator:
Natalia Kolanovska

Members of G-RISC Steering Committee

B. Brisch
DAAD, Head of Division 32 / Eastern Europe and CIS of DAAD, Bonn, Germany
Prof. Dr. B. Fiedler
Mathematics, Freie Universität Berlin, Germany
Prof. Dr. C. Laubschat
Physics, Technische Universität Dresden, Germany
Prof. Dr. G. Leonov
Mathematics, St. Petersburg State University, Russia
Prof. Dr. E. Rühl
Physical Chemistry, Freie Universität Berlin, Germany
Prof. Dr. S. Shapiro
Geophysics, Freie Universität Berlin, Germany
Prof. Dr. A.M. Shikin
Physics, St. Petersburg State University, Russia
Prof. Dr. V. Troyan
Geophysics, St. Petersburg State University, Russia
Prof. Dr. Yu. Tver'yanovich
Physical Chemistry, St. Petersburg State University, Russia

The G-RISC Steering Committee during the fall meeting 2011 in St. Petersburg (from left to right): A. M. Shikin, Yu. Tver'yanovich, A. Rybkina, B. Brisch, E. Rühl, C. Laubschat, N. Kolanovska, V. Troyan.

Development of G-RISC

New Horizons in Scientific Exchange, Education, and German-Russian Collaborations

In the early days of G-RISC, which were not too long ago, everything was new and had to be invented. There was in 2010 virtually nothing that could be copied and all structures had to be developed from scratch. These challenging pioneering days of G-RISC dominated the first year of operation. Since then, G-RISC has run smoothly and the developed structures have turned out to be operational and useful. A few items have had to be optimized, such as limiting the length of funded stays to two months or defining the age of a 'young researcher' who can be funded by G-RISC. All in all, things have gone quite well and the Steering Committee of G-RISC is pleased at how well the scientific communities from Russia and Germany have adapted to this unique Center of Excellence. The Steering Committee and the funding organization DAAD are specifically pleased by the high quality of proposals and research that is being carried out under the roof of G-RISC. This is mostly due to the joint projects that are most typically carefully and thoughtfully written. On the whole, the requested resources are moderate, which is beneficial for the broad range of research which is funded by G-RISC.

G-RISC has been strongly supported in both Russia and Germany, which has been decisive for its development. The Embassies of both countries have been especially helpful, particularly in regard to granting visas for scientific exchange as well as provided the necessary support for conferences and special events involving German-Russian partnerships. This help, together with the constant support of the funding organization German Academic Exchange Service (DAAD) as well as of the German Foreign Office and the hosting institutions, St. Petersburg State University and Freie Universität Berlin, has been much needed and appreciated for the development of G-RISC. This stability is a good basis for advancing further and reaching new horizons and a depth of interaction which was not anticipated in the beginning of the project. We can see now new developments, such as strategic partnerships between the hosting institutions, which facilitate closer work together than ever before. Most recently, a joint workshop was held, with a focus on joint degrees on the master's and doctoral level. There are numerous problems that need to be tackled before such joint educational efforts will become reality and routine, but G-RISC is continuing to address these and other difficult issues coming up in the development of joint educational programs.

We would especially like to see joint and coordinated research programs between Russia and Germany, in which funds for joint research are allocated. This is clearly beyond the present scope, where each partner is required to have sufficient funds for carrying out the joint research and the scientific exchange is funded by G-RISC. We hope that in the near future funding organizations from Germany and Russia will be able to launch such joint coordinated research programs, in which funding from both sides is provided. First examples of such projects are already visible, but on a larger scale this is not reality yet.

The imbalance of people preferring to travel from Russia to Germany rather than from Germany to Russia is another aspect that has been recognized. The situation for competitive research is constantly improving in Russia, however, with the result of an increasing number of projects, that more researchers from Germany are traveling for research stays to partner groups in Russia. This is a suitable indicator for current developments in Russian science. G-RISC sees its task to contribute to a balanced scientific exchange between both countries, that, in the near future, the best conditions for competitive cutting-edge research will eventually be equally found in both countries.

G-RISC Steering Committee and guests at a meeting in the St. Petersburg Office. From left to right: E. Rühl (FU Berlin), V. Troyan (St. Petersburg State University), D. Rüland (Secretary General of DAAD), G. Berghorn (DAAD and DWIH Moscow), C. Laubschat (TU Dresden), B. Brisch (Head of Division 32/Eastern Europe and CIS of DAAD), A. M. Shikin (St. Petersburg State University), M. Kleineberg (DAAD Lector, St. Petersburg), A. Rybkina.

G-RISC: A Closed Shop?

How to apply for a G-RISC Project

G-RISC was established in 2009 and formally opened in March 2010. Since then, numerous projects between Russian and German scientists have been funded. However, G-RISC is always open to new ideas, which are suitable to enhance collaborations between scientists working in the fields of physics, geophysics, physical chemistry, and mathematics.

G-RISC has been established in a bottom-up process that works for the benefit of the whole scientific community and it is set up so that administrative structures are kept as small as possible. This has numerous benefits, including a short time from the project idea to its realization, in some cases as short as two months. This implies that certain regulations and rules must be respected to be successful. In the following, ten important questions are answered, which are especially important for all people considering participation in G-RISC activities.

1. What is the benefit of applying to G-RISC?

G-RISC funds joint research between partner groups from Russia and Germany, where young researchers holding at least a Bachelor degree can work for up to two months in the laboratory of the partner group. The travel expenses and local costs are covered by G-RISC up to a given limited amount. The results of such projects are manifold and reach from new personal insights to new interdisciplinary research, as well as to joint publications with new partner groups and friendships. G-RISC also funds teaching visits of experienced researchers, workshops, and sur-place stipends for Russian young researchers. All in all, there are significant benefits, which motivate numerous groups to apply every six months. The funding chances have always been good, even though competition for the best ideas and proposals is always present in the Center of Excellence!

2. When and where are calls for proposals issued?

Calls for proposal are issued every six months, typically around April 1 and October 1. It is recommended to check regularly at the official G-RISC website **www.g-risc.org** for news. After publication of a call for proposals, there is typically one months' time to write and submit a proposal. The mentioned deadlines are very strict. Late proposals cannot be considered. Those who are late can submit their proposal simply six months later.

3. Who can apply?

All researchers from Russia and Germany can apply. Typically, these are outstanding researchers who write their proposal in support of young people who wish to travel to the partner group either in Germany or in Russia. This implies that young researchers cannot write such proposals for their own research stay. A letter of acceptance from the partner group who is hosting the research is always required.

4. What is funded?

G-RISC primarily funds the mobility of young researchers below 35 years from Russia and Germany, if they intend to do research in the respective other country. G-RISC neither funds expensive equipment nor salaries of researchers. Therefore, G-RISC can only fill the need for scientific and educational exchange. This includes the organization of conferences and workshops and teaching of outstanding researchers abroad.

5. How much work is it to write a proposal?

A G-RISC proposal is a brief document of two printed pages, which covers the most important issues the reviewers need to know for evaluating the proposal. This includes the following aspects: (i) title of the project; (ii) involved partner groups from Russia and Germany; (iii) state-of-the-art and own previous work; (iv) aims of the project and description of the innovative, interdisciplinary approach; (v) brief work plan or outline of activities; (vi) requested funds and justification, according to the rules of G-RISC and DAAD. Most proposers feel that this is quite simple and can be done within a short period of time, so that writing a G-RISC proposal is not a difficult task.

6. How long does it take for a proposal to be evaluated?

G-RISC makes an effort to evaluate the proposals as fast as possible. Typically, the Steering Committee evaluates the proposals about 2 weeks after the deadline. Only the best proposals are approved for funding, and competition for the available funds limits the funding chances. Then, after another two weeks, the funding decision is sent to the proposers. There are not too many funding agencies that can manage such a short processing time. Even if a proposal cannot be funded, it is always worthwhile to improve it and resubmit it at the next call for proposals.

7. What is important to consider for a G-RISC proposal?

The Center of Excellence G-RISC can only support outstanding research proposals of the highest quality and interdisciplinary scientific innovation. Therefore, proposers are encouraged to only submit their strongest proposals which fall into the scope of GISC.

There are successful groups who have managed in the past to receive continuous support from G-RISC. Long-term proposals are excluded by G-RISC regulations, but excellent research which is successful in the competition will always get funded, if there are sufficient funds available. On the other hand, the Steering Committee carefully looks at the quality of new groups joining G-RISC. These

new groups are strongly encouraged to apply.

8. How to prepare a research stay?
If a proposal is successfully evaluated and the funding statement is signed by the principal investigators, then it is time to get ready for the exchange visit. The first step is then to receive a letter of invitation, which is a prerequisite for obtaining a visa. The G-RISC offices in St. Petersburg and Berlin help with official letters of invitation. The G-RISC office in Berlin handles all financial affairs for people traveling either to Germany or to Russia. This requires thoughtful preparation well in advance to the travel activities, i.e., communication with the G-RISC office in Berlin. Guests to Germany receive their funds either at FU Berlin or the funds are transferred to the hosts in Germany. People traveling to Russia receive their funds after the trips typically by bank transfer. It is important to note that G-RISC neither makes any travel arrangements, such as buying flight or train tickets, nor books accommodations for guests. This is the duty of the hosts together with the guests.

9. Are there any other duties?
A research stay funded by G-RISC is for up to two months. This time period is quite short and requires intense work by the funded people and the hosts for the success of the project. The aim is to get important interdisciplinary work done. This is first of all documented in a scientific report, to which a personal statement can be added. Typically, such reports cover at least 5 printed pages, although some are considerably longer. These reports cover the most important results accomplished during the project and are due within four weeks after the funded person has returned from the research stay. Certainly, all funded people are strongly encouraged to publish their work in international peer-reviewed journals, which contribute to the scientific visibility of G-RISC.

10. Who can help in the case of questions and problems?
G-RISC does everything in its power for the community to avoid any foreseeable problems, but if they do occur, everybody is asked to contribute to a solution. In most cases, it is sufficient to ask the administrative coordinators. All problems beyond that are resolved together with the scientific coordinators and the Steering Committee.

Personal Impressions by Funded People


photograph: Th. Dahms

Dr. Thomas Dahms (TU Berlin) - G-RISC Project: M-2012a-2 - A research stay in St. Petersburg

Personally, I was impressed by the interest that the project found at St. Petersburg State University. Both the possibilities of the e-chalk system and the experience of the virtual participation in a big international conference were tangibly appreciated by Prof. Fradkov and his group. I feel that the continuation of such projects will tremendously enhance interaction between cooperating research groups. Last but not least, the pleasant atmosphere in the group of Prof. Fradkov made this project an invaluable experience for me.


photograph: D. Anikiev/I. Abakumov

Denis Anikiev and Ivan Abakumov (St. Petersburg State University) - G-RISC Project: G-2012a-2 - A research stay in Hamburg

We were glad to stay in Hamburg during the visit. The atmosphere there was very friendly and pleasant. In Hamburg we worked with Prof. Dr. Dirk Gajewski and his students, Mehrnoosh Behzadi, Oksana Zhebel, and Sergius Dell. This fruitful collaboration resulted in very interesting and important results, which were submitted in the form of an expanded abstract to the 82nd SEG Annual Meeting which took place from 4th to 9th November 2012 in Las Vegas, USA. The results of the project will be also included in the paper which we plan to submit to a peer-reviewed journal in geophysics.

Daniel Nordmeyer and Peter Schmiel (FU Berlin)
- G-RISC Project: C-2012a-6 -
A research stay in St. Petersburg


photograph: G-RISC

We are working as Ph.D. students from the Freie Universität Berlin in the field of nanochemistry. At our university we use transmission and scanning electron microscopes to analyze our samples.
By travelling to the Interdisciplinary Resource Center for Nanotechnology at St. Petersburg State University we improved our skills regarding the imaging techniques in electron microscopy. Furthermore we had the opportunity to learn more about helium ion microscopy. Together with the research group members of Prof. Dr. Oleg F. Vyvenko we imaged different types of nanoparticles, like iron oxide, silicon dioxide, gold and core/shell (silicon dioxide/gold) nanoparticles with electron microscopy and, for the first time, with helium ion microscopy.
The research group members of Prof. Dr. Oleg F. Vyvenko have another point of view as physicists than chemists regarding the samples which is very helpful for our further research. Indeed, our interdisciplinary research had the advantage that entirely new ideas could be developed. Finally, St. Petersburg is a beautiful city and always worth a journey.

Georgy Grebenyuk (Ioffe Physical Technical Institute, RAS, St. Petersburg)
- G-RISC Project: P-2012a-10 -
A research stay in Dresden


photograph: G. Grebenyuk

I want to thank the entire laboratory staff of Prof. Laubschat for their wonderful hospitality and goodwill. It was through these times that I felt I was able to learn and grow the most in developing my skills during my trip. The staff responded quickly to my requests and always made me feel like a full-time member of the group.
I am very glad that I managed to work at the modern set-up that satisfied all necessary needs. Unfortunately, due to the difficulties working with it and the long time needed for a thorough degassing, there was not enough time to conduct all the experiments that I wanted and to investigate the effects of changes in the layers' sequence on the obtained results. In spite of this, my impressions of the experiment and of the trip to the beautiful city of Dresden were quite positive.

Artem Rumyantsev (Lomonosov Moscow State University)
- G-RISC Project: P-2012b-8 -
A research stay in Potsdam


photograph: A. Rumyantsev

I am very grateful to G-RISC for providing me an opportunity both to start a collaboration with colleagues from the University of Potsdam and to enjoy sights and attractions in Berlin. I managed to visit Pergamon Museum in Berlin and was impressed by the greatness and beauty of antique architecture. I am also very grateful to Prof. Dr. Svetlana Santer and other members of her group for interesting and useful scientific discussions and hospitality.

Liudmila Lysyakova (St. Petersburg State University)
- G-RISC Project: P-2012b-15 -
A research stay in Potsdam

photograph: L. Lysakova

I am very grateful to G-RISC for the support. With the help of G-RISC I was able to complete my Master's work dedicated to the study of photosensitive DNA-surfactant complexes at the University of Potsdam. I was taught to work in the chemistry laboratory, to prepare the complexes, and in the laser laboratory I have learned several new methods, especially on AFM in depth. During several of my visits to Germany, besides doing experiments, I was lucky to meet some famous physicists in well-known places of interest and to do some research on cultural traditions, e.g., Christmas and I even briefly studied West-European fauna (I took a lot of pictures of hedgehogs, ducks, rabbits, and Eastern bunnies).

German-Russian Year of Education, Science, and Innovation 2011/2012

Introduction

In a joint effort the Ministry of Education and Science of the Russian Federation and the Federal Ministry of Education and Research of Germany agreed to celebrate the German-Russian Year of Education, Science, and Innovation in 2011/2012. The goals were to create a vivid partnership of ideas and to improve bilateral efforts in research for an economical and ecological sustainable development. Numerous activities were launched during this year. Several activities were either initiated or supported by G-RISC. These are briefly summarized in the following.

10th Anniversary of the Russian-German Laboratory at BESSY II

Signing of the new contract of the Russian-German-Laboratory (from left to right): A. Zabrodskii (Ioffe Institute, RAS), C. Laubschat (TU Dresden), S. Tunik (St. Petersburg State University), A.R. Kayser-Pyzalla (Helmholtz Zentrum Berlin), P. A. Alt (Freie Universität Berlin).

The German-Russian Laboratory at the synchrotron radiation facility BESSY II is one of the core activities of G-RISC, which is a place for intense collaborations for scientists from Russia and Germany. This laboratory was opened in 2001 after several years of preparation and building of a soft X-ray beamline for user operation. Further details were described in the previous Annual Report of G-RISC (http://www.g-risc.org/annual_report/index.html). On June 27/28, 2011, 10 years of successful operation were celebrated in a two-day workshop that was held at the BESSY II facility of the Helmholtz Zentrum Berlin (HZB) in Berlin-Adlershof.

The workshop started with opening addresses by the heads or delegates of all institutions that are actively contributing to the consortium of the Russian-German Laboratory. These are Helmholtz Zentrum Berlin, Freie Universität Berlin, and Technical University of Dresden from Germany and St. Petersburg State University, Ioffe Physico-Technical Institute (RAS, St. Petersburg), National Research Center "Kurchatov Institute" (RAS, Moscow), and the Shubnikov Institute for Crystallography (RAS, Moscow) on the Russian side. Furthermore, Dr. B. Vierkorn-Rudolf from the Federal Ministry of Education and Research (BMBF) and the Minister-Counselor of the Embassy of the Russian Federation, Prof. A.V. Zverev, also gave welcome addresses. Most importantly, this welcome was followed by signing the new collaboration contract, which will guarantee the continuation of this successful Russian-German collaboration. The opening session was followed by views on the perspectives of the bilateral activities in the field of photon science, which were given by V. Akzenov (NRC Kurchatov Insitute) and E. Rühl (FU Berlin).

The following sessions were devoted to future perspectives of the Russian-German Laboratory, which is currently being significantly extended, by building of a new undulator beamline along with a new endstation so that new, state-of-the-art facilities will become available. These presentations were given by D. Vyalikh (TU Dresden) and C. Schüssler-Langeheine (HZB, Berlin). Further extension of the work at the BESSY II facility will be to make use of the European Free Electron Laser facility XFEL as well as new joint accelerator developments, as presented by A. Föhlisch and T. Kamps

(HZB Berlin) as well as by S. Molodtsov (XFEL, Hamburg).

The subsequent sessions were dedicated to research that has been carried out at the Russian-German Laboratory, where outstanding contributions from researchers from both countries were presented. The following subjects were covered: (i) nanoscience, (ii) novel materials, (iii) from nano- to biomaterials, and (iv) hot topics. This program showed impressively the breadth of research that is done at this facility, without going into the scientific details of each single presentation. Another highlight of the workshop that is worthwhile to mention was a reception that was held in the Embassy of the Russian Federation at the end of the first day of the meeting. There, G. Kaindl, who could be called the "Father of RGL", held a moving speech on the history of the Russian-German Laboratory. It became clear that the start of this successful operation was not at all smooth and easy and that pioneers were needed in order to circumvent numerous problems on the way to the success which the present and future activities are building towards.

During the dinner reception at the Embassy of the Russian Federation in Berlin (from left to right): Prof. A.V. Zverev (Minister Counselor, Russian Federation), Dr. B. Vierkorn-Rudolf (BMBF, Germany), and Prof. G. Kaindl (FU Berlin).

First German-Russian Conference on Knowledge and Technology Transfer

G-RISC was represented by a contribution to the first German-Russian Conference on Knowledge and Technology Transfer, which was held on December 16-18, 2011 in St. Petersburg. The motivation for this workshop was to bring experts from Germany and Russia together, who gathered the present conditions in each country. Selected projects were presented, among these was G-RISC in the field of knowledge transfer, where substantial interactions in knowledge transfer between both countries are already visible.

The Conference was not only part of the German-Russian Year of Education, Science, and Innovation, but was also supported by the St. Petersburg Dialogue, which brought together distinguished participants from Russia and Germany. The Conference was opened by the Senior Vice-Rector of St. Petersburg State University, Prof. I. Gorlinsky, and the opening session was introduced by Dr. F. von Weyhe, who represented the Consulate General of Germany in St. Petersburg, L. Efremova (Ministry of Education and Science of the Russian Federation), and Dr. G. Berghorn (Head of German Research and Innovation Forum in Moscow). The following contributions gave an overview of the present state in the field of knowledge and technology transfer in both countries, where some projects already bridge the activities between both countries. This was also documented by an on-site visit to the Otto-Schmidt Laboratory, where expert scientists from both countries successfully work together in the fields of polar and marine research. Other examples are the German-Russian Laboratory at BESSY II, which is substantially supported by G-RISC, and the binational Training Network 1384 on enzymes and multienzyme complexes interacting with nucleic acids that is funded by the German Research Foundation (DFG). Joint Master Programs between Russian and German Universities, such as on Applied and Computational Physics (ACOPHYS) and on Polar and Marine Studies (POMOR), are existing examples of successful Russian-German study programs. Several examples of successful technology transfer were also presented. There was sufficient time for intense discussions, whereby two plenary discussions indicated that the participants were highly motivated to improve the present situation in the fields of knowledge and technology transfer. This was also documented by a joint Communiqué which was elaborated during the conference and discussed at the end of the conference. This declaration represents a significant cornerstone for further developments in knowledge and technology transfer between Russia and Germany.

Participants from G-RISC projects are enjoying the reception held at the Embassy of the Russian Federation in Berlin.

German-Russian Conference on Fundamentals and Applications of Nanoscience

At the German-Russian Conference on Fundamentals and Applications of Nanoscience an interdisciplinary forum from Russia and Germany was created in order to discuss current issues of nanoscience at Freie Universität Berlin. The conference was held May 19-21, 2012 just before the closing event of the German-Russian Year of Education, Science, and Innovation. The motivation for the conference was to bring a sizable number of outstanding scientists from this field as well as young scientists from Russia and Germany together in order to strengthen the collaborations between both countries. This conference followed an earlier one that was held in November 2010 in Moscow during the Rosnanotech-Conference, which was jointly organized by A.R. Khokhlov (Moscow State University) and K. Al-Shamery (University of Oldenburg).

Almost 150 people came to the Nanoscience Conference at Freie Universität Berlin to disuss in parallel sessions the following topics: nanooptics and photonics, catalysis and chemical transformations, surfaces and thin films, polymers and hybrid composites, applied nanosystems, and biorelated nanosystems. Furthermore, about 50 posters were presented, and experienced and young researchers from both counties were able to discuss their most recent results.

The **opening ceremony** was opened by the First Vice-President of Freie Universität Berlin, Prof. M. Schäfer-Korting, which already indicates the importance of this conference. The German Research Foundation (DFG), which also generously supported this conference, was represented by the DFG Vice-President, Prof. C. Windbichler. The German Academic Exchange Service (DAAD) was represented by Dr. A. Julius, especially since a large number of young researchers from Russia and Germany has been invited by G-RISC. The Embassy of the Russian Federation was represented by Dr. A.A. Derevyanchenko. The scientific organization was jointly done by A.R. Khoklov (MSU, Moscow) and E. Rühl (Freie Universität Berlin). Plenary lectures were given by Prof. H. Möhwald (MPI Golm), Prof. S. Molodtsov (European XFEL), and Prof. A.A. Khoklov (MSU), who discussed quite different facets of state-of-the-art nanoscience.

A.R. Khokhlov presented new results on self assemblies in polymer systems, in particular, on how to design nanostructures for involving block copolymer melts. He highlighted the formation of nanostructures for block-copolymers with amphiphilic blocks, and nanostructures in thin films. He also presented 'smart polymers', i.e., polymers which change their properties depending on the external conditions.

S. Molodtsov introduced the new European free-electron laser facility XFEL, which is presently under construction, but will soon provide outstanding opportunities in structural research, as ultrabrilliant tunable X-rays become available. Even though user operation is expected to start in 2015, there are numerous activities, that require German-Russian collaborations in order to build the user instruments so that they are most profitable for joint collaborations.

Conference photograph

H. Möhwald highlighted in his presentation entitled 'Capsules from films and films with capsules for controlled and remote release' the use of polyelectrolytes for generating hollow capsules and free-standing films whereby the capsules are of use as drug carriers. Combinations of polyelectrolyte coatings and responsive colloidal carriers have the potential to be used as self repairing coatings, for which numerous applications are evident.

More than 80 oral talks followed which were communicated as invited and contributed presentations given by young and experienced researchers from Russia and Germany. This documented the breadth and the depth of research that is pursued in both countries in the field of nanoscience. The frame of the nanoscience conference was completed by various events, such as an informal welcome dinner, a conference dinner, and the long poster session which was held together with a buffet dinner.

All in all, the participants felt not only that the conference was scientifically interesting, but that the venue was pleasant and the city Berlin was explored by those who came early or left late. Almost half of the participants stayed for the closing ceremony of the German-Russian Year of Education, Science, and Innovation which followed on the next day.

Speakers at the opening of the G-RISC Conference on Fundamentals and Applications of Nanoscience: M. Schäfer-Korting (First Vice-President of Freie Universität Berlin), Dr. A. Julius (DAAD), A.R. Khokhlov (Moscow State University), and Dr. A.A. Derevyanchenko (Embassy of Russian Federation in Berlin).

Closing Ceremony for the German-Russian Year of Education, Science, and Innovation 2011/2012 at Freie Universität Berlin

Freie Universität Berlin was chosen as the site for the closing ceremony of the German-Russian Year of Education, Science, and Innovation 2011/2012. The ministers from both countries and other high-ranked representatives from both countries set the stage for this important event, which also several young and experienced participants of the German-Russian Conference on Fundamentals and Applications of Nanoscience were able to attend. Podium discussions and a ceremony that was devoted to signing various contracts between German and Russian institutions, that tightened the cooperations between both countries were main events of this impressive day.

Highly active scientists from G-RISC especially contributed to the podium discussion: "From the Big Bang to Future Materials", in which mostly research and perspectives for close collaborations using large-scale facilities in Russia and Germany were discussed by young scientists from physics and chemistry. This event provided a good foundation for improving the already close interactions between scientists from both countries.

The German Minister of Education and Research of Germany, Prof. A. Schawan, and the former Minister of Education and Science of the Russian Federation, Prof. A. Fursenko, at the Closing Ceremony of the German-Russian Year of Education, Science, and Innovation 2011/2012 at Freie Universität Berlin.

The President of Freie Universität Berlin, Prof. P. A. Alt, and the Vice-President of St. Petersburg State University, Prof. S. Tunik, are signing a new contract for intensifying the cooperation between both universities.

Podium discussion organized by E. Rühl during the Closing Ceremony of the German-Russian Year of Education, Science, and Innovation 2011/2012 covering the topic „From the Big Bang to Future Materials" (from left to right): E. Rühl (FU Berlin), O. Polonzhentsev (Southern Federal University, Rostov/Don), Yu. Litvinov (GSI, Darmstadt), K. Lange (Max-Born-Institute, Berlin), D. Vyalikh (TU Dresden), F.G. Schröder (KIT, Karlsruhe), M. Tlucykont (DESY, Hamburg), and S. Molodtsov (European XFEL, Hamburg).

Final Event of the Closing Ceremony of the German-Russian Year of Education, Science, and Innovation 2011/2012: All people are on the stage thanking for the joint year.

E-Chalk and G-RISC: Overview, State-of-the-art, and Future Perspectives

T. Dahms, P. Hövel, R. Aust, E. Schöll (Technical University of Berlin), A.L. Fradkov, A.A. Selianov (St. Petersburg State University)

What is E-Chalk?

E-Chalk is short for "electronic chalkboard" [1]. The project was initially developed at Freie Universität Berlin in 2000 [2]. The project's aims is to combine the advantages of traditional blackboard lectures with the benefits of an electronic system.
The lecture itself is kept as close to a traditional lecture as possible: The lecturer writes on a special tablet screen either using a laptop or a stationary computer. By using the former, the system is portable. Using one or more projectors, the lecture is visible to the audience. By an Internet stream, the lecture can also be made accessible to a remote audience. This remote lecture takes place in real time and includes the voice of the lecturer. This makes the system particularly interesting for the use by G-RISC.
The E-Chalk system allows for various other extensions of the classical format of a lecture. The inclusion of pictures and animations is possible and the system is able to recognize handwritten formulas in order to, e.g., generate live plots from written functions. All lectures can be stored online for later viewing on demand.

Video broadcast from Berlin to St. Petersburg during the Spring Meeting in 2012 of the German Physical Society in Berlin using the E-Chalk equipment.

Benefits to G-RISC

Due to its simplicity and its possibilities, the E-Chalk system provides better quality, interactivity, and understandability for any lecture. But the possibility of remotely following a lecture or a seminar in real time – including the speaker's voice – is the most intriguing feature.
Within G-RISC students and researchers from Germany and Russia are brought together, usually in the form of joint conferences, workshops, and lectures in Russia and Germany. Using the E-Chalk system, these scientific interactions and exchange of ideas can be significantly intensified. Students from institutions participating in the G-RISC framework can profit from jointly performed lectures and seminar series without additional costs for traveling.

The computer equipment acquired for G-RISC, consisting of six tablet computers and six beamers, actively supports these efforts. Three of these units are available at TU Berlin and the other ones at St. Petersburg State University. With respect to future workshops, this computer equipment can also be used as a presentation platform for the benefit of advanced students about to enter the international conference community.
In addition, different working groups can also profit from an enhanced multimedia infrastructure via virtual group meetings and seminars. In these meetings, all group members will convene at their home institution and are connected via the Internet to other groups within the same project.

Recent G-RISC Projects using E-Chalk

The G-RISC project M-2010a-5 [3] by Philipp Hövel formed the foundation for E-Chalk activities and introduced the possibilities resulting from the E-Chalk system. Meanwhile, media kits have been purchased that form the hardware backbone of the E-Chalk activities. All colleagues who were introduced to the system were very interested and impressed by the possibilities of E-Chalk. The establishment and adoption of lectures using the E-Chalk system is now planned by many of them.
Additionally, the live video-streaming to St. Petersburg State University of the two-and-a-half-hour symposium "Control of Network Dynamics" at the 76th DPG Annual Conference and Spring Meeting of the Condensed Matter Section of the Deutsche Physikalische Gesellschaft (Local Organizer: E. Schöll) in Berlin, March 25-30, 2012 was realized using this equipment, which demonstrated and stimulated the possible applications of both the hard- and software.

The broadcast was attended by approximately 20 people, including undergraduate and postgraduate students, researchers and professors in St. Petersburg.

Prof. Fradkov stated, "For my group it was extremely interesting and instructive." This broadcast was a success not only from the point of view of creating new ideas for further collaborative research but was specifically true, because many undergraduate and graduate students at St. Petersburg State University who attended this broadcast had never been at an international conference with talks in English before. For them, this broadcast was an important first experience of the atmosphere and the surroundings of such an international event.

Future Perspectives

Due to lack of experience and the size of the Symposium, we could not do a video stream in bidirectional exchange in the form of questions or discussions after the talks. Our collaborators in St. Petersburg are eager to continue their efforts into this direction, especially since the system is now available and ready to use. For similar events in the future, bidirectional communication including explicit participation with remote questions and discussions will be realized using the E-Chalk equipment using the tablet computer kits. Especially the availability of webcams, touch screens, and E-Chalk will facilitate such interactions.

Regarding the E-Chalk system in particular, Prof. Fradkov and other lecturers will adopt the E-Chalk system for their lectures. They will receive further assistance and support from their German collaborators at Technical University of Berlin while the use of E-Chalk at St. Petersburg State University is growing.

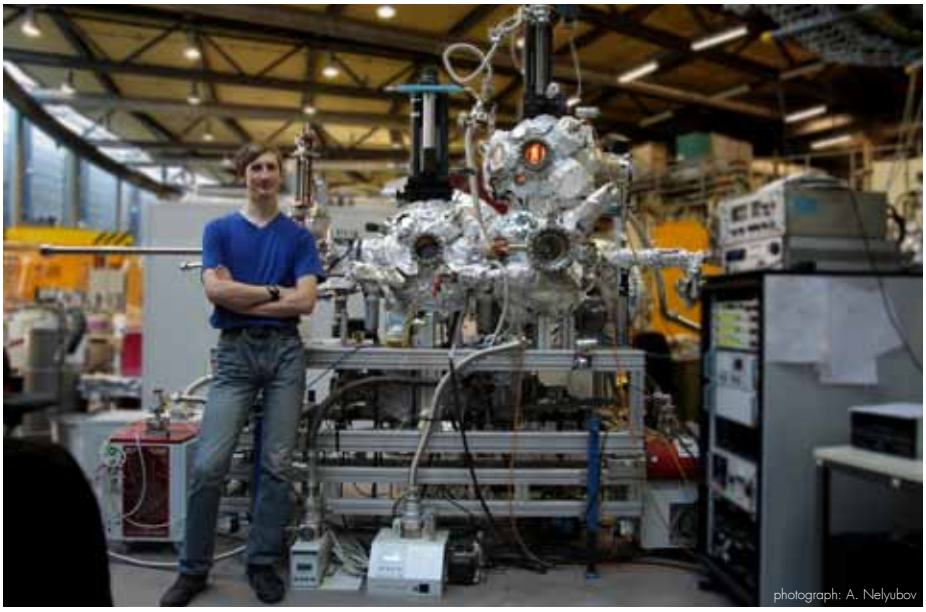
References

[1] http://www.e-chalk.de/
[2] R. Rojas, L. Knipping, W. Raffel, G. Friedland: Elektronische Kreide: Eine Java-Multimedia-Tafel für den Präsenz- und Fernunterricht in: „Informatik: Forschung und Entwicklung", Vol 16, Issue 3, pp. 159-168, Publisher: Springer-Verlag, (available online at Springer: Link), Berlin and Heidelberg, September 2001.
[3] P. Hövel, G-RISC Report on project M-2010a-5, "Implementation of Tools for E-Teaching" (2010).
[4] T. Dahms, Report on project M-2012a-2, "Implementation of Tools for E-Teaching and Initiation of Joint Seminars and Lectures" (2012).

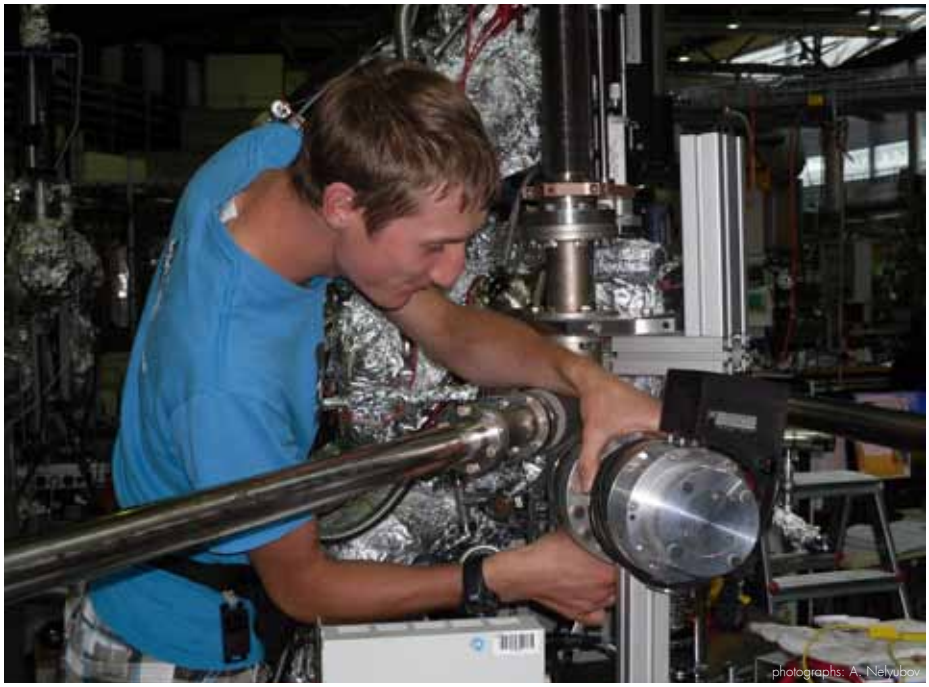
User Support at the Russian-German Laboratory at BESSY II

The Russian-German Laboratory at the synchrotron radiation facility BESSY II is designed for users from Russia and Germany, where every week different people perform their experiments. Receiving such a narrow time slot for research requires excellent preparation, a well working infrastructure, and individual user support.

First of all, a scientific idea is needed in order to get permission to work at the Russian-German Laboratory. This idea has to be put into a brief proposal of about two pages. After a peer-review process, the best proposals, which are selected in a competition, receive beam time of typically one week. This competition limits the number of accepted proposals to about one-third of the submitted ones. The users come from Russia or Germany and their level of experience in the use of synchrotron radiation is quite different. Typically, the users bring their samples for structural characterization, which cannot be done in their own laboratories. They come a few days before the beam time starts. This time is used for final preparations of the samples and to get familiar with the instruments and synchrotron radiation. Often, they are not quite familiar with all the details that are required to perform a successful experiment within a short time period. Therefore, support is given to the users, which requires the presence of an experienced person, who knows the laboratory and the use of synchrotron radiation in detail as well as the needs of users, who are highly motivated to acquire the desired results. Especially for users from Russia, it is beneficial for a beamline scientist from Russia to accommodate them, who knows about typical problems and their solution. The beamline scientist employed by G-RISC from October 2010



Beamline scientist, Alexander Nelyubov, and some intallations of the Russian-German Laboratory at BESSY II.



Russian-German Laboratory at BESSY II : Impressions and work bench of the beamline scientist Alexander Nelyubov.

until July 2012, Alexander Nelyubov, participated in a team of German and Russian scientists at the Russian-German Laboratory, where he was responsible for numerous tasks, including maintaining the facility's instruments for the best work possible. Furthermore, there are constant improvements that must be made on the beamline delivering photons for experiments and on the instruments that are used for characterizing the users' samples. Researchers at the Russian-German Laboratory can use tunable soft X-rays to apply these photons for photoemission and X-ray absorption experiments. This gives deep insight into the electronic structure and dynamics of the samples being studied, which are typically thin films of deposited metals, molecules, or graphene that are investigated in an ultra-high vacuum in order to have clean and well-defined sample conditions. Additionally, the equipment is constantly being developed. For example, a new experimental station was recently designed for the Russian-German Laboratory to replace the previously used one, so that overall the performance was significantly improved. Users have full access to the documentation of the spectrometers and detectors, which is essential for successful work (http://www.bessy.de/rglab/). The web-page of the laboratory is constantly being updated, so that users always know the current condition of the laboratory. Furthermore, the successful progress of the Russian-German laboratory depends on input from the beamline scientist and the team running the laboratory. Therefore, a technical design concept for a new, improved experimental station was developed recently. After delivery of the parts, substantial work was required to install and commission this new experimental station. Meanwhile, a state-of-the-art photoemission instrument in combination with a photoelectron microscope will be made available in the near future to the users of the Russian-German Laboratory at an undulator beamline. There, the users will receive many orders of magnitude more photons than today, an thus be able to do experiments on more dilute samples at substantially higher energy and spatial resolution than presently possible. The insights into the structure and dynamics of matter will become significantly more detailed, which will be beneficial for performing competitive research jointly involving scientists from Russian and Germany.

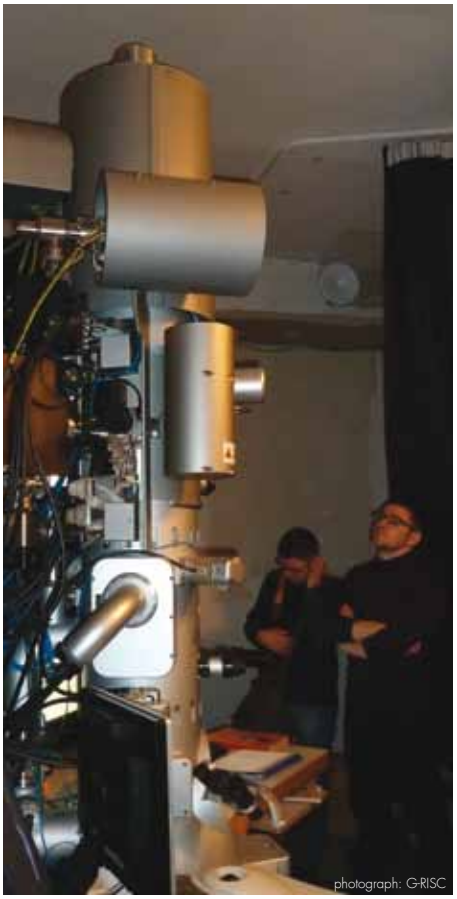
Alexander Nelyubov (Beamline scientist at the Russian-German Laboratory): "The Russian-German Laboratory is a place, where you can work, get new knowledge, and you can talk to highly experienced people. Berlin is a big city, it is easily possible to find here places of interest, such as parks for cycling and walking. The surroundings of Berlin-Adlershof, where I lived, are quiet and green, and I used to go to work by bicycle. I highly appreciated this opportunity to serve at the Russian-German Laboratory and to keep myself in good physical shape every day. I am glad about this period in my life."

Compact Classes held in Russia

G-RISC has made an effort to increase the number of young researchers participating in research stays in Russia. This is needed in order to balance the exchange visits between Germany and Russia. Until now, the flow of researchers from Russia to Germany has been significantly higher than the other way around. This is mostly due to the general view that the research conditions are better in Germany than in Russia, which is more and more not correct. Currently, in Russia significant efforts are being made to acquire the most modern equipment for experimental research in natural sciences. This, together with highly skilled and experienced researchers, can be an excellent way for young German researchers to widen their scope by finding excellent conditions for their research and improving their skills.

G-RISC has identified such unique offers, where as a first attempt, the newly formed research centers at St. Petersburg State University have been identified as attractive places for state-of-the-art research and post-graduate education. Prof. O. Vyvenko from the Interdisciplinary Resource Center for Nanotechnology of St. Petersburg State University has agreed to host up to four graduate students for this purpose. His center is excellently equipped with modern scanning and transmission electron microscopes as well as a helium ion microscope, which is unique with respect to the combination of ultra-high resolution and material contrast. This was sufficient motivation for researchers from Germany (Cottbus, Potsdam, and Berlin) who wanted to learn more about this technique, which was not available at their own laboratories in Germany, in order to perform studies on their own samples and develop joint research.

Thus, this model appears to be attracting more young researchers from Germany. St. Petersburg State University is particularly popular, since several of its research centers have been recently updated or are under development. Furthermore, other institutions in Russia are also well-prepared for hosting researchers from Germany. Which G-RISC is willing to to support to achieve a better balanced exchange of researchers between Russia and Germany.


photograph: G-RISC

Modern transmission electron microscope at St. Petersburg State University.


photographs: G-RISC

Helium ion microscope at the Interdisciplinary Resource Center for Nanotechnology of St. Petersburg State University (left) and Prof. O. Vyvenko, head of the electron microscopy center (right).

Teaching in Germany

Spatio-Temporal Dynamical Systems: Stabilization in parabolic functional-differential equations

Andrey Muravnik (Peoples' Friendship University of Russia) teaching at FU Berlin in October 2011

Results in various modern areas of partial differential equations and related areas of analysis have been exhibited to German colleagues. In turn, they proposed various ways to develop the research further. As a whole, a comprehensive base for an immediate and fruitful collaboration has been formed. Later discussions have shown that at least three directions are completely ready for further joint development:

- Long-time behavior of the Cauchy problem solutions for parabolic functional-differential equations (together with research group of Prof. B. Fiedler, Freie University Berlin)
- Blow-up of solutions of systems of nonlinear elliptic and parabolic in equalities (together with the research group of Prof. W. Jäger, University of Heidelberg)
- Fourier-Bessel integral transformation and qualitative properties of monotone radial solutions of parabolic equations in unbounded domains (together with research group of Prof. T. Weth, Goethe University Frankfurt/Main).

Andrey Muravnik: "In my opinion, the G-RISC is nowadays among the key factors of the interdisciplinary research collaboration between Germany and Russia. In spite of its relatively short history, it has undoubtedly proved its ability to efficiently elaborate and support projects of various levels and sizes."

Topological Degree for Fredholm Nonlinear Maps and Its Application

Prof. Dr. N. Ratiner (Department of Mathematical Physics, Voronezh State University) teaching at FU Berlin (April 22-28, 2012)

The project activities were centered around three lectures (7 hours) on the topological degree for Fredholm proper maps with nonnegative index on Banach manifolds and its application to problems of solvability and bifurcation of solutions in partial differential equations. The talks attracted the attention of specialists in applied analysis, nonlinear dynamic, and functional analysis. After the talks there was an active discussions on the topics, and further development of the topological methods and their applications.

The compact course of lectures was devoted to the construction of the topological degree for proper nonlinear Fredholm maps on Banach manifolds. It was started from the brief review of the degree for maps on finite-dimensional manifolds. Much attention was given to a distinction between the case of zero index and positive index, and to difficulties occurring in the infinite dimensional case. The suggested construction of the degree uses the Fredholm structures and the finite-dimensional reduction method. The method of finite-dimensional reduction allows minimal smoothness of maps and manifolds. In the zero index case, the construction of integer valued degree with respect to oriented Fredholm structure was given. In the positive index case, the degree takes values in the cobordism group of framed sub-manifolds in a Fredholm structure. The notion of framed sub-manifold is an extension of Pontrjagin construction. Some applications of the constructed degree were presented. They are the bifurcation problem for nonlinear elliptic boundary value problem with real and complex parameter, the theorem on the existence of a branch of solutions for oblique boundary problem, the solvability for boundary problem for the system of ordinary differential equation.

Furthermore, some time was devoted to discussions on the following topics: the development of the degree theory for oriented families of Fredholm linear operators with positive index on possibly nonoriented manifolds, further applications of the degree theory for nonlinear differential equation, and topological properties of Banach manifolds.

N. Ratiner: "The compact teaching within the framework of the project appeared important for communication between Russian and German researchers working in the different areas of mathematics. The project provided an exchange of information on the application of topological methods in various problems concerning operator equations."

G-RISC Conferences in Russia and Germany

International Student's Conference "Science and Progress"

The second Student's Conference "Science and Progress" took place from November 14-18, 2011 at the Faculty of Physics at St. Petersburg State University. This interdisciplinary conference was focused on a joint look at investigations in physics, geophysics, chemistry, and mathematics. Its aim was to develop deep collaborations between students and young researchers from Russia and Germany and to increase the level of the student scientific investigations by intense discussions between young researchers and professors as well as experienced researchers from both countries. In addition, overview lectures were given by professors from Russia and Germany.

We are pleased to say that 238 participants came from different cities of Russia and Germany to the International Student's Conference "Science and Progress-2011". Among them were 10 people from Germany, 4 people from Ukraine, and 37 people from different cities of Russia (Moscow, Yaroslavl, Tver, Kazan, Kaliningrad, and Vladivostok). Representatives from Germany who joined were the head of DAAD Information Center in St. Petersburg, Dr. Michael Kleineberg, the head of the Division Eastern Europe/CIS of DAAD, B. Brisch, and the representative of Freie Universität Berlin at the liaison office in Moscow, T. Stüdemann. Moreover, online video conferencing using the G-RISC video equipment gave scientists in Germany a chance for remote participation in this conference.

The results were presented in overview lectures, oral talks, and posters which were divided into 9 Sections. The official language of the conference was English. The best oral talks and posters in each section were awarded by certificates and presents. As the result of the conference, a book of abstracts was publsihed as well as the conference proceedings.

The invited lectures in the most topical and interesting fields of science were presented by Prof. Dr. Eckart Rühl (Physical Chemistry, Freie Universität Berlin, Germany), Prof. Dr. Oliver Rader (Helmholtz-Zentrum Berlin, Germany), Prof. Dr. Alexander Saranin (Institute of Automation and Control Processes FEB RAS, Vladivostok, Russia), Prof. Dr. Dirk Urlandt (Leibniz Institute for Plasma Science and Technology, Greifswald, Germany), and Prof. Dr. Dieter Michel (Leipzig University, Germany). During the conference were two excursions, which went to Pavlovsk and to New Peterhof (Grand Peterhof Palace).

Finally, we would like to invite all of you to participate in the next International Student's Conference "Science and Progress" in the framework of the German-Russian Interdisciplinary Science Center (G-RISC), will be held, as a tradition, in November of each year.

Hydrogen Bonds between the Disciplines

Martin A. Suhm (Göttingen)

This workshop was held in the Walther-Nernst lecture hall at the Institute of Physical Chemistry in Göttingen from September 11-12, 2011, just prior to the 19th International Conference on "Horizons in Hydrogen Bond Research" (September 12-17, 2011). It had three central goals – to foster exchange between PhD students across disciplines, to train students for active participation in the subsequent conference, and to provide an informal framework for the presentation and discussion of their ongoing research. For this purpose, it included four sessions with invited talks and student presentations as well as an extended poster discussion.

Impressions from the G-RISC workshop on "Horizons in Hydrogen Bond Research" (Göttingen).

There were 14 students from Moscow, St. Petersburg, and Novosibirsk, 15 students from Germany (mostly Göttingen), and additional 8 students from different European countries. Together with 4 survey lecturers, 4 session chairs, and 8 senior participants of the follow-up conference, a total of 53 participants spent two intense days discussing science and exploring the possibilities for future cooperation. Very few registered participants had to cancel their visit at short notice.
All G-RISC student participants were offered free registration and accommodation for the entire week of the Horizons' conference from the conference budget and the DFG research training group 782 on "Spectroscopy and Dynamics of Molecular Coils and Aggregates". This raised student participation in this traditional conference to a gratifying level.

photograph: M. Suhm

The first session (chair: M. A. Suhm) was opened by a lucid survey of anharmonic aspects of weakly hydrogen bonded systems, provided by D. M. Benoit, who was based in Ulm at the time of invitation and has now moved to the University of Hull. It was followed by four student talks ranging from the construction of potential energy hypersurfaces (Cornaton) to the experimental characterization of low frequency modes (Kollipost) and dihydrogen bonds (Levina), and to the monitoring of alkane folding under the influence of dispersion interactions (Lüttschwager). This session showed that there are still major challenges in the description of weak and strong hydrogen bonds, starting from an accurate calculation and parametrization of the ground electronic state hypersurface and culminating in the comparison of experimental and calculated anharmonic transition frequencies and intensities. Direct contacts between hydrogen atoms were seen to be important both for proton transfer to hydrides and for the folding of alkanes.
In the second session, chaired by P. M. Tolstoy (St. Petersburg), all poster presenters were given the opportunity to present their posters in three minutes after an educational survey on the structural and dynamical characterization of organic solids by E. V. Boldyreva from Novosibirsk. The students were able to motivate the audience to visit their posters by using a range of presentation skills such as leaving open the main conclusion or important details. More than three hours of lively poster discussion involving over 30 posters followed and everybody was encouraged to vote for his or her favorite poster presentations.
On the next day, two poster book prizes sponsored by St. Petersburg State University were awarded, one of them went to T. N. Krinitskaya for the best poster presentation, the other one to a lucky voter who was drawn from the ballot box. A pictorial presentation of ab initio molecular dynamics simulations by D. Sebastiani (Berlin) followed in a session chaired by H.H. Limbach (Berlin). Sebastiani had very recently been awarded the prestigious Hellmann prize of the Theoretical Chemistry workgroup. This is quite fitting for a joint German-Russian workshop, as the famous quantum physicist Hellmann had worked both in Germany and in Russia, before his tragic death in Moscow (1938). The following student presentations ranged from the investigation of anion hydration (M. A. Vovk), metal hydration (R.M. Forck) and neutral molecule solvation (R. Misra) to the characterization of crystals with Raman (B. A. Zakharov) and FTIR microspectroscopy (M. Nedić). This collection of work on relatively strong hydrogen bonds nicely illustrated the influence of solvent and crystal field effects.
After lunch in a session chaired by I. G. Shenderovich (Berlin, now: Regensburg), A. V. Nemukhin (Moscow) gave a nice survey on possible ways to use QM/MM methods, followed by student presentations on biologically and catalytically relevant hydrogen bond research. M. Khrenova showed how hydrogen bond rearrangement accompanies changes in photophysical properties of proteins, L. De Beuckeleer investigated hydrogen bonding in the model compound pyrrole and G. Silantyev provided multiexperimental evidence for organometallic hydrogen bonds.
Some of the participating students acknowledged the G-RISC and DAAD funding by forming the corresponding letters on the lawn in the backyard of the institute and everybody felt well prepared to attend the subsequent DFG-funded conference on "Horizons in Hydrogen Bond Research". Plans for cooperation between research groups from Russia and Germany (e.g. Boldyreva/Suhm) and beyond were born and will hopefully grow in the coming years. A questionnaire distributed among the participants showed that the workshop had fulfilled its main goals.

International Workshop on "Spatio-Temporal Dynamical Systems"

A. L. Skubachevskii

The international workshop "Spatio-Temporal Dynamical Systems" was held in the Steklov Mathematical Institute of the Russian Academy of Sciences, Moscow, Russia, from August 18-20, 2011. It was organized by the Peoples' Friendship University of Russia in cooperation with the Steklov Mathematical Institute and the Lomonosov Moscow State University, and was supported by the German-Russian Interdisciplinary Science Center (G-RISC).

The workshop brought together various groups of G-RISC on the common basis of spatio-temporal aspects of differential equations. Among the main topics were nonlinear ordinary and partial differential equations, functional differential equations, nonlocal problems, and hysteresis phenomena. Emphasis was put on stability properties, local and global bifurcations, nonlocal synchronization and desynchronization, and control schemes of nonlocal spatio-temporal systems. Interdisciplinary applications, including delay control in laser systems, multiscale modeling of transport and reaction in complex media, and control of temperature fields under boundary microwave heating were discussed.

The description of open problems and the formation of directions of future research was an important part of the workshop. Moreover, the workshop provided a presentation platform to benefit from those advanced students who were entering the international conference community.


photograph: G-RISC

Participants at the G-RISC workshop on "Spatio-Temporal Dynamical Systems".

The workshop was a satellite of the Sixth International Conference on Differential and Functional Differential Equations (August 14–21, 2011, Steklov Mathematical Institute, Moscow, Russia). This allowed to attract attention of prominent mathematicians actively working in the field of differential equations and dynamical systems to the research issues covered by G-RISC. Nine international top-level plenary speakers of the conference were invited to give lectures at the workshop, which significantly increased the scientific level of the workshop and facilitated integration of advanced students into the international mathematical community. Furthermore, interdisciplinary discussions were promoted together with experts in differential equations and mathematical physics by inviting G-RISC researchers to the workshop from the fields of theoretical physics, physical chemistry, and mathematical biology. This provided an interdisciplinary platform in the sprit of G-RISC.

After the workshop was finished, the editorial board of the journal Russian Mathematical Surveys (the English translation of the Russian bimonthly journal Uspekhi Matematicheskikh Nauk) suggested that the organizers write a paper about the workshop and the conference, which was published.

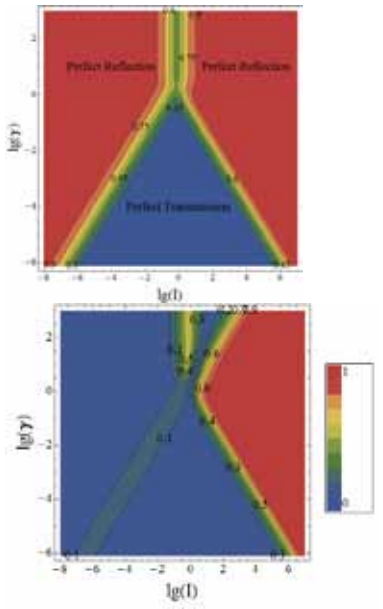
Furthermore, the Russian Foundation of Basic Research plans to publish a volume devoted to its 20th anniversary. The volume will contain information concerning the best international conferences supported by the Foundation during the last 20 years, including the international workshop "Spatio-Temporal Dynamical Systems".


photographs: G-RISC

Teaching of W. Weber (Heidelberg) during the mathematics conference in Moscow.

Selected Projects in Physics and Geophysics

G-2011b-2	V. Rok V. Troyan, B. Kashtan S. Shapiro	University of Dubna St. Petersburg State University FU Berlin	Seismic waves propagation and reflection in fractured fluid-saturated rocks



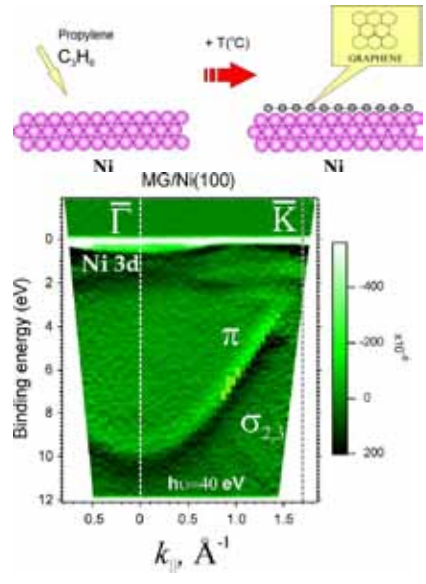
Contour plots of normal incident SH-wave reflection coefficient versus dimensionless parameters: Exact solution (top) and discrepancy between linear slip model (LSM) predictions and the exact solution (bottom).

Stanislav Glubokovskikh (Dubna), Visit to Berlin (October - December 2011)

Interactions of seismic waves with hydraulic fracture (SH-waves) were studied. This study provides a theoretical basis for active seismic detection techniques of extensive hydrofractures. Exact solutions for reflection and transmission coefficients were analyzed for thin plane layer filled with viscous/perfect fluids. We found out that viscosity has a negligible effect for all possible natural fluids. For real rough fractures only approximate models are available. We proved that the linear slip model is suitable for our purposes. We used the above-mentioned exact solutions to examine accuracy of this model. Exact and approximate results are in good agreement for the wide range of geological media properties. Some important properties of linear slip model were revealed. The most crucial one is an inability to take into account energy dissipation during wave passing the layer.

A linear slip model allows us to describe the fracture effect on seismic waves in terms of distinct parameters, such as specific compliances. These values must be obtained from experiments. Results of physical modeling for honey-saturated plexiglass plate models support a conclusion that for heavy fluids viscous forces effects prevail over asperity resistance.

P-2011b-2	A. M. Shikin O. Rader	St. Petersburg State University Helmholtz-Zentrum Berlin	Study of anomalously large spin-orbit splitting structure of π-states of graphene on Ni(111) and Ni(100)



The electronic structure of graphene/Ni(100) measured by angle-resolved photoelectron spectroscopy in the ΓK direction of the Brillouin zone of graphene. For better visualization, the dispersion relations are presented in the form of the first derivative with respect to energy (photon energy: 40 eV).

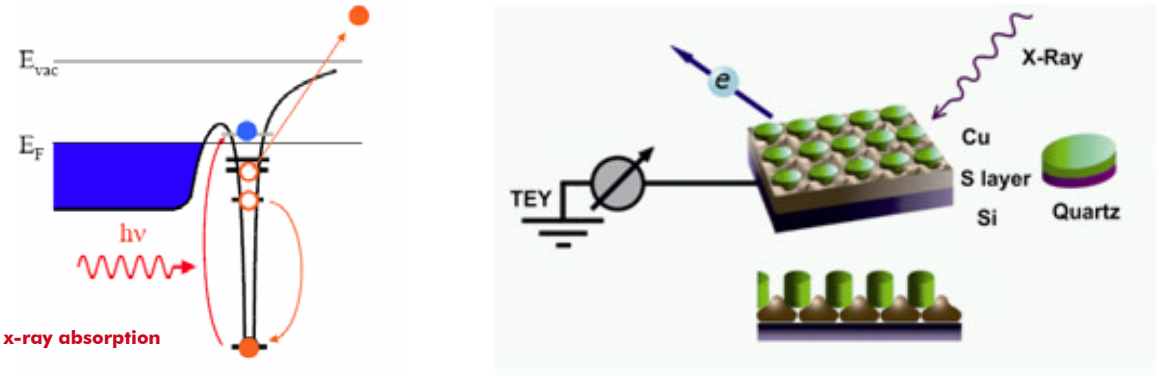
Anna Popova and Evgeny Zhizhin (St. Petersburg),
Visit to Berlin at Russian-German Laboratory (November - December 2011)

Investigations of graphene monolayers have attracted considerable interest in recent years due to their unusual electronic structure, i.e. the linear "photon-like" dispersion of electron states near the Fermi level in the region of the K-point of the Brillouin zone, and because of their related unique transport properties. A comparative investigation of the processes of synthesis of graphene on the surface of the thin films of Ni with different crystal structures (Ni (111) and Ni (100)) has been performed. It is shown that on the surfaces of Ni of different crystal structures a well ordered graphene monolayer is formed. However, the formation of graphene on the surface of Ni (100) is somewhat difficult because of the mismatch of crystal lattices of graphene and the underlying substrate. The investigations of the electronic structure of graphene show that the interaction of graphene with the Ni substrate of any crystal structure is strong. There is a violation of the linearity of the dispersion dependences of π-states in the field of the K point (characteristic of quasi-free graphene). However, the intercalation of Au atoms causes blocking of this strong covalent interaction and the dispersion dependences of π-states in the field of the K-point are of a linear character. Yet, the covalent interaction of π-states of graphene with d-states of gold leads to hybridization. There is a modification of the dispersion dependences, which can be described in terms of an avoided-crossing of the electronic states. The changes in the spin structure of graphene in the intercalation of atoms of gold under the graphene monolayer can also be described in the terms of a spin-dependent avoided-crossing of the electronic states.There is a spin-orbit splitting of the π-states of graphene induced by the underlying layer of intercalated gold.

P-2011b-x	A.M. Shikin C. Laubschat, D. Vyalikh	St. Petersburg State University TU Dresden	Modification of structural properties in bacterial surface protein layer by metals

Anna Makarova (St. Petersburg),
Visit to Berlin at Russian-German Laboratory (October-November 2011)

Our project was devoted to the analysis of modification of the protein structure by atomic copper and investigation of the copper nanostructures formation on top of the bacterial surface layer protein of *Bacillus sphaericus NCTC 9602*. Using Near Edge X-ray Absorption Fine Structure (NEXAFS) spectroscopy we have explored the unoccupied electronic states and analyzed the morphology of the surface layer of the protein-copper hybrid system. The analysis of the modification in C 1s NEXAFS spectra and further comparison with theoretical data allows us to reveal the peculiarities of copper nanostructure formation and to estimate size of the particles. According to the experimental and theoretical results, we draw the following conclusions: (i) the structural properties of the formed S layer-copper hybrid system can be estimated by careful analysis of NEXAFS spectra; (ii) copper does not form solid layers on top of the surface layer protein; (iii) we suggest that copper nanoparticles are formed in pores of the protein layer; and (iv) the nanoparticle size is estimated from the dependence of the sum of the oscillator strength of the copper thickness for the system S-layer and the copper layer.

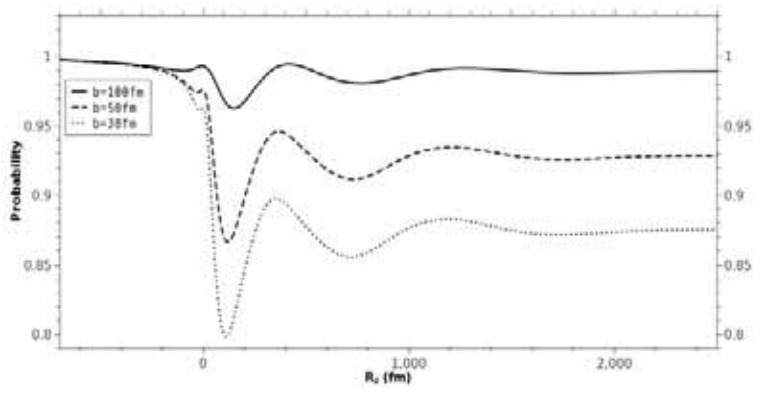


Schematic presentation of NEXAFS spectroscopy and the experiments.

P-2012a-8	V. M. Shabaev G. Plunien	St. Petersburg State University TU Dresden	Ionization probabilities in low-energy heavy-ion collisions

Andrey Bondarev (St. Petersburg), Sur-place stipend (January - June 2012)

The present work is devoted to calculations of the ionization probabilities in the collision process of hydrogen-like uranium ions in the 1s-state with bare uranium nuclei and neutral uranium atoms. The calculations have been carried out in the monopole approximation for the potential of a projectile and beyond for various values of the impact parameter and at the incident projectile energy equal to 6 MeV/u. It is shown that the probability to conserve the initial state is large, even for the small impact parameters. This can be explained by the fact that the velocity of the projectile is much lower than the velocity of the electron motion in the field of the nucleus.

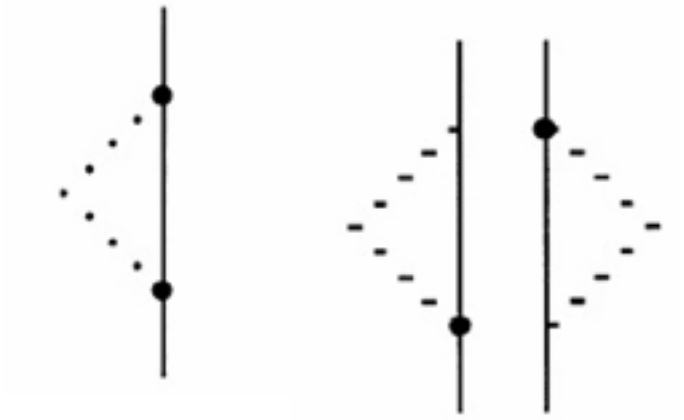


Probability to observe the electron in the initial 1s state during the $U^{91+}(1s) - U^{92+}$ collision as a function of R_z for various values of the impact parameter b and at the incident projectile energy equal to 6 MeV/u.

P-2012a-9	V. M. Shabaev G. Plunien	St. Petersburg State University TU Dresden	Determination of nuclear charge radii from the isotope shifts in dielectronic recombination resonance spectra at heavy ion storage rings

Natalya A. Zubova (St. Petersburg), Sur-place stipend (January - June 2012)

The aim of the present project on isotope shifts is to evaluate to volume and mass isotope shifts in heavy Li-like ions. The theoretical calculations based on the Dirac-Fock-Sturm method include the Breit, electron correlation and quantum electrodynamics (QED) corrections. These are combined with the related experimental results to derive differences of the nuclear charge radii for different isotopes. With the reference isotope nuclear radius known from other experiments, we can determine the values of the nuclear radius and the values of the nuclear charge radii along isotopic shifts. Furthermore, numerical calculations on the one-photon-exchange contributions containing two-electron recoil operators have been performed.

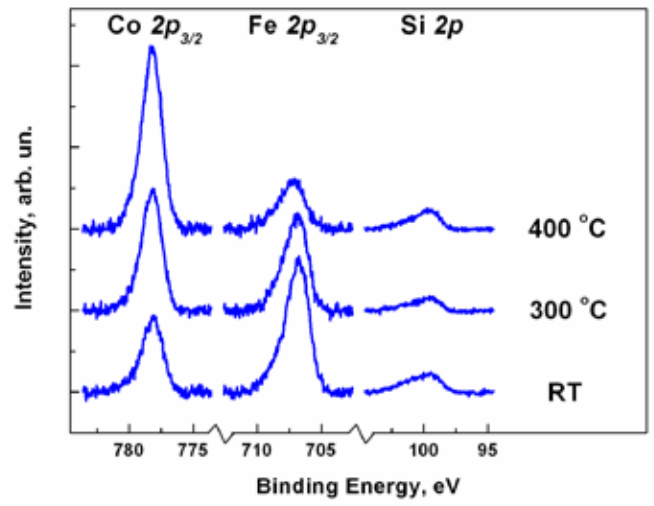


Coulomb nuclear recoil diagram (left) and one-transverse-photon nuclear recoil diagram (right), which are numerically evaluated.

P-2012a-10	I. Pronin C. Laubschat/ D. Vyalikh	Ioffe Institute, St. Petersburg Technische Universität Dresden	The formation of ultrathin Co_2FeSi Heusler alloy films on a silicon surface covered with a barrier layer

Georgy Grebenyuk (St. Petersburg), Visit to Dresden (March 2012)

The aim of the present work was to investigate the formation of Co_2FeSi Heusler alloy thin films on silicon surface covered with barrier layers of SiO_x (~2 nm) and CaF_2 (~8 nm) and to study their electronic properties. Photoelectron spectra were measured in ultrahigh vacuum. The thin films of iron, cobalt and silicon were deposited on the samples surface in different sequence. Then, they were annealed at various temperatures. It is shown that by using this procedure the film with the stoichiometric composition of synthesized alloy can be created. The values obtained for spin polarization (~20%) are significantly lower than the theoretical ones. This may be caused by disordering effects during the thin film growth.

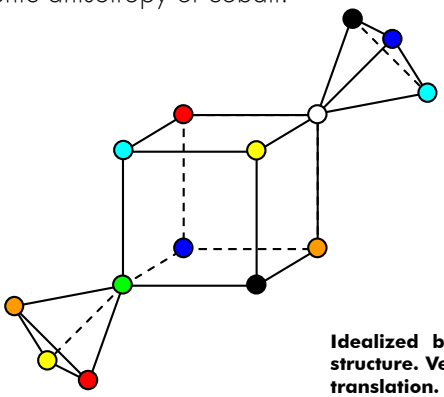


Co 2p, Fe 2p and Si 2p photoelectron spectra taken after Si, Co, and Fe depositions (RT) and sample annealing at 300 and 400 °C.

P-2012a-11	N. Grigoryeva P. Lemmens, D. Menzel	St. Petersburg State University TU Braunschweig	Magnetic and temperature studies of ferromagnetic inverted opal-like structures by SQUID-magnetometery

Alexander Mistonov (St. Petersburg), Visit to Braunschweig (April - May 2012)

Ferromagnetic crystals with the inverted opal structure were studied by SQUID-magnetometry. The features of the complicated frustrated magnetic structure were investigated. The dependencies of the magnetization on the temperature were obtained and analyzed. It was shown that this method allows detecting the magnetic state switching, which is important for improving magnetic studies of these objects. The difference in magnetic behavior between two materials – nickel and cobalt – is demonstrated. It is observed that there is an influence of the sample's thickness on the magnetic properties. Furthermore, the difference for Ni and Co inverse opal-like structures (IOLS) is observed, which is explained by the crystallographic anisotropy of cobalt.



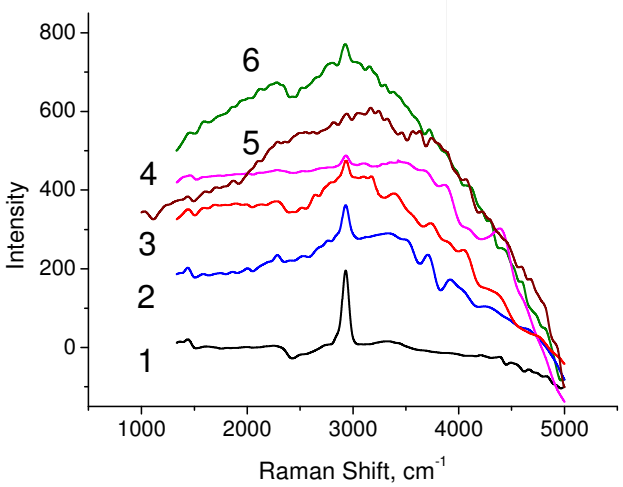
Idealized basic element of the inverted opal-like structure. Vertices of the same color are equal by the translation.

Selected Projects in Physical Chemistry

C-2012a-2	P. Pakhomov E. Rühl	Tver State University FU Berlin	Spectroscopic identification of the sizes of scattering nanoparticles in polymer composites

Vera Sitnikova (Tver), Visit to FU Berlin (May/June 2012)

The sizes of filler particles in polymeric composites are studied by the FTIR spectroscopy, as well as optical and electron microscopy methods. The composites are researched using the approach from Tver State University for determining the average size and size distribution of filler particles, as well as the nature of their aggregation in the bulk polymer matrix. It makes use of the analysis of the scattering component. The main requirements for this non-destructive technique is that the pore or filler particle size are in the micrometer regime and that there is some difference in refractive indices and density between the polymer matrix and filler. Raman spectroscopy was used for the collaboration. The size distribution was determined and the structural properties were compared to results from electron microscopy.

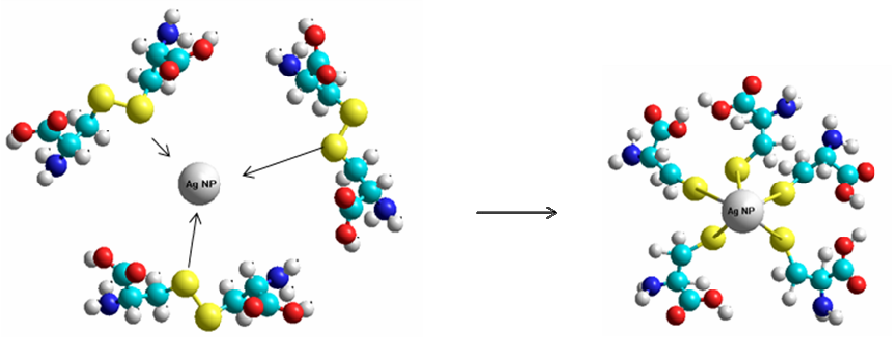


Raman spectra of polymeric composites based on polyvinylalcohol (PVA) (1) with different filling degree of TiO_2: 1% (2), 3% (3), 5% (4), 10% (5), and 20% (6).

C-2011b-5	P. Pakhomov	Tver State University	Supramolecular nanostructered hydrogels based on amino acid L-cysteine and silver ions
	E. Rühl	FU Berlin	

Olga Baranova (Tver), Visit to FU Berlin (October - December 2011)

In the course of this research, three most important aims were achieved: New structural information about L-cysteine based hydrogels was received, a new form of this gel with silver nanoparticles inside was synthesized, and the literature was screened. The main conclusions from this work are: The silver nanoparticles are present inside the cysteine-silver solution - gel precursor, as proven from first stages of synthesis by TEM and UV-visible spectroscopy. The silver nanoparticles are able to form structures of different shape and size in cystein-silver-water solution (CSS) and hydrogels. The presence of other types of particles of different chemical composition in cysteine-silver solutions is also possible. CSS is compatible with the usual cysteine-capped silver nanoparticles, whereby the gel formation ability in this case was kept. The mechanism of gel formation is a complicated process which includes interactions between supramolecular polymer chains and colloidal structures.

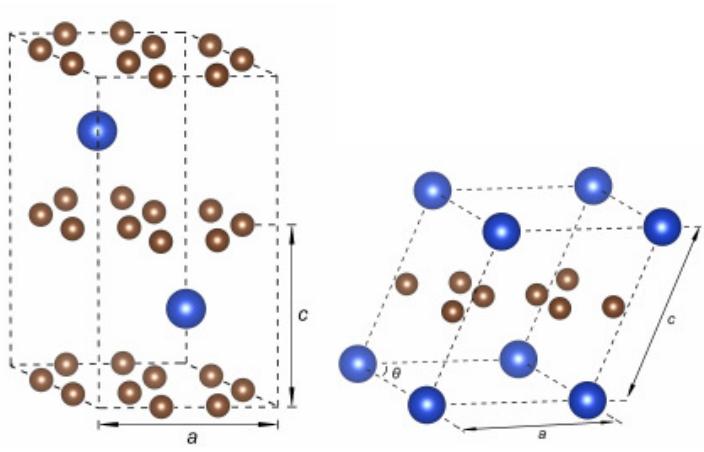


Binding of cystine on silver nanoparticles.

C-2012a-3	S. Kurbatov E. Voloshina/ B. Paulus	Southern Federal University Rostov/Don FU Berlin	Structural and magnetic properties of binary graphite 3d-transition metal intercalated compounds

Evgeny Grigoryev (Rostov/Don), Visit to FU Berlin (April - June 2012)

We performed a DFT study of binary graphite 3d-transition metal intercalated compounds with XC_6 stoichiometry and Cr, Mn, Fe, Co, Ni, and Cu as intercalants. The main aim of this work was a regularity elucidation of the phenomenon of inducing the magnetic moments in graphite. An ideal monolayer of graphite (that is graphene) is non-magnetic. However, the presence of any defects, especially introduction of 3d-transition metals, may lead to a significant increase of the magnetic moment of the system under consideration. There is an illustrative case of the studied CrC_6 intercalate in which the state with hexagonal structure has a high magnetic moment (3.29 μB), whereas in rhombohedral structure it is equal to zero. This is an important feature of graphite intercalation compounds, which may have wide technical application.

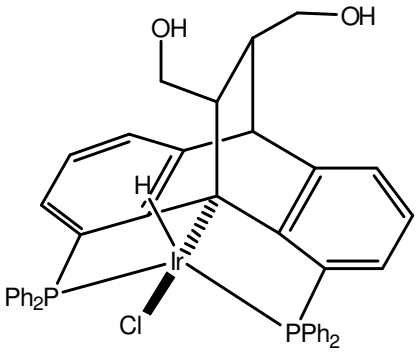


The unit cells of 3d-transition metal intercalated graphite compounds (XC_6; X = Cr, Mn, Fe, Co, Ni, Cu) in hexagonal (P63/mmc) and rhombohedral (R-3m) crystalline structures. The small solid spheres represent the carbon atoms of host graphite sheets, while large solid spheres represent transition metal atoms of guest intercalate sheets.

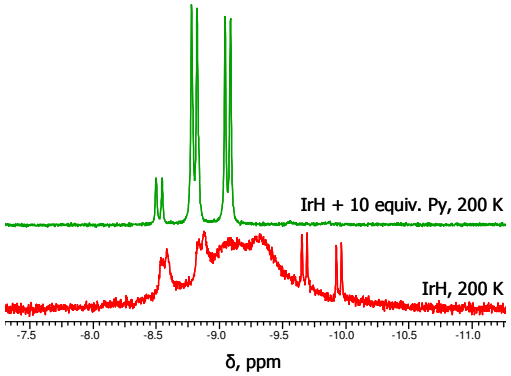
C-2012a-4	E. Shubina K. Weisz	Institute of Organo-element Compounds RAS, Moscow Universität Greifswald	Acid-base interactions involving polyfunctional transition metal hydrides

Gleb A. Silantyev (Moscow), Visit to Greifswald (April - May 2012)

Understanding the mechanisms of catalytic processes is a problem of great practical importance, since it contributes to the development of novel efficient catalysts. The catalytic reaction mechanism establishment is a non-trivial task and different approaches often have to be applied. Moreover, the mechanistic studies become complicated by the introduction of functional groups to an organometallic catalyst molecule. In the framework of this project we studied the polyfunctional pincer iridium complex which is a catalyst of acceptorless dehydrogenation of alcohols, and its interaction with reagents of different nature. Experimental data were provided by IR and NMR spectroscopy over a wide temperature range; the computational analysis was carried out at the DFT/B3PW91 level. The results obtained demonstrate the conformational flexibility of a PC(sp^3)P pincer iridium hydride which should be important in the catalytic process.



Complex under study (compound (1)).

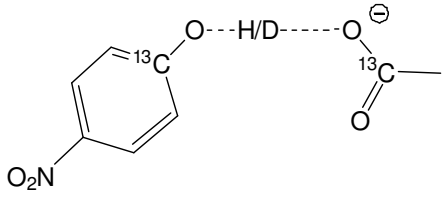


^{1}H NMR spectra (hydride region) of compound (1) of the complex under study without and with 10 equivalents of pyridine (Py), 200 K, CD_2Cl_2.

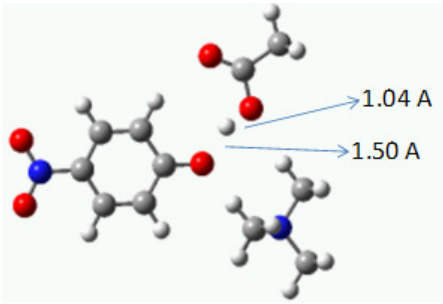
C-2012a-5	P. Tolstoy D. Sebastiani	St. Petersburg State University FU Berlin	Hybrid first-principles QM/MM simulations of strongly H-bonded complexes in aprotic polar media

Svetlana Pylaeva (St. Petersburg), Visit to Berlin (April - May 2012)

In this project we studied the influence of solvent fluctuations on the geometry of a strong hydrogen bond formed between 4-nitrophenol and acetate anion dissolved in dichloromethane. The characteristic time of such fluctuations – sub-nanosecond – is too fast for NMR detection and too slow for steady-state optical spectroscopy, meaning that in experimental spectra signals are either averaged out (NMR) or inhomogeneously broadened (UV). To interpret experimental spectra we performed quantum chemical calculations and *ab initio* molecular dynamics simulations. We show that bridging proton position is governed by the picoseconds-fast breaking and reformation of weak hydrogen bonds with solvent molecules and electrostatic interaction with the counter-ion. As a result, instead of a continuum of proton positions we obtain two groups of structures, distinct both geometrically and spectroscopically, so called proton tautomers. Such conformational isomerism explains most of our experimental findings and opens the way for the quantitative predictions of spectra influenced by rapid fluctuations of solvation shell configuration in similar systems.



H-bonded complex between 4-nitrophenol and acetate.



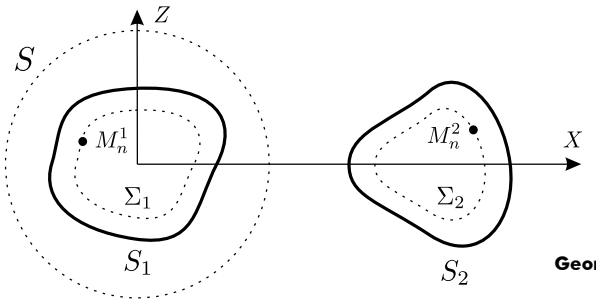
Optimized structure of the complex between 4-nitrophenol and the acetate anion with the counterion tetramethyl ammonium (TMA) in the gas phase.

Selected Projects in Mathematics

M-2011b-4	Yu. Eremin T. Wriedt	Lomonosov Moscow State University Universität Bremen	Application of the discrete sources method for Maxwell stress tensor computation

Alexandr Baryshev (Moscow), Visit to Bremen (July - August 2011)

For the first time the Discrete Sources Method has been applied to calculate Dyadic Green's function for a system of particles with an arbitrary shape. With the discrete sources method it was possible to calculate Dyadic Green's function for both perfect electric conducting and penetrable particles. The obtained function was used to determine and calculate Maxwell Stress Tensor. Having worked out the stress tensor we could calculate the Casimir force acting on a particle from the other particles in the system. All the corresponding algorithms have been realized in a form of Fortran code programs. The main program calculating the Casimir force was first utilized to calculate the force between two perfect electric conducting spheres at zero temperature. This case was chosen because of the corresponding results that were recently computed by other numerical methods. The investigation that our results for the Casimir force qualitatively resemble already available ones, but for lack of accuracy, coincidence of the results has not been reached. At the moment we are working to eliminate this drawback and will then move on to calculate the force for a system of arbitrarily shaped particles that reflect and penetrate at arbitrary temperatures.

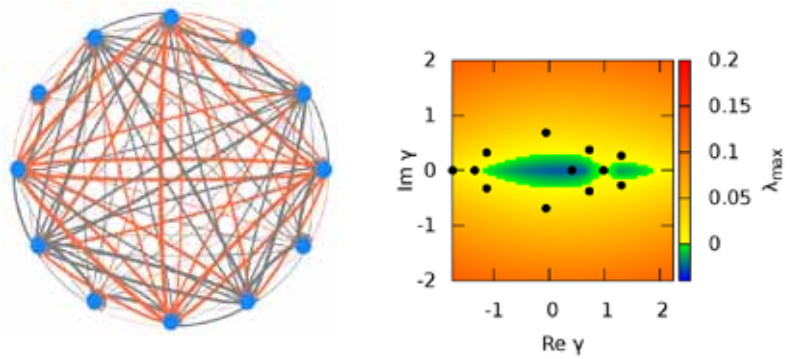


Geometry of the problem.

M-2012a-1	A. Fradkov E. Schöll	St. Petersburg State University TU Berlin	Adaptive time-delayed feedback control of synchronization

Judith Lehnert (TU Berlin), Visit to St. Petersburg State University (March - April 2012)

Networks play a prominent role in the research of very different fields, including social sciences, economics, psychology, biology, physics, and mathematics. The goal of this project was to show that adaptive networks can be used to control the dynamics of the network. As a model we used the Stuart-Landau oscillator which is the normal form of a Hopf bifurcation and therefore generic for many oscillating systems present in nature and technological applications. We assumed that the coupling between the nodes was time-delayed, as time delays naturally arise in many applications. We designed the adaption algorithm for the network links by using the speed-gradient (SG) method.

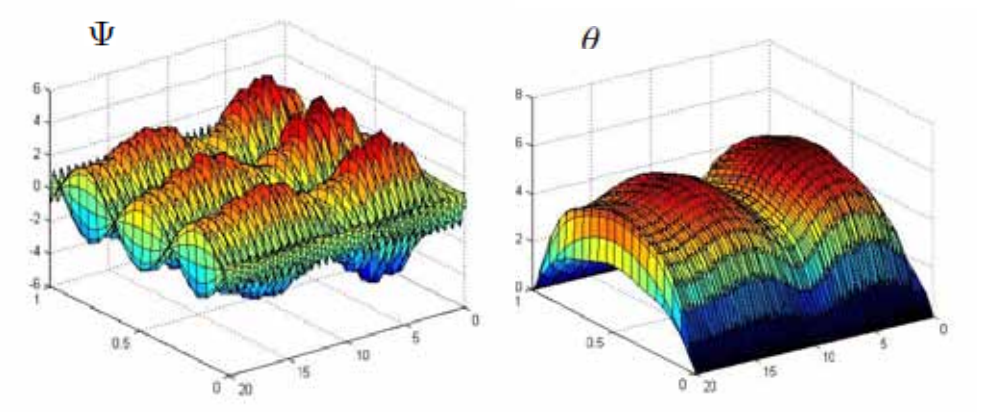


Evolution of the network topology (left-hand side) with the goal to achieve zero-lag synchronization. Gray: positive weighted links, red: negative weighted links. Node colors denote phase differences with respect to the first node. On the right-hand side, the master stability function (MSF) is shown for the final state.

M-2012a-7	V. Reitmann H. Kantz	St. Petersburg State University MPI for the Physics of Complex Systems Dresden	The use of determining functionals for observation of asymptotic dynamics of a microwave heating problem

Ilya Ermakov (St. Petersburg), Visit to Dresden (April 2012)

A coupled system derived from Maxwell's equations and the heat equation was studied. Under certain assumptions, it has been proven that the system has a finite number of determining functionals in a special non-autonomous sense. Physically, this means a finite number of degrees of freedom for the asymptotic dynamics. Using this approach, we obtained results on the existence of a finite system of pullback-determining functionals for the cocycle corresponding to the microwave heating problem. The first numerical experiments were conducted but a more informative experimental method has to be used for the investigation of determining functionals.



The figure was obtained from numerical experiments, which showed that the non-autonomous system has a nontrivial asymptotic behavior.

M-2012b-3	A. Skubachevskii P. Gurevich	Peoples' Friendship University of Russia FU Berlin	Reaction-diffusion systems with spatially distributed hysteresis: Numerical methods

Pavel Gurevich (FU Berlin), Visit to Peoples' Friendship University of Russia (August 2012)

The research visit dealt with reaction-diffusion equations with spatially-distributed hysteresis. Such equations arise when modeling chemical and biological processes with kinetics which depends on the concentration of the substances according to hysteresis law. The emphasis was put on developing numerical methods. We proved that the reaction-diffusion equation with spatially distributed hysteresis has a unique solution as long as this solution preserves the spatial topology of hysteresis. Furthermore, we have developed a numerical scheme which converges to the solution as long as the solution preserves the spatial topology of hysteresis. It remains unclear how one should model reaction-diffusion equations with spatially distributed hysteresis and which numerical schemes one should use if the transversality property fails.

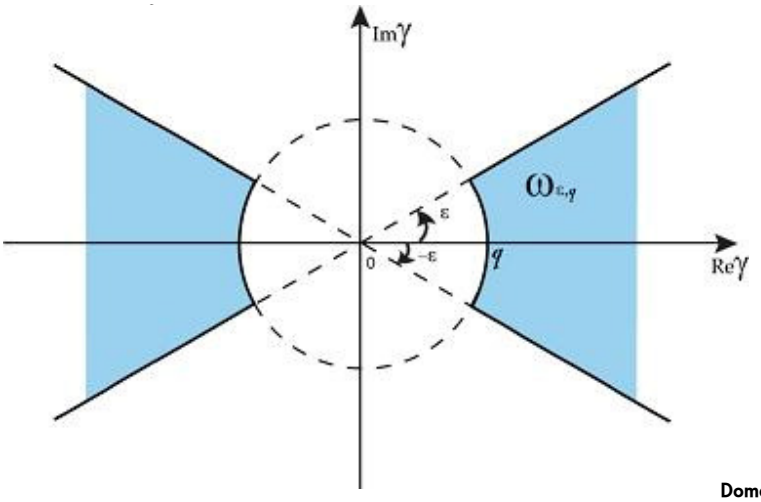
Concentration of bacteria on a Petri dish.

M-2011b-9	A. Skubachevskii	Peoples' Friendship University of Russia, Moscow	Stability and control of nonlocal spatio-temporal systems: Spectral theory of nonlocal elliptic problems
	B. Fiedler	FU Berlin	

Ksenia Darovskaya (Peoples' Friendship University of Russia),

Visit to Freie Universität Berlin (December 2011)

The goal of our project was to study the application of integral operators to neuroscience (reaction-diffusion processes and traveling pulses in the cerebrum), to biology (diffusion in a living cell), and to physics (control of temperature fields). We studied an ordinary differential operator of second order with nonlocal boundary conditions and a spectral parameter. Boundary conditions were given by the Riemann integrals which contained derivatives (or their linear combination) of the unknown function. In the Sobolev space and in the space of right-hand sides we introduced equivalent norms depending on the spectral parameter and on the type of integral conditions (for the space of right-hand sides). In terms of these norms we proved an *a priori* estimate of solution for sufficiently large values of the spectral parameter. Using the obtained estimate, we have derived spectral properties of the corresponding operators, so that the next step is to create a general theory of operators with integral conditions.



Domain $\omega_{s,q}$.

Funded Projects in Physics

Project No.	Principal Investigators	Location	Title of Project and Funded Person
		Fourth Funding Period (July-December 2011)	
P-2011b-1	A. Pavlychev E. Rühl	St. Petersburg State University FU Berlin	Spectral distribution of oscillator strength for X-ray transitions and line shape analysis of inner-shell excitations in free molecules, clusters, and solids Funded Person: Y. Krivosenko
P-2011b-2	A. Shikin O. Rader	St. Petersburg State University Helmholtz Zentrum Berlin	Study of anomalously large spin-orbit splitting structure of π-states of graphene on Ni(111) and Ni(100) Funded Persons: A. Popova, E. Zhizhin
P-2011b-3	V. Shabaev G. Plunien	St. Petersburg State University TU Dresden	Parity violation effects with doubly-excited states in heavy Li-like ions Funded Person: V. Zaytsev
P-2011b-4	N. Kasyanenko S. Santer	St. Petersburg State University U. Potsdam	Light-induced reversible DNA compaction by photosensitive surfactants Funded Persons: L. Lysyakova, E. Titov
P-2011b-5	V. Shabaev G. Plunien	St. Petersburg State University TU Dresden	Evaluation of the screened vacuum-polarization corrections to the hyperfine splitting in Li-like Bi Funded Person: O. Andreev
P-2011b-8	B. Novikov G. Gobsch	St. Petersburg State University TU Ilmenau	Investigation of photoreflection and luminescence in $Cd_{0.9}Mn_{0.1}Te$/CdMgTe and CdTe/MnTe/CdMgTe quantum well nanostructures Funded Person: V. Bogdanov
P-2011b-x	A. Shikin C. Laubschat, D. Vyalikh	St. Petersburg State University TU Dresden	Modification of structural properties in bacterial surface layers by alkali and earth-alkali metals Funded Person: A. Makarova
P-2011b-x1	A. Soldatov E. Aziz	Southern Federal University Rostov/Don Helmholtz Zentrum Berlin	X-ray spectroscopic study of materials in the liquid state: Local atomic and electronic structure Funded Person: M. Soldatov
P-2011b-x2	A. Soldatov E. Rühl	Southern Federal University Rostov/Don FU Berlin	Local and electronic structure of multi-valently bound amino ligands on noble metal nanoparticles: XANES and DFT analysis Funded Person: A. Kravtsova
P-2011b-x3	A. Soldatov W. Wurth	Southern Federal University Rostov/Don U. Hamburg	16-pole radiofrequency ion trap for spectroscopic investigations of physical properties and chemical reactivity of charged nanoclusters in the gas phase Funded Person: A. Guda

Project No.	Principal Investigators	Location	Title of Project and Funded Person
		Fifth Funding Period (January-June 2012)	
P-2012a-1	A. Shikin O. Rader	St. Petersburg State University Helmholtz Zentrum Berlin	Modification of the valence band spin structure of graphene on Ni(111) by joint intercalation of Bi and noble metals. Funded Person: A. Popova
P-2012a-2	L. Yashina O. Rader	Federal State Research and Design Institute of Rare Metal Industry, Moscow Helmholtz Zentrum Berlin	Photoemission study of layered bismuth chalcogenides Funded Person: V. Neudachina
P-2012a-3	E. Ivchenko S. Ganichev	Ioffe Institute of RAS, St. Petersburg U. Regensburg	Photogalvanic effects in semiconductor nanostructures Funded Person: G. Budkin
P-2012a-4	N. Kasyanenko S. Santer	St. Petersburg State University U. Potsdam	Light-induced reversible DNA compaction by photosensitive surfactants on negatively charged surfaces of varying density Funded Person: L. Lysyakova
P-2012a-5	N. Kasyanenko T. Liedl	St. Petersburg State University Ludwig-Maximilians U. München	Metallization of the DNA-origami structures on surfaces Funded Person: A. Puchkova
P-2012a-6	A. Pavlychev E. Rühl	St. Petersburg State University FU Berlin	New methods for line shape analysis of inner-shell excitations in free molecules, clusters, and solids Funded Person: Y. Kan
P-2012a-7	A. Pavlychev E. Rühl	St. Petersburg State University FU Berlin	Dynamic C 1s-hole localization and symmetry breaking effects in core-excited C_6H_6 in the gas phase, molecular C_6H_6-clusters and C_6H_6-solid and the $6a_{1g}$-line shape analysis of S 2p and F 1s excited SF_6 Funded Person: E. Klyushina
P-2012a-8	V. Shabaev G. Plunien	St. Petersburg State University TU Dresden	Ionization probabilities in low-energy heavy-ion collisions Funded Person: A. Bondarev
P-2012a-9	V. Shabaev G. Plunien	St. Petersburg State University TU Dresden	Determination of the nuclear charge radii from the isotope shifts in dielectronic recombination resonance spectra at heavy ion storage rings Funded Person: N. Zubova
P-2012a-10	I. Pronin C. Laubschat, D. Vyalikh	Ioffe Institute of RAS, St. Petersburg TU Dresden	The formation of ultrathin CO_2FeSi Heusler alloy films on silicon surfaces covered with a barrier layer Funded Person: G. Grebenyuk
P-2012a-11	N. Grigoryeva P. Lemmens, D. Menzel	St. Petersburg State University TU Braunschweig	Magnetic and temperature studies of ferromagnetic inverted opal-like structures by SQUID magnetometery Funded Person: A. Mistonov

Project No.	Principal Investigators	Location	Title of Project and Funded Person
P-2012a-12	V. Uzdin H. Zabel	St. Petersburg State University U. Bochum	Modeling of the magnetization reversal process in nanostructures Funded Person: M. Moskalenko
P-2012a-13	A. Soldatov M. Wilke	Southern Federal University Rostov/Don Helmholtz Zentrum Potsdam	Nanoscale atomic and electronic structure of geological materials: XANES, DFT and MD insights Funded Person: A. Kravtsova
P-2012a-14	V. Sivkov H. Ehrlich	RAS Komi Science Center, Syktyvkar TU Bergakademie Freiberg	XPS and NEXAFS study of the unique copper-containing biomineral from endemic Baikal Lake sponges Funded Person: O. Petrova
		Sixth Funding Period (July-December 2012)	
P-2012b-1	A. Shikin O. Rader	St. Petersburg State University Helmholtz Zentrum Berlin	Study of anomalously large spin-orbit splitting of π-states of graphene induced under contact of graphene with Au Funded Persons: E. Zhizhin, D. Pudikov
P-2012b-2	A. Shikin H. Zabel	St. Petersburg State University U. Bochum	Anomalously large spin-orbit splitting of quantum-well and surface states in ultrathin surface Bi-noble metal alloys on W(110) and W(100) Funded Person: I. Klimovskih
P-2012b-3	L. Labzowsky G. Plunien	St. Petersburg State University TU Dresden	The direct QED evaluation of the "two-photon" decay width in H-like ions Funded Person: T. Zalialiutdinov
P-2012b-6	V. Shabaev G. Plunien	St. Petersburg State University TU Dresden	Parity violation effects with doubly-excited states in heavy Li-like ions Funded Person: V. Zaytsev
P-2012b-8	E. Kramarenko S. Santer	Lomonosov Moscow State University U. Potsdam	Light-controlled reversible manipulation of microgel particle size using azobenzene-containing surfactant Funded Person: A. Rumyantsev
P-2012b-10	N. Kasyanenko T. Liedl	St. Petersburg State University Ludwig-Maximilians U. München	Metallization of three-dimensional DNA-origami structures Funded Person: A. Puchkova
P-2012b-11	V. Sivkov H. Ehrlich	RAS Komi Science Center, Syktyvkar TU Bergakademie Freiberg	Identification of chitin and spongin biopolymers within skeletons of endemic Baikal Lake sponges using XPS and NEXAFS spectroscopy methods Funded Person: O. Petrova
P-2012b-12	L. Yashina O. Rader	Federal State Research and Design Institute of Rare Metal Industry, Moscow Helmholtz Zentrum Berlin	Photoemission and photoelectron diffraction studies of layered bismuth chalcogenides Funded Person: V. Neudachina
P-2012b-13	E. Charnaya J. Haase	St. Petersburg State University U. Leipzig	Investigation of properties of metals under nanoconfinement Funded Person: D. Nefedov

Project No.	Principal Investigators	Location	Title of Project and Funded Person
P-2012b-15	N. Kasyanenko S. Santer	St. Petersburg State University U. Potsdam	DNA adsorption onto light-responsible surfaces Funded Person: L. Lysyakova
P-2012b-16	A. Golovin D. Rolles	St. Petersburg State University CFEL at DESY, Hamburg	Time-resolved photoelectron diffraction from aligned molecules Funded Persons: A. Golovin, D. Anielski
P-2012b-17	O. Vyvenko S. Santer	St. Petersburg State University U. Potsdam	Investigation on conductivity properties of thin metallic films on light sensitive polymers Funded Person: F. Linde
P-2012b-18	A. Saranin C. Laubschat, D. Vyalikh	Institute of Automation and Control Processes, Vladivostok TU Dresden	Photoemission insight into electronic properties of compound metal layers with 2D electron gas on the Si(111) surface Funded Person: L. Bondarenko
P-2012b-19	Y. Golubovskii D. Uhrlandt	St. Petersburg State University Das Leibniz-Institut für Plasmaforschung und Technologie Greifswald	Role of reabsorption and radiation trapping in ionization and recombination mechanisms in non-equilibrium plasma Funded Person: D. Kalanov
P-2012b-20	V. Chizhik, M. Shelyapina F. Fujara	St. Petersburg State University TU Darmstadt	^{1}H NMR study of hydrogen diffusion in new intermetallics for hydrogen storage Funded Person: A. Vyvodtseva
P-2012b-21	A. Pavlychev E. Rühl	St. Petersburg State University FU Berlin	L(E)⊗L$_{a}$(E)⊗G(E)-method for analysis of X-ray absorption and inner-shell photoemission spectra of free molecules, clusters, interfaces, and solids Funded Person: Y. Kan
P-2012b-22	V. Shabaev G. Plunien	St. Petersburg State University TU Dresden	Evaluation of the screened vacuum-polarization corrections to the hyperfine splitting in Li-like bismuth Funded Person: O.Andreev

Funded Projects in Geophysics

Fourth Funding Period (July-December 2011)

G-2011b-1	I. Makarova L. Dubrovinsky	Shubnikov Institute, RAS, Moscow U. Bayreuth	Study of pressure-induced structural transformations in bis(glycinium)oxalate by X-ray diffraction Funded Persons: A. Ivanova, S. Aksenov
G-2011b-2	B. Kashtan, V. Troyan V. Rok S. Shapiro	St. Petersburg State University University of Dubna FU Berlin	Seismic wave propagation and reflection in fractured fluid-saturated rocks Funded Persons: S. Glubokovskikh, I. Abakumov

Project No.	Principal Investigators	Location	Title of Project and Funded Person
		Fifth Funding Period (January-June 2012)	
G-2012a-1	V. Troyan V. Rok S. Shapiro	St. Petersburg State University University of Dubna FU Berlin	Seismic wave propagation and reflection in fractured fluid-saturated rocks Funded Person: R. Shigapov
G-2012a-2	B. Kashtan D. Gajewski	St. Petersburg State University U. Hamburg	Passive seismic localization of low-frequency microtremor signals Funded Persons: D. Anikiev, I. Abakumov
		Sixth Funding Period (July-December 2012)	
G-2012b-1	I. Makarova L. Dubrovinsky	Shubnikov Institute, RAS, Moscow U. Bayreuth	Study of pressure-induced structural transformations in labuntsovite by X-ray diffraction Funded Person: S. Aksenov
G-2012b-2	B. Kashtan D. Gajewski	St. Petersburg State University U. Hamburg	Joint interpretation of mono-typic and converted waves Funded Person: I. Abakumov
G-2012b-3	B. Kashtan, V. Troyan V. Rok S. Shapiro	St. Petersburg State University University of Dubna FU Berlin	Seismic wave propagation and reflection in fractured fluid-saturated rocks Funded Person: L. Danilovskaya
G-2012b-4	V. Troyan C. Böckmann	St. Petersburg State University U. Potsdam	Joint inversion of seismic and geoelectromagnetic data Funded Person: D. Molodtsov

Funded Projects in Physical Chemistry

		Fourth Funding Period (July-December 2011)	
C-2011b-1	K. Tokhadzhe C. Maul	St. Petersburg State University TU Braunschweig	Cavity ringdown spectroscopy of homo-nuclear diatomic molecules (O_2, Cl_2) Funded Person: P. Sergeev
C-2011b-2	V. Korotkov, K. Tokhadzhe K. Weisz I. Shenderovich	St. Petersburg State University U. Greifswald FU Berlin	Acridine as an extremely sensitive luminescence sensor of protonation Funded Person: Y. Rozhkova
C-2011b-3	A. Shulakov B. Paulus	St. Petersburg State University FU Berlin	First-principles calculations of the electronic structure and X-ray absorption/emission spectra of metal-based systems Funded Person: R. Ovcharenko
C-2011b-4	E. Shubina K. Weisz	RAS, Moscow U. Greifswald	Hydrogen bonding and proton transfer to ruthenium hydrides Funded Person: G. Silantiev

Project No.	Principal Investigators	Location	Title of Project and Funded Person
C-2011b-5	P. Pakhomov E. Rühl	Tver State University FU Berlin	Supramolecular nanostructured hydrogels based on amino acid L-cysteine and silver ions Funded Person: O. Baranova
C-2011b-6	A. Ganeev V. Hoffmann	St. Petersburg State University IFW Dresden	Semiconductor and dielectric sample analysis using pulsed glow discharge techniques Funded Person: A. Gubal
		Fifth Funding Period (January-June 2012)	
C-2012a-1	R. Talroze E. Rühl	Topchiev Institute of Petrochemical Synthesis (RAS), Moscow FU Berlin	Photoluminescence of nanoparticles organized by self-assembled liquid crystal polymer matrix Funded Person: G. Tselikov
C-2012a-2	P. Pakhomov E. Rühl	Tver State University FU Berlin	Spectroscopic identification of the sizes of scattering nanoparticles in polymer composites Funded Person: V. Sitnikova
C-2012a-3	S. Kurbatov B. Paulus	Southern Federal University Rostov/Don FU Berlin	Electronic structure and magnetic properties of the bilayer-graphene/Ni(111) interface Funded Person: E. Grigoriev
C-2012a-4	E. Shubina K. Weisz	RAS, Moscow U. Greifswald	Acid-base interactions involving poly-functional transition metal hydrides Funded Person: G. Silantiev
C-2012a-5	P. Tolstoy D. Sebastiani	St. Petersburg State University FU Berlin	Hybrid first-principles QM/MM simulations of strongly hydrogen-bonded complexes in aprotic polar media Funded Person: S. Pylaeva
C-2012a-6	O. Vyvenko E. Rühl	St. Petersburg State University FU Berlin	The electron- and ion microscopic facility of the Interdisciplinary Resource Center for Nanotechnology of Saint Petersburg State University for Educational and Research Purposes Funded Persons: D. Nordmeyer, P. Schmiel, A. Kopyshev, C. Krause
C-2012a-8	V. Korotkov I. Shenderovich	St. Petersburg State University U. Regensburg	The effect of the self-association of acridine on its luminescence in aprotic solutions Funded Person: Y. Rozhkova
C-2012a-10	S. Kashchenko E. Dittmann-Thünemann J. Fastner	Yaroslavl State University U. Potsdam Federal Environmental Agency, Berlin	Genetic investigations and physicochemical determination of cyanobacterial toxins in the water bodies of the Volga river basin Funded Person: S. Sidelev
C-2012a-11	V. Boyarskiy V. Raev	St. Petersburg State University TU Braunschweig	Pd-catalyzed cyanation of aryl halides Funded Person: E. Savicheva

Project No.	Principal Investigators	Location	Title of Project and Funded Person
		Sixth Funding Period (July-December 2012)	
C-2012b-2	P. Tolstoy I. Shenderovich, R. Gschwind	St. Petersburg State University U. Regensburg	NMR study of the elemental activation modes of hydrogen bonding and ion pairing in Brønsted acid catalysis Funded Person: A. Gurinov
C-2012b-4	Y. Tveryanovich, A. Manshina G. Leuchs, S. Christiansen	St. Petersburg State University MPI Erlangen	The investigation of the laser induced Au-Cu, Au-Ag nanoparticles deposition mechanisms Funded Person: A. Povolotckaia
C-2012b-6	A. Eremeyshvili L. Schomburg	Yaroslavl State University Berlin Charité – Universitätsmedizin	Stabilization of trace elements in human blood by drying for long-term storage and transportation in order to allow quantitative analysis after reconstitution Funded Person: E. Bakaeva

Funded Projects in Mathematics

		Fourth Funding Period (July-December 2011)	
M-2011b-2	S. Kashchenko S. Yanchuk	Yaroslavl State University HU Berlin	Asymptotic integration of dynamical systems Funded Person: P. Nesterov
M-2011b-3	S. Kashchenko T. Küpper	Yaroslavl State University U. Köln	Synchronization in nonlinear models of cognitive neural processes Funded Person: D. Glyzin
M-2011b-4	Y. Eremin T. Wriedt	Lomonosov Moscow State University U. Bremen	Application of the Discrete Sources Method for Maxwell stress tensor computation Funded Person: A. Baryshev
M-2011b-6	V. Reitmann B. Fiedler, P. Gurevich	St. Petersburg State University FU Berlin	Asymptotic analysis of the free boundary of a two-phase inductive heating problem Funded Person: D. Kalinichenko
M-2011b-7	A. Skubachevskii B. Fiedler, P. Gurevich	Peoples' Friendship University Moscow FU Berlin	Stability and control of nonlocal spatio-temporal systems. Reaction-diffusion systems with spatially distributed hysteresis Funded Person: P. Gurevich
M-2011b-8	A. Skubachevskii B. Fiedler, P. Gurevich	Peoples' Friendship University Moscow FU Berlin	Spatio-temporal dynamical systems: Stabilization in parabolic functional-differential equations Funded Person: A. Muravnik
M-2011b-9	A. Skubachevskii B. Fiedler, P. Gurevich	Peoples' Friendship University Moscow FU Berlin	Stability and control of nonlocal spatio-temporal systems. Spectral theory of nonlocal problems Funded Person: K. Darovskaya

Project No.	Principal Investigators	Location	Title of Project and Funded Person
		Fifth Funding Period (January-June 2012)	
M-2012a-1	A. Fradkov E. Schöll	St. Petersburg State University TU Berlin	Adaptive time-delayed feedback control of synchronization and propagation patterns in complex networks Funded Persons: J. Lehnert, T. Isele
M-2012a-2	A. Fradkov E. Schöll	St. Petersburg State University TU Berlin	Implementation of tools for E-teaching and initiation of joint seminars and lectures Funded Person: T. Dahms
M-2012a-3	A. Afendikov S. Liebscher, P. Gurevich	RAS, Moscow FU Berlin	Cosymmetries and bifurcations without parameters in applied problems Funded Person: A. Afendikov
M-2012a-5	R. Shamin W. Jäger	Peoples' Friendship University Moscow U. Heidelberg	Mechanisms for the formation of rogue waves. Funded Person: A. Yudin
M-2012a-6	N. Ratiner M. Väth	Voronezh State University FU Berlin	Compact teaching on topological degree for Fredholm nonlinear maps and its application Funded Person: N. Ratiner
M-2012a-7	V. Reitmann H. Kantz	St. Petersburg State University MPI Dresden	The use of determining functionals for the observation of asymptotic dyna mics of a microwave heating problem Funded Person: I. Ermakov
		Sixth Funding Period (July-December 2012)	
M-2012b-1	A. Fradkov E. Schöll	St. Petersburg State University TU Berlin	Robust and adaptive time-delayed feedback control of synchronization in complex networks Funded Person: E. Usik
M-2012b-2	V. Denisov W. Jäger B. Fiedler, P. Gurevich H.-O. Walther	Lomonosov Moscow State University U. Heidelberg FU Berlin U. Giessen	Compact course of interdisciplinary lectures "Stabilization problems for parabolic equations" Funded Person: V. Denisov
M-2012b-3	A. Skubachevskii B. Fiedler, P. Gurevich	Peoples' Friendship University Moscow FU Berlin	Reaction-diffusion systems with spatially distributed hysteresis: Numerical methods Funded Person: P. Gurevich
M-2012b-4	A. Skubachevskii E. Schöll	Peoples' Friendship University Moscow TU Berlin	Delay differential equations describing complex networks Funded Person: E. Schöll
M-2012b-5	A. Skubachevskii B. Fiedler, P. Gurevich	Peoples' Friendship University Moscow FU Berlin	Stability and control of nonlocal spatio-temporal systems: Functional differential equations with degeneration Funded Person: V. Popov

Project No.	Principal Investigators	Location	Title of Project and Funded Person
M-2012b-7	M. Roitberg L. Bordag	Higher School of Economics, Moscow Hochschule Zittau-Görlitz	Mathematical models of iliquidity on the financial markets Funded Person: I. Yamshchikov
M-2012b-8	S. Kashchenko U. Bandelow, A. Vladimirov	Yaroslavl State University WIAS Berlin	Compact course of interdisciplinary lectures "Nonlinear dynamics in laser systems with mode-locking" Funded Person: I. Kashchenko
M-2012b-9	M. Komarov A. Pikovsky	Nizhny Novgorod State University U. Potsdam	Resonance interaction in communities of phase oscillators Funded Person: M. Komarov
M-2012b-10	V. Reitmann H. Kantz	St. Petersburg State University MPI for the Physics of Complex Systems, Dresden	Time-series analysis for a physical systems described by the Maxwell-Dirac equations Funded Person: S. Popov

Funded G-RISC Workshops

W-2010-b2	A. Skubachevskii	Steklov Mathematical Institute, Moscow (August 20-22, 2011)	Spatio-Temporal Dynamical Systems Number of Participants: 40
W-2011b-1	M. Suhm	U. Göttingen (September 11-12, 2011)	Graduate Student Research School on "Hydrogen Bonds between the Disciplines" Number of Participants: 53
W-2011-b2	A. Shikin	St. Petersburg State University (November 14-18, 2011)	The second Russian-German interdisciplinary International student conference "Science and Progress" Number of Participants: 238
W-2012a-1	E. Rühl	FU Berlin (May 19-21, 2012)	German-Russian Conference on Fundamentals and Applications of Nanoscience Number of Participants: 145
W-2012b-1	A. Shikin	St. Petersburg State University (November 12-16, 2012)	The third Russian-German Interdisciplinary International Student Conference „Science and Progress" Number of Participants: 170

Selected G-RISC Publications in Peer Reviewed International Journals

1. D. Usachov, V. K. Adamchuk, D. Haberer, A. Grüneis, H. Sachdev, A. B. Preobrajenski, C. Laubschat, and D. V. Vyalikh
„Quasi freestanding single-layer hexagonal boron nitride as a substrate for graphene synthesis"
Phys. Rev. B **82**, 075415 (2010).

2. M. A. Komarov, G. V. Osipov, and M. S. Burtsev
„Adaptive functional systems: Learning with chaos"
Chaos **20**, 045119 (2010).

3. I. I. Tupitsyn, Y. S. Kozhedub, V. M. Shabaev, G. B. Deyneka, S. Hagmann, C. Kozhuharov, G. Plunien, and Th. Stöhlker
„Relativistic calculations of the charge-transfer probabilities and cross sections for low-energy collisions of H-like ions with bare nuclei"
Phys. Rev. A **82**, 042701 (2010).

4. K. M. Lange, R. Könnecke, S. Ghadimi, R. Golnak, M.A. Soldatov, K.F. Hodeck, A. Soldatov, and E.F. Aziz
„High resolution X-ray emission spectroscopy of water and aqueous ions using the micro-jet technique"
Chem. Phys. **377**, 1 (2010).

5. J. Lehnert, P. Hövel, V. Flunkert, P. Yu. Guzenko, A. L. Fradkov, and E. Schöll
„Adaptive tuning of feedback gain in time-delayed feedback control"
Chaos **21**, 043111 (2011).

6. K. M. Lange, R. Könnecke, M. Soldatov, R. Golnak, J.-E. Rubensson, A. Soldatov, and E. F. Aziz
„On the origin of the hydrogen-bond-network nature of water: X-Ray absorption and emission spectra of water–acetonitrile mixtures"
Angew. Chem. Int. Ed. **50**, 106215 (2011).

7. D. Usachov, O. Vilkov, A. Grüneis, D. Haberer, A. Fedorov, V. K. Adamchuk,A. B. Preobrajenski, P. Dudin, A. Barinov, M. Oehzelt, C. Laubschat, and D. V. Vyalikh
„Nitrogen-doped graphene: Efficient growth, structure, and electronic properties"
Nano Lett. **11**, 5401 (2011).

8. A.A. Popova, A.M. Shikin, A.G. Rybkin, D.E. Marchenko, O.Yu. Vilkova, A.A. Makarova, A.Yu. Varykhalo, and O. Rader
„The role of the covalent interaction in the formation of the electronic structure of Au- and Cu-intercalated graphene on Ni(111)"
Phys. Solid State **53**, 2539 (2011).

9. A.A. Gurinov, Y.A. Rozhkova, A. Zukal, J. Cejka, and I.G. Shenderovich
„Mutable Lewis and Brønsted acidity of aluminated SBA-15 as revealed by NMR of adsorbed pyridine-^{15}N"
Langmuir **27**, 12115 (2011).

10. S. Kong, A.O. Borissova, S.B. Lesnichin, M. Hartl, L.L. Daemen, J. Eckert, M. Yu. Antipin, and I.G. Shenderovich
„Geometry and spectral properties of the protonated homodimer of pyridine in the liquid and solid states. A combined NMR, X-ray diffraction and inelastic neutron scattering study"
J. Phys. Chem. A **115**, 8041 (2011).

11. M.V. Vener, S.S. Kong, A.A. Levina, and I.G. Shenderovich
„Spectroscopic signatures of $[H_9O_4]^+$ and $[H_{13}O_6]^+$ ions in a polar aprotic environment revealed under DFT-PCM approximation"
Acta Chim. Slov. **58**, 402 (2011).

12. A.A. Selivanov, J. Lehnert, T. Dahms, P. Hövel, A.L. Fradkov, and E. Schöll
„Adaptive synchronization in delay-coupled networks of Stuart-Landau oscillators"
Phys. Rev. E **85**, 016201 (2012).

13. R. Flesch, E. Serdaroglu, F. Blobner, P. Feulner, X. O. Brykalova, A. A. Pavlychev, N. Kosugi, and E. Rühl
„Gas-to-solid shift in C 1s-excited benzene"
Phys. Chem. Chem. Phys. **14**, 9397 (2012).

14. P.L. Gurevich
"Periodic solutions of parabolic problems with hysteresis on the boundary"
Discrete Cont. Dyn. Syst. A **29**, 1041 (2011).

15. P.L. Gurevich and S.B. Tikhomirov
"Uniqueness of transverse solutions for reaction-diffusion equations with spatially distributed hysteresis"
Nonlinear Anal.: Theory, Methods and Applications **75**, 6610 (2012).

16. O.V. Andreev, D.A. Glazov, A.V. Volotka, V.M. Shabaev, and G. Plunien
"Evaluation of the screened vacuum-polarization corrections to the hyperfine splitting of Li-like bismuth"
Phys. Rev. A **85**, 022510 (2012).

17. A.V. Volotka, D.A. Glazov, O.V. Andreev, V.M. Shabaev, I.I. Tupitsyn, and G. Plunien
"Test of many-electron QED effects in the hyperfine splitting of heavy high-Z ions"
Phys. Rev. Lett. **108**, 073001 (2012).

18. K.M. Lange, M. Soldatov, R. Golnak, M. Gotz, N. Engel, R. Könnecke, J.-E. Rubensson, and E.F. Aziz
„X-ray emission from pure and dilute H_2O and D_2O in a liquid microjet: Hydrogen bonds and nuclear dynamics"
Phys. Rev. B **85**, 1551014 (2012).

19. E. Schöll, A. Selivanov, J. Lehnert, T. Dahms, P. Hövel, and A. Fradkov
„Control of synchronization in delay-coupled networks"
Int. J. Mod. Phys. B **26**, 124007 (2012).

20. Yu. A. Rozhkova, A. A. Gurinov, A. O. Orlova, V. G. Maslov, I. G. Shenderovich, and V. I. Korotkov
"Spectrophotometric investigations of protonated forms of heterocyclic compounds"
Opt. Spectrosc. **113**, 275 (2012).

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