Bogoliubov Laboratory of Theoretical Physics of the Joint Institute for Nuclear Research

The Bogoliubov Laboratory of Theoretical Physics (BLTP) is a part of the Joint Institute for Nuclear Research (JINR), a huge international center comprising experimental facilities of nuclear and high energy physics located at Dubna near Moscow.

Nowadays, BLTP is a big research institution in theoretical physics with scientific staff of about 170 researchers, half of them working on fixed-term contracts. Since its creation more than 45 years ago, our Laboratory has been the nest of the prominent schools in quantum field theory, theoretical nuclear physics, and statistical physics founded by Blokhintsev, Bogoliubov, and Markov. Among the merits of the Bogoliubov Laboratory are the practice of interdisciplinary research in these fields of theoretical physics and the interaction between theorists and experimentalists.

Computer facilities of BLTP include more than a hundred PC's and workstations joined by local network. They are regularly upgraded to maintain the international standard level. Via the JINR network, our Laboratory is connected with major world communication and information networks.

The Joint Institute at Dubna is an indispensable center of international cooperation in fundamental physics for scientists of the countries from the former Soviet Union (FSU), European and some Asian countries. Its developed infrastructure, comfortable location (130 km north of Moscow, 90 km of International Sheremetyevo airport, and 5 km of earth satellite station) on the bank of the Volga river and picturesque surroundings make it an outstanding place in Russia for hosting international meetings.

The BLTP has a great deal of international contacts. We organize numerous conferences, schools, and workshops on different topics in theoretical physics. Traditionally, we have good relations with leading theoretical institutions of the JINR Member States and many other countries.

An important part of JINR's activities is connected with the education and training of young scientists and students. The JINR has a special training center for M.Sc. and Ph.D. students, with members of the BLTP staff participating in the teaching process. About 20 graduate students have completed their doctoral theses at the Bogoliubov Laboratory for the last two years. Many of our senior staff members are supervising doctoral theses, professors of the staff are lecturing at Moscow, Tver', Ivanovo State Universities and some other Educational Institutions.

PREFACE

In 2001 — 2002, the Bogoliubov Laboratory of Theoretical Physics was even more active in research than in the previous 1999 — 2000 period. This can be seen by looking into the list of publications as well as by reading the short reports written by our leading scientists. In particular, there appeared more publications on new topics, for example, on astroparticle physics, new nonperturbative methods in QFT, noncommutative theories, nonlinear problems, etc. The changing priorities of research may also be seen from the list of themes and projects it is not identical to the list in the 1999 — 2000 report, and more changes will show up next year when the themes will be renewed.

At present, the main correction of the research priorities is the formation of the new theme **Modern Mathematical Physics**. In the last several years a group of theorists (of different age, including quite young scientists), which was working on modern problems in the borderland between Physics and Mathematics, developed into an internationally recognized collective. It is thus quite natural that from 2003 there will be four themes at BLTP. In future, it might be as well reasonable to organize a project related to research on **Astroparticle Physics**. It might be an interdisciplinary research project combining scientists with different background from nuclear to particle and mathematical physics. The first phase might be based on extending the existing collaboration with scientists and centers that are more experienced in this field.

The geography of the BLTP **scientific collaboration** is markedly extending and theorists of BLTP seem to be in high demand all over the world. The collaboration programs with Germany, Poland, Czechia, Slovakia, INFN, CERN continue to work successfully. In addition, BLTP theorists are supported by national and international foundations (RFBR, INTAS, etc.). There are also numerous individual collaboration programs, many of which were triggered by the above-mentioned collective programs. It is also important that now we have more collaboration with experimentalists, including experimental laboratories of JINR, but one can see that the growting potential in this field is not fully realized. We think that both experimentalists and theorists should be blamed for this and new approaches should be attempted to improve work in the borderland between Theory and Experiment.

Unfortunately, BLTP has not only successes. There is a dark side behind this apparently serene facade. We have long-standing and **deep problems** the optimum solution of which shooled be looked for. The main two problems are: **low salaries** and **aging of the staff**. These two problems are common for all laboratories and are even more severe in the majority of Russian scientific institutes. Moreover, these problems are interrelated. Shamefully, low salaries and obviously insufficient financing of the fundamental research are the main reasons for young gifted men and women to avoid scientific careers. This results in severe diminishing of the flow of young talents into fundamental research which may render our science lifeless in the very near future.

A similar tendency exists in other countries, including some JINR Member States, though the reasons for this phenomenon may be different in different countries. For

example, in some countries, universities and research institutions experience these days a severe reduction in the number of permanent positions to absorb well established and renown young scientists. This discourages newcomers. There is however also a fundamental and common reason for this in the downgrading of general public education in schools and even in some universities. Scientific studies become generally much more difficult to young people. General disaffection occurs that deviates also the inflow of still existing young talents.

We, scientists, cannot do very much to overcome this general tendency. However, the international community of scientists can use the present resources to support at least the future of science which is mostly located in finding, attracting and educating of young talents. We should try to do something so that not all of the best young people go over to computer or car industry, banking, telecommu-nications, etc. Our aim should be to keep with us in fundamental science at least a small portion of young idealists who could keep the intensity of research above the stagnation level which is now dangerously close, as it was pointed out recently by several prominent personalities. This problem can be solved only by **coordinated efforts of scientists of all countries** who should keep high the level of guard against a fatal downgrading of fundamental science throughout the world. Today, in the most farsighted countries there exist several programs for supporting education and research.

As a modest contribution (unfortunately, very modest) to this work, BLTP recently proposed a new program

Dubna International Advanced School of Theoretical Physics (DIAS-TH).

It is based on the existing activity of the Bogoliubov Laboratory in supporting international cooperation in research, and its aim is to strengthen the educational (research - training) component of this activity. This may be of interest to both non-participating and participating countries of JINR.

BLTP has a good record in organizing international workshops and schools in Dubna. This activity was successful even in the worst times when financing was extremely low. Especially useful may be the format of **research workshop and school** (RWS for brevity) consisting of lecture courses, topical lectures, and of original reports given by both lecturers and participants. The examples of RWS are: *"Calculations for Modern and Future Colliders"*, 9 – 23 July, 2000; *"Quantum Gravity and Superstrings"*, 18 – 28 June, 2001; *"Heavy Quark Physics"*, May 27 – June 5, 2002. All these RWS originally were Research Workshops and their transformation to RWS became possible due to a generous financial support of the Federal Ministry for Education, Research and Technologies of Germany (BMBF). The purpose of this additional support initiated by Prof. H.Rollnik (University of Bonn) and Dr. H-F.Wagner (BMBF) was to organize JINR German schools (with inviting participants also from FSU states). So the first RWS was organized by inviting several lecturers, postgraduates, and students to the planned workshop. The school components of the second and the third RWS were organized in a more systematic way because the sources of financing were known in advance (although the financial status of the second school became clear only 4 months

before its beginning. Note that the first and the third schools were organized almost exclusively by using BMBF money (with a small addition of the Russian (RFBR) and Heisenberg-Landau (HLP) grants) while the bigger second RWS used several sources (BMBF, INTAS, UNESCO ROSTE, RFBR, HLP and some other grants). In addition, in 2002, the school *"Quantum Statistics and Many-Particle Systems"* (July 21 – August 10) was organized which used exclusively the German grant (DAAD).

Analyzing the experience with organizing the mentioned schools we may infer that the **crucial conditions** for their success are the following: **proper financing** (including travel money for lecturers and participants), careful **advanced planning** (including the sources of financing), **proper advertising** in the internet and by other means, **wide dissemination** of lectures in any reasonable form (digital photo and video, scanned transparencies, more standard printed texts). To satisfy these requirements DIAS-TH should be a sort of a superstructure of BLTP which organizes and controls all educational programs for students, postgraduates, young scientists. **DIAS-TH should function continuously** and the standard short schools (about 3-4 a year) should be organized coherently (with correlated programs, organizing committees, etc.). DIAS-TH should also be correlated with other educational programs existing in Dubna, such as the JINR University Center common programs on modern theoretical physics, workshops for students and young scientists should be envisaged.

The main **topics** of the activity of DIAS should be centered around the most important directions of research at BLTP. At present there are four principal directions of research (themes) at BLTP (the fourth, Modern Mathematical Physics starts from January 2003). In addition, there are plans to organize research in Astroparticle Physics and Cosmology and this topic should be included in the the DIAS activity.

The unique features of DIAS-TH will be the following: wide participation of the students from Europe (Germany, Poland, Czechia, Slovakia, Bulgaria, Romania, possibly, Italy, France), from Russia (Moscow, St. Petersburg, Tomsk, Irkutsk, Vladivostok, Saratov, etc.), from FSU (Ukraine, Byelarus, Armenia, Georgia, Moldova, etc.); participation of the leading physics institutes of Russia (ITEP, Lebedev, Steklov, Landau institutes, Moscow University, etc.) and of FSU with which JINR is connected by different agreements; support of special programs in the framework of the JINR budget (HLP, Bogoliubov Infeld, Blokhintsev Votruba Programmes); economizing organizational spending by using of JINR infrastructure and facilities. In addition to the above-mentioned programs, one may hope to get support from BMBF, UNESCO, RFBR and from other organizations supporting international research and education. For example, the School of Modern Mathematical Physics of DIAS-TH was proposed to participate in a net of schools supported by European Union in 2004 — 2008 (Marie Curie program). There may exist other possibilities that should be tried. For example, an international research training project on Modern Mathematical Physics is being established between France (CNRS), Russia (ITEP, Landau, Steklov, Lebedev institutes) and BLTP. It is supposed to be financed by CNRS and (like the HLP) may provide a basis for participation of French students and professors in DIAS-TH.

Finally, let us formulate the main **goals** of DIAS:

- Training courses for students, graduates, and young scientists in the JINR Member States and other countries (according to special agreements and grants).
- Looking for and supporting gifted young theorists in the JINR Member States; creating databases of students and young researchers.
- Organization of schools of different scales in Dubna and coordination with similar schools in Russia, Germany and other European countries.
- Support of the JINR experimental programs by organizing lecture courses and review lectures on new trends in modern physics.
- Cooperation with the JINR University Center in training students and postgraduates as well as in organizing schools for students.
- Cooperation with the existing training programs in mathematics and physics for gifted schoolchildren (there are at present two such high-level programs acting in Dubna).
- Coordination of the research - training programs with workshops and conferences at JINR (e.g., inviting prominent participants to lecture at DIAS).
- Coordination with the schools and workshops supported by European community, UNESCO and other organizations.
- Participation in nets of workshops and schools in Europe as well as in other European research training and educational programs.
- Publications of lectures and discussions in different forms, in particular, with the use of modern electronic equipment, etc.
- Supporting the WEB page of DIAS-TH which should become the organizing center of the programs related to DIAS-TH.

If at least a substantial part of this program is realized, we will contribute as much as we can to solving one of the most difficult problems of theoretical physics which, we think, is not less important than, say, quark confinement or M-theory. Let us hope that JINR scientists and its Member States (and, hopefully, of other countries) will support this project and participate in the proposed activity. After all, if not, we are who will ensure the future of our science, our institute, and our laboratory, which were founded by great men whose example we should follow as much as we can.

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