

Hinweise und Formular zum Zwischenbericht

Bei Vorhaben, die für zwei oder mehr Jahre gefördert werden, erwartet die VolkswagenStiftung jährliche Zwischenberichte. Bitte übersenden Sie diese elektronisch (.doc bzw. .docx oder .pdf) **und** in Papierform. Über Vorhaben in Förderinitiativen, zu denen die Antragstellung auf Englisch erfolgt, sollte in englischer Sprache berichtet werden (mit einer kurzen Zusammenfassung in Deutsch).

Im Interesse an der Weiterentwicklung ihrer Förderinitiativen legt die Stiftung Wert auf eine systematische Evaluierung von Projekten. Eine wesentliche Voraussetzung dafür sind vergleichbare Berichte. Wissenschaftliche Publikationen sind willkommen. Sie ersetzen aber nicht einen Zwischenbericht. Bitte nutzen Sie dafür das folgende Formular. Sollten einzelne Punkte des Formulars für Ihr Vorhaben nicht zutreffen, können sie übersprungen werden.

Titelblatt	
Förderinitiative	Between Europe and the Orient - A Focus on Research and Higher Education in/on Central Asia and Caucasus
Aktenzeichen	Az. 86 260
Titel des Vorhabens	Regional Training Network in Theoretical Physics
Projektleiter/innen und Kooperationspartner/innen	University of Bonn Tbilis State University Yerevan State University University of Siegen (joined at a later stage)

Textteil des Zwischenberichts (bitte nicht mehr als 6 Seiten)

Wissenschaftliche Ergebnisse und erzielte Fortschritte (etwa 2 – 4 Seiten)

The funding of the project „Regional Training Center in Theoretical Physics“ was approved in December, 2012. The project has been officially launched in March 2013 during the Inaugural Workshop at Tbilisi State University.

The stated goals of the Network in the first funding period, among others, included:

- Facilitation of the increased collaboration between German, Georgian and Armenian scientists, creation of a common educational space in theoretical physics.
- Participation of the German universities in bringing the level of PhD training in theoretical physics in Georgia and Armenia closer to the international standards, creation of common PhD programs.
- Delivery of distant PhD courses, using videoconferencing means.
- Facilitation of the student/lecturer mobility.
- Co-supervision of PhD theses by the co-supervisors from the different Universities.
- Organization of scientific workshops and a PhD school in theoretical physics on the yearly basis.

Below, we shall present a critical assessment of the implementation of the goals listed here, consider the lessons learned during the implementation of the project and present an upgraded proposal for the second funding period.

1. Memorandum of understanding, creation of the common PhD programs and the launch of the Network.

On the sidelines of the workshop held in Tbilisi, 13-14 March, 2013, the representatives of the Universities of Bonn, Tbilisi and Yerevan have signed the **Memorandum of Understanding** that implied the creation of a common PhD program in theoretical physics. Later, the Memorandum was joined by the University of Siegen. According to the decision of the representatives of the Universities, the functions of the Regional Training Network, among others, include the implementation of the Memorandum. In particular, the Network should help the students to enlist for PhD studies at other Universities, which are also the members of the Network. Moreover, the co-supervisors should be assigned, so that a student, while working on his/her thesis, could spend a significant amount of time at the guest University.

Within the Network, we have two PhD students from Georgia (A. Agadjanov and D. Agadjanov, supervisors U.-G. Meißner and A. Rusetsky from Bonn), who started to work on their PhD theses in 2012. In addition, the PhD thesis by A. Saghatelian from Yerevan (defended in 2014) was co-supervised by A. Nersessian (Yerevan) and M. Gogberashvili (Tbilisi). Several more PhD, Master and Bachelor students are taking part in the activities of the Network. The full list of all theses is given in a separate sheet.

2. Delivering the PhD lectures.

The following advanced lecture courses have been prepared and (mostly) delivered at Tbilisi and Yerevan Universities. Part of these lectures have been delivered at distance, by using videoconferencing means.

- Integrable models in String Field Theory by George Jorjadze (TSU) (summer semester 2015)
- Introduction to physics of quarks with flavour and colour by Alexander Khodjamirian (USi) (summer semester 2015)
- Introduction to Path Integrals by Akaki Rusetsky (UB) (summer semester 2015)
- Physical Methods in Biology by Tamaz Mdzinarashvili (TSU) (winter semester 2014/2015)
- Statistical Physics and Thermodynamics of Macromolecules by Yevgeni Mamasakhlisov (YSU) (winter semester 2014/2015)
- QCD by Akaki Rusetsky (UB) (winter semester 2013/2014)
- QCD, part 2, by Akaki Rusetsky (UB) (summer semester 2014)
- Theory of Integrable Systems and Their Applications by David Karakhanyan (YSU) (winter semester 2014/2015)
- Gravitation and Cosmology by Merab Gogberashvili (TSU) (prepared)
- Basics of Two-dimensional Conformal Field Theory with Defects and Boundaries by Gor Sarkissian (YSU) (winter semester 2014/2015)
- Introduction to quantum statistical thermodynamics by Armen Allahvedyan (YSU) (to be delivered)
- Introduction to Quantum Spin chains by Vadim Ohanian (YSU) (to be delivered)

3. Videoconferencing equipment

VolkswagenStiftung has supported the purchase of 3 videoconferencing devices, which have been installed at the Universities of Bonn, Tbilisi and Yerevan. Following the initial agreement, the Tbilisi State University carried out the renovation of the rooms, which were allocated to the Network and where the videoconferencing device was installed. The University of Siegen possesses a similar device as well.

At the moment, the devices are already used for the transmission of the lecture courses at distance. Transmitting scientific seminars is also planned.

4. Schools and workshops

Up to now, two Autumn schools for the PhD students and several scientific workshops have been held under the aegis of the Regional Training Network. The list of all events is given in a separate sheet.

Holding such events we consider as one of **the biggest successes** of our Network. The schools in 2013 and 2014 hosted not only the Georgian, Armenian and German students, but many students from neighbouring countries. In our opinion, early contacts between the future colleagues, who will tomorrow represent the scientific elite in their countries is an extremely important thing to do. In the same vein, the scientific workshops gather many active scientists in the region, as well as many leading specialists from all over the world.

Moreover, to the best of our knowledge, our schools and workshops are one of the very few events in the field of theoretical physics, which are regularly held in the region. **For this reason, we believe that the Regional Training Network has a potential to consolidate not only Georgian and Armenian physicists, working in this field, but become attractive for the scientists and students from the wider region, including the countries like Turkey, Iran, Azerbaijan, Ukraine, Russia, possibly others as well. In the perspective, we consider a possibility to create an East European & Central Asian (EECA) Network (School) in Theoretical Physics, with the participation of the researchers and students from the above countries.**

In case of success, the scientific, educational and social implications of this fact could not be underestimated.

5. Scientific and student exchanges

The Network has facilitated the lecturer/student mobility between German, Georgian and Armenian Universities. The German participants of the network have regularly attended the events organized in Georgia and Armenia. There have been visits of the Georgian and Armenian scientists and students to Germany, as well as exchanges between Tbilisi and Yerevan.

We would like to especially stress that the Network has been focused to promote the student mobility, namely, the visits to the German Universities, participating in various PhD schools & conferences, as well as student exchanges between Georgia and Armenia.

6. Network webpage

For normal functioning of the network, a web page was created, where, in particular, all students have an open access to the materials of all lecture courses, delivered within the Network. This is vitally important, especially for the lecture courses, which are delivered at a distance, using videoconferencing. In addition, the webpage contains all information about the activities of our Network.

The address of our webpage is: <http://training.hepi.edu.ge/rtn/>.

7. Grid cluster

In the original proposal, we have requested some financing for the normal functioning of the grid clusters in Tbilisi and Yerevan. Since we have got some additional funding for the grid clusters from the national agencies, we have re-allocated part of this money for other needs. In the future, we have decided not to request funding for the grid cluster.

8. Publications

In a separate sheet, we provide a list of publications of all scientists united in the project. In addition, we provide the offprints of the papers where our students were involved.

Selbsteinschätzung im Vergleich mit den ursprünglichen Zielen und Planungen (z.B. unerwartete Ergebnisse, andere inhaltliche/methodische Abweichungen)

The main lesson we have learned in the first funding period is that we can not limit our work to the PhD students only. We have to start working with the bachelor/master students, otherwise, when the students reach the PhD level, the vast majority of the best students is already “booked off.” Moreover, according to our experience, many gaps in the education emerge earlier, and it is more efficient to bridge them immediately.

This deficiency became clear to us at a rather early stage of our project, and we acted accordingly. Our lectures were attended by the master and even bachelor students. We have adjusted the level of the delivered lectures accordingly. It is, however, important not to reduce the complexity of the courses further. Our advanced courses should remain **complementary** to the University courses and **not** merely **double** them.

The second lesson that we have learned is that the videoconferencing of **all lectures** is not necessary or desirable. Sometimes, there are not enough interested students on the other end of the wire. One has to hold some lectures locally, without videoconferencing. Since the videoconferencing is more demanding for a lecturer, it would be fair, that the compensation for delivering a course locally is smaller than a standard sum envisaged for a lecturer.

Last but not least, as already mentioned above, the PhD schools, organized so far, immediately went beyond the Georgian-Armenian format. Many students from the neighboring countries attended the events. **In the future, it seems very reasonable to widen the geography of our Network.** Broadcasting/receiving the lectures and seminars to other Universities could be one option, apart from the participation in the PhD schools.

To summarize: we have an overall positive assessment of the Network activities during the first funding period, which expires in fall, 2015, and we apply for the cost-neutral extension of the project during the next 18 months (see the detailed application in a separate sheet). Moreover, we believe that it will be important to get the project financed in a second funding period, where all the lessons learned so far will be taken into account and the detailed exit strategy will be gradually implemented in cooperation with national as well as international funding agencies. We plan to submit an application for the second funding period in due time.

Erkenntnisgewinn durch interdisziplinäre und internationale Zusammenarbeit

The project has definitely gained momentum after a relatively slow start, since a lot of technical and administrative problems had to be solved first. This can be seen, for example, in a sharp increase of the number of the prepared/delivered lecture courses per semester. Moreover if, in the beginning, most of the lectures were delivered by German partners, now the center of activity is shifted towards TSU and YSU. We consider this to be one of the biggest gains of the international cooperation.

Moreover, the Regional Training Network provides ample possibilities for the students and young academics from the region to establish direct contacts with the leading experts in the field. It should be pointed out that many students, which have been associated with the network in this period have used this opportunity participating in the autumn school, as well attending the lectures delivered by the researchers from partner Universities.

Öffentlichkeitsarbeit und Medienresonanz

The outreach is one of the important spheres of activity of the Network. We give list of related publications in the media outlets separately.

Weitere Aspekte (z.B. besonders förderliche oder hemmende Umstände, Kooperationserfahrungen)

It should be pointed out that the local administrations both in Georgia and Armenia have shown themselves cooperative towards our project. It would be stressed that, up to now, we often managed to get a substantial co-financing of our events from the national funding agencies and Universities.

Tabellarischer Anhang

<i>Beteiligte Forscher/innen und Studierende mit Angaben zur institutionellen Anbindung und Finanzierungsquelle</i>	See a separate sheet
<i>Weitere Kooperationspartner/innen</i> (sofern nicht selbst Antragsteller)	
<i>Veröffentlichungen und Abstracts mit direktem Projektbezug</i> (bitte Sonderdrucke oder Belegexemplare beifügen)	See a separate sheet
<i>Projektbezogene Veranstaltungen</i> (Programm, Teilnehmerliste, Abstracts und weitere Details können gesondert beigefügt werden)	See a separate sheet
<i>Patente mit direktem Projektbezug</i>	

