

Summary of Implementation of the theme

Research and Education Project

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

(01-3-1074-2009/2013) for 2009-2013

The following Schools and Workshops were organized in Dubna:

1. Winter School on theoretical physics (2009-2013);
2. School on modern mathematical physics (2009, 2010);
3. Workshop on the theory of nucleation and its applications (2009-2013);
4. School “Dense QCD states in heavy ion collisions” (2010);
5. School on nuclear theory and applications in astrophysics (2011);
6. School “QCD on lattice, hadron structure and hadron matter “(2011);
7. School and Workshop “Calculations for modern and future colliders “(2009, 2012);
8. School “Dense matter in heavy ion collisions and astrophysics “ (2012);
9. School “Physics of heavy quarks and hadrons” (2013);
10. School “Cosmology, strings and new physics” (2013)

The Schools and Workshops were attended by students, post-graduates and young scientists from JINR Member States and other countries.

The Schools were supported by the Russian Foundation for Basic Research, “Dynasty” Foundation, JINR, Helmholtz Association, DFG, and DAAD.

Full information on the Schools and Workshops is available on site:

<http://theor.jinr.ru/~diastp/diasth/>

- Seminars and lectures for post-graduates and students are organized on a regular basis.
- Participation in the educational process of the Chairs of theoretical and nuclear physics, nanotechnologies and new materials at the International University “Dubna”.
- Courses of lectures were given by: A.A.Belavin (Landau ITP), P. Fre (Turin University) "Introduction to the string theory", I.L.Bukhbinder (Tomsk University) " Introduction to supersymmetric quantum field theory", D. Voskresensky (MIPI), M.Lashkevich (Landau ITP) "Quantum field methods in statistical physics”, D.Blaschke (BLTP \ Wroclaw University), D.Voskresensky (MIPI) "Introduction to the physics of collisions of relativistic heavy ions ", G.Tompson (ICTP) "Fundamentals of the topological field theory", I.Bakas (Athens University) "Theory and applications of the Lifshits models".

- DIAS-TH: <http://theor.jinr.ru/~diastp/diasth/> is available
- The database is filled up with the lectures from the schools held.
- A classroom and a lecture hall are established and equipped.

Rector: A.T. Filippov

Leaders: A.S. Sorin, V.V. Voronov

DIAS-TH: Dubna International Advanced School of Theoretical Physics
Helmholtz International Summer School

"NUCLEAR THEORY AND ASTROPHYSICAL APPLICATIONS"

Bogoliubov Laboratory of Theoretical Physics
JOINT INSTITUTE FOR NUCLEAR RESEARCH
Dubna, Russia, July 24 - August 2, 2011

TOPICS:

- terrestrial experiments for astrophysics,
- clusters and features of their structure and reactions,
- nuclear synthesis in stars,
- superfluidity in nuclei and neutron stars,
- neutrino interactions with nuclei / nuclear matter and supernovae,
- condensation and phase transitions in dense matter.



LECTURERS:

D. Bemmerer (Dresden)
R. Jolos (JINR)
E. Litvinova (GSI)
D. Nadyozhin (Moscow)
G. Roepke (Rostock)
F. Simkovic (JINR/Bratislava)
A. Vdovin (JINR)

H. Grigorian (Yerevan)
T. Klahn (Wroclaw)
J. Margueron (Orsay)
R. Reifarh (Frankfurt)
E. Saperstein (Moscow)
K. Sonnabend (Darmstadt)
D. Voskresensky (GSI/MEPhI)

H.-W. Hammer (Bonn)
H. Lenske (Giessen)
Jie Meng (Beijing)
F. Roepke (Garching)
H. Schulz (Dresden)
S. Typel (GSI)

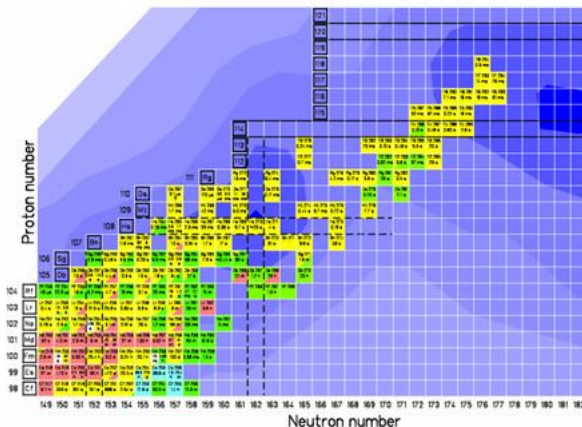
ORGANIZERS:

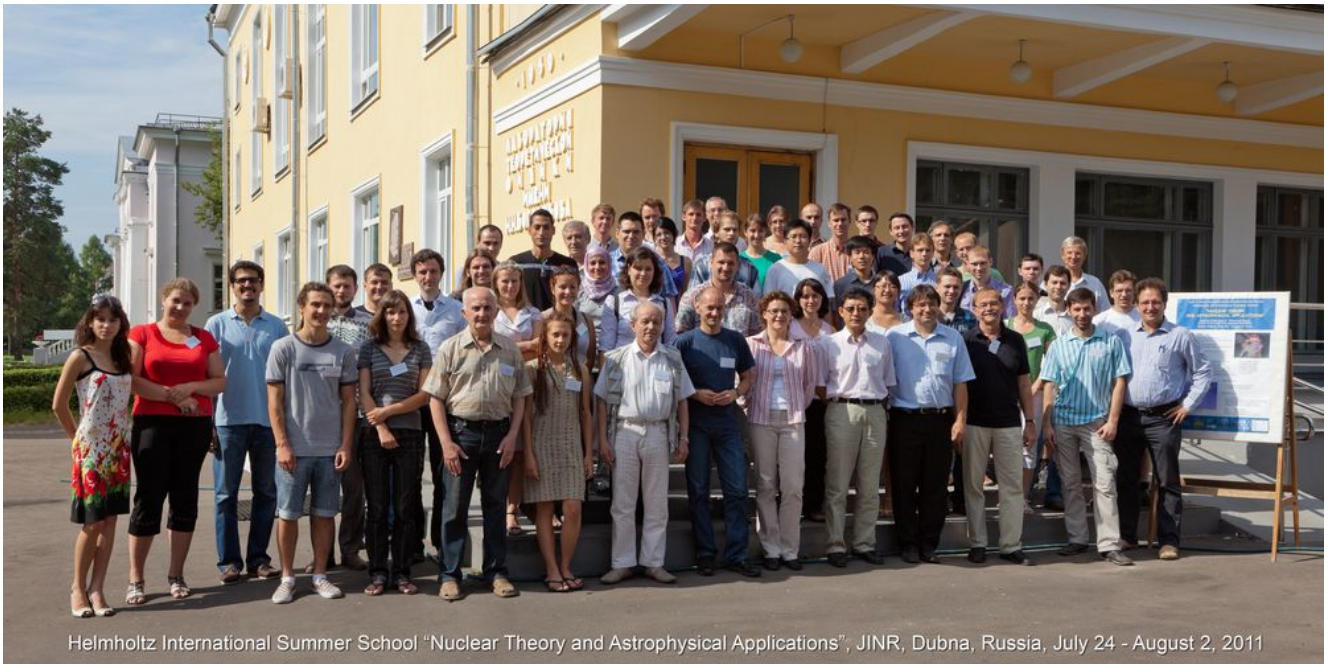
K. Langanke (GSI, Darmstadt),
V. Voronov (JINR, Dubna).

CONTACTS:

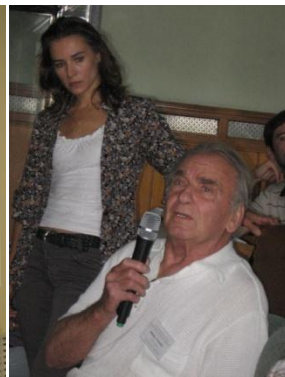
Prof. V. Voronov
Bogoliubov Laboratory of Theoretical Physics
Joint Institute for Nuclear Research
141980, Dubna, Moscow Region, Russia

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E-mail: ntaa@theor.jinr.ru
WWW: <http://theor.jinr.ru/~ntaa/11/>





Helmholtz International Summer School "Nuclear Theory and Astrophysical Applications", JINR, Dubna, Russia, July 24 - August 2, 2011







НАУКА СОТРУЖЕСТВО ПРОГРЕСС

ЕЖЕНЕДЕЛЬНИК ОБЪЕДИНЕННОГО ИНСТИТУТА ЯДЕРНЫХ ИССЛЕДОВАНИЙ

Газета выходит с ноября 1957 года № 30 (4070) Пятница, 29 июля 2011 года

«Теория ядра и астрофизика»

Школы

Гельмгольцевская летняя школа «Теория ядра и астрофизика» проходит в конференц-зале ЛТФ с 24 июля по 2 августа. Лекторы и руководители семинаров – ведущие физики-теоретики Дубны, университетов и научных центров Германии. В программу включены также доклады молодых ученых – участников школы.

На снимке Павла КОЛЕСОВА: с первой лекцией на школе выступила Керстин Зоннабанд.



Сообщение в номер

110

DIAS-TH: Dubna International Advanced School of Theoretical Physics
Helmholtz International Summer School
«Nuclear Theory and Astrophysical Applications»
JINR, Dubna, Russia, July 24 -- August 2

The *Helmholtz International Summer School «Nuclear Theory and Astrophysical Applications»* was held on July 24 -- August 2 at the Bogoliubov Laboratory of Theoretical Physics of JINR. It was the next event in the framework of the permanent Dubna International Advanced School of Theoretical Physics (DIAS-TH).

The School was devoted to problems of nuclear structure theory and astrophysical applications of nuclear theory methods and results. Nineteen lecture courses on hot topics of contemporary studies in nuclear physics and astrophysics areas were delivered to more than 50 students from JINR, Armenia, Belarus, Bulgaria, China, Greece, Egypt, Germany, Poland, Portugal, Romania, Russia, Slovakia, and Ukraine. The lecturers have presented the new data from terrestrial experiments for the astrophysical purposes and astronomical observations, the latest achievements of nuclear structure theory, new understandings concerning the structure of neutron stars and theory of nucleosynthesis and so on. The lecturers were from Dresden, Dubna, Frankfurt/Main, Garching, Giessen, GSI, Moscow, Obninsk, Orsay, Wroclaw, Yerevan. Beside the lectures the School professors have held seminars where some particular questions of their lecture courses have been discussed as well as the students have made the exercises. On three special sessions 12 School students have given the short talks on their own investigations.

The School was organized by BLTP at JINR and the Helmholtz Gemeinschaft (the co-organizers are Professors V.V. Voronov and K. Langanke). Moreover, the School has been financially supported in part by RFBR (the Russian Foundation for Basic Research) and ATHENA (which is the networking activity within European Nuclear Science and Applications Research funded by the European Commission).

The lectures presented at the School as well as selected presentations by students are available at the web site: <http://theor.jinr.ru/~ntaa/11/>

Organizers:

K. Langanke (GSI, Darmstadt)
V. Voronov (JINR, Dubna)

Local Organizing Committee:

A. Andreev (JINR, Dubna) - Sc. secretary
N. Antonenko (JINR, Dubna)
N. Arsenyev (JINR, Dubna)
D. Blaschke (JINR, Dubna & U. Wroclaw, Poland)
R. Jolos (JINR, Dubna)
V. Novikova (JINR, Dubna) - Secretary
J. Schmelzer (JINR, Dubna & U. Rostock, Germany)
A. Severyukhin (JINR, Dubna)
V. Shilov (JINR, Dubna)
T. Teterova (SINP MSU, Dubna)
A. Vdovin (JINR, Dubna)

Lecturers/Lectures:

Bemmerer, Daniel (Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany)

LUNA: Underground nuclear astrophysics

Hydrogen burning in the carbon-nitrogen-oxygen cycles

Blaschke, David (University of Wroclaw, Wroclaw, Poland)

Quark substructure effects in nuclear and neutron star matter

Borzov, Ivan (Institute for Physics and Power Engineering, Obninsk, Russia)

Beta-decay rates: global approaches, experiments, applications

Grigorian, Hovik (Yerevan State University, Yerevan, Armenia)

Cooling of compact stars

Jolos, Rostislav (Joint Institute for Nuclear Research, Dubna, Russia)

Collective excitations, octupole mode and application of the supersymmetric quantum mechanics

Klaehn, Thomas (University of Wroclaw, Wroclaw, Poland)

Astrophysical constraints on the nuclear equation of state

Lenske, Horst (Justus-Liebig-Universität Giessen, Giessen, Germany)

From hypernuclei to hyperons in neutron stars

Nuclei as open quantum systems: Spectroscopy at the particle threshold and in the continuum

Litvinova, Elena (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany)

Extensions of the covariant density functional theory and collective phenomena in nuclei

Margueron, Jerome (Institut de Physique Nucleaire Orsay, France)

Superfluid properties of the crust of neutron stars

Meng, Jie (Peking University, Beijing, China)

Covariant density functional theory and its applications

Nadyozhin, Dmitriy (Institute for Theoretical and Experimental Physics, Moscow, Russia)

Neutrino-induced nucleosynthesis in supernovae

Popov, Sergey (Sternberg Astronomical Institute MSU, Moscow, Russia)

Isolated neutron stars

Reifarth, Rene (Goethe University Frankfurt, Frankfurt, Germany)

Nuclear astrophysics at FRANZ

Roepke, Friedrich (Universität Würzburg, Würzburg, Germany)

Type-I supernovae

Saperstein, Eduard (Kurchatov Institute, Moscow, Russia)

On the ab initio theory of nuclear pairing

Simkovic, Fedor (Joint Institute for Nuclear Research, Dubna, Russia)

Neutrinoless double beta-decay

Sonnabend, Kerstin (Goethe University Frankfurt, Frankfurt, Germany)

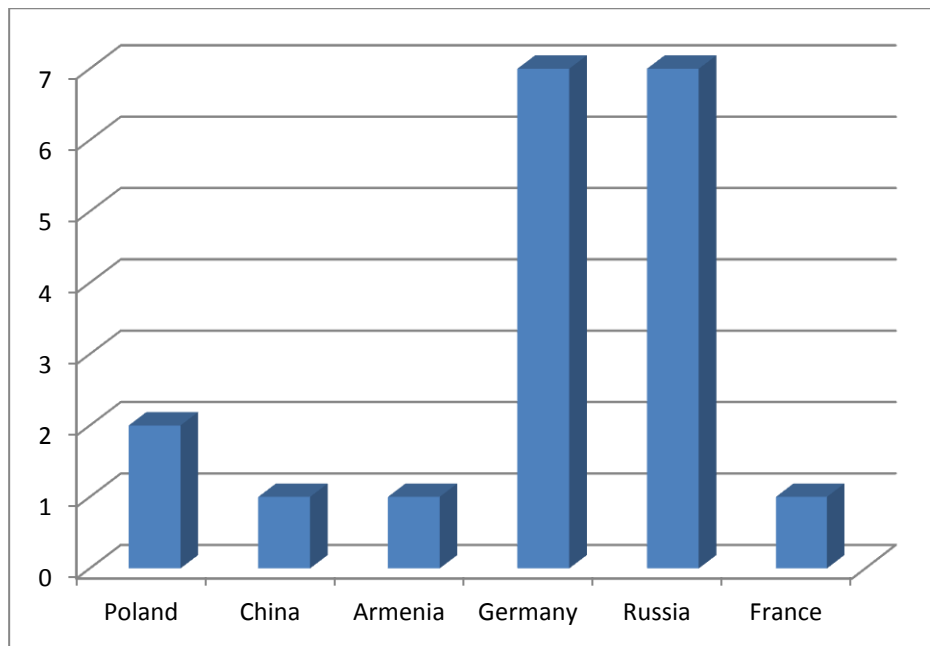
Experiments for the astrophysical p-process

Typel, Stefan (Technical University Munich, Munich, Germany)

Clusters in low-density nuclear matter

Vdovin, Andrej (Joint Institute for Nuclear Research, Dubna, Russia)

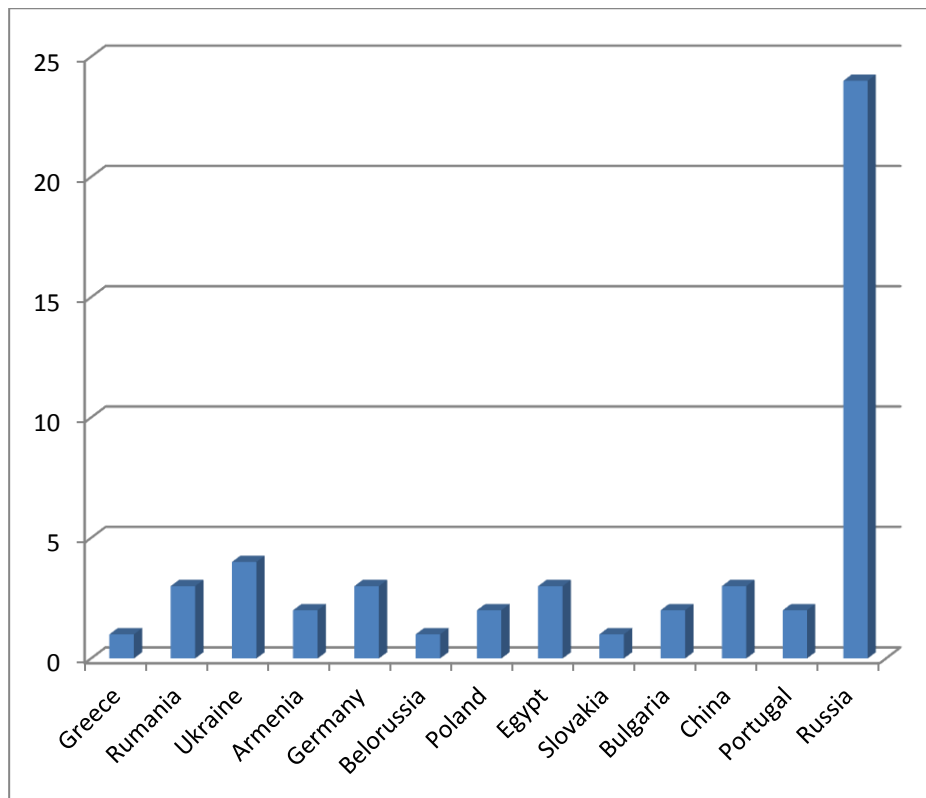
Weak-interaction processes with hot nuclei in stellar environment



| Countries | Lecturers |
|------------------|------------------|
|------------------|------------------|

| | |
|---------|---|
| Poland | 2 |
| China | 1 |
| Armenia | 1 |
| Germany | 7 |
| Russia | 7 |
| France | 1 |

| | |
|---------------------|-----------|
| <i>Total</i> | 19 |
|---------------------|-----------|



Countries Students

| | |
|------------|----|
| Greece | 1 |
| Rumania | 3 |
| Ukraine | 4 |
| Slovakia | 1 |
| Germany | 3 |
| Belorussia | 1 |
| Poland | 2 |
| Egypt | 3 |
| Austria | 2 |
| Bulgaria | 2 |
| China | 3 |
| Portugal | 2 |
| Russia | 24 |

***TOTAL* 51**

PROGRAM

| | July 25 (Monday) | July 26 (Tuesday) | July 27 (Wednesday) | July 28 (Thursday) | July 30 (Saturday) | July 31 (Sunday) | August 1 (Monday) | August 2 (Tuesday) |
|---------------|---------------------|----------------------------|---------------------------|----------------------------|------------------------|--------------------------------|-----------------------------|-------------------------------|
| 9:30 – 10:00 | Opening | | | | | | | |
| 10:00 – 10:45 | K. Sonnabend | F. Röpke | H. Grigorian | R. Jolos | E. Saperstein | I. Borzov | F. Simkovic | A. Vdovin |
| 10:45 – 11:15 | Coffee break | | | | | | | |
| 11:15 – 12:00 | K. Sonnabend | F. Röpke | H. Grigorian | R. Jolos | E. Saperstein | I. Borzov | F. Simkovic | A. Vdovin |
| 12:00 – 12:45 | Jie Meng | D. Bemmerer | T. Klähn | S. Typel | D. Blaschke | E. Litvinova | J. Margueron | F. Simkovic / J. Margueron |
| 12:45 – 15:00 | Lunch break | | | | | | | |
| 15:00 – 15:45 | Jie Meng | D. Bemmerer | T. Klähn | Excursion to FLNR | D. Blaschke | E. Litvinova | J. Margueron | S. Popov |
| 15:45 – 16:30 | R. Reifarth | H. Lenske (1) | H. Lenske (2) | S. Typel | R. Jolos / S. Typel | D. Nadyozhin | E. Litvinova / I. Borzov | S. Popov |
| 16:30 – 17:00 | Coffee break | | | | | | | |
| 17:00 – 18:00 | R. Reifarth | K. Sonnabend / Jie Meng | F. Röpke / D. Bemmerer | H. Grigorian / T. Klähn | PC3 | D. Nadyozhin | D. Nadyozhin | Farewell |
| 18:00 – 19:00 | Welcome | R. Reifarth / H. Lenske | PC1 | PC2 | | E. Saperstein / D. Blaschke | | |

Lectures (45 min + 45 min) are marked with blue, seminars (60 min) are marked with green, PC – participant contributions (15-20 min each)

Friday, July 29: Excursion to Sergiev Posad (by invitations of the Organizing Committee)

8:00 – departure of bus from the Hotel “Dubna”

Picnic in Ratmino: after excursion, approx. 17:00 – 21:00 (bring your favored music instruments)

16:30 – departure of buses from the Hotel “Dubna”

Report on HISS Dubna
“Lattice QCD, Hadron Structure, and Hadronic Matter”
JINR, Dubna, Russia, September 5.-17., 2011



Bogoliubov Laboratory of Theoretical Physics, Joint Institute for Nuclear Research
Dubna International Advanced School of Theoretical Physics
Helmholtz International Summer School

Lattice QCD, Hadron Structure and Hadronic Matter

Dubna, Russia, September 5 - 17, 2011

Introduction to Lattice Gauge Theories
Hadron structure and spectroscopy
Nonzero temperature and baryon number density
Heavy quark physics
Beyond the Standard Model
Strong magnetic fields
Simulation algorithms and analysis techniques

LECTURERS:

D. Blaschke (ITP, Uni. of Wroclaw & BLTP, JINR)
S. Catterall (Syracuse U.)
M. Goeckeler (ITP, Regensburg U.)
M. Mueller-Preussker (Humboldt U., Berlin)
K. Jansen (NIC, DESY, Zeuthen)
F. Karsch (Bielefeld U. & BNL)
D. I. Kazakov (BLTP, JINR)
M. Peardon (Trinity College, Dublin)
P. Petreczky (BNL)
M. Polikarpov (ITEP, Moscow)
M. Polyakov (S.-Pb. Nucl. Phys. Inst., Gatchina & Bochum U.)
A.V.Radyushkin (JLAB, USA & JINR, Dubna, Russia)
C. Schmidt (Frankfurt U. & GSI, Darmshtadt)
R. Sommer (NIC, DESY, Zeuthen)
A. S. Sorin (BLTP, JINR)
O. V. Teryaev (BLTP, JINR)
C. Urbach (Bonn U.)
V. I. Zakharov (ITEP, Moscow)

ORGANIZERS:

R. Sommer (NIC, DESY, Zeuthen)
A. Sorin (JINR, Dubna)



CONTACTS: Bogoliubov Laboratory of Theoretical Physics, Joint Institute for Nuclear Research
141980 Dubna, Russia; Phone: (+749621) 65084; e-mail: diastp@theor.jinr.ru
<http://theor.jinr.ru/~diastp/summer11>



Helmholtz International School
Lattice QCD, Hadron Structure and Hadronic Matter

In the period from September 5 till September 17, 2011, the Bogoliubov Laboratory of Theoretical Physics organized the **Helmholtz International Summer School (HISS)** “**Lattice QCD, Hadron Structure and Hadron Matter**”. This school was another event in the series of schools organized in the framework of the permanently working **Dubna International Advanced School of Theoretical Physics (DIAS-TH)**. The present school was directed to the following circle of topics.

As is well known, many of the problems of modern high-energy physics require the application of non-perturbative approaches. These problems include, for instance, the explanation of the mechanism of quark and gluon confinement, the transition from the phase of confinement to the phase of quark-gluon plasma at high temperatures and/or densities, and others. The discussion of these problems becomes especially important in connection with the construction of the accelerator complex of heavy ions NICA in Dubna.

The school was devoted to the application of non-perturbative methods of investigation of quantum field theory models (in particular, methods of numerical modeling in the framework of lattice regularization) in describing the properties of hadrons and hadronic matter. The most interesting field-theoretical models include

quantum chromodynamics (QCD), supersymmetric field theories, the so-called Standard Model, and others.

The main goal attempted to be reached in organizing the school was to attract young scientists into research in hadron physics, in particular, with the intention to further implement widely in the research advanced numerical methods at modern computers. The program of the school covered a wide range of ideas and methods: QCD at high temperatures and densities, structure functions and meson form factors, description of heavy quarks, exotic mesons, super-symmetry theories, and others. It also included introductory courses on the theory of gauge fields on lattice and seminars. Ample time was devoted to the discussion of computer algorithms and practical training of students.

Around 20 cycles of lectures were given at the school, and 14 papers of students participating in the school were presented at the poster session. The following recognized scientists in this field of research acted as lecturers: Mueller-Preussker M. (Humboldt Uni., Berlin, Germany), Jansen K. (NIC, DESY, Zeuthen, Germany), Goeckeler M. (ITP, Uni. Regensburg, Germany), Karsch F. (Uni. Bielefeld, Germany & BNL, USA), Blaschke D. (ITP, Uni. of Wroclaw, Poland & BLTP, JINR, Dubna, Russia), Kazakov D.I. (BLTP, JINR, Dubna, Russia), Catterall S. (Dept. of Physics, Syracuse Uni., USA), Zakharov V.I. (ITEP, Moscow, Russia), Schmidt C. (Frankfurt Inst. Adv. Studies, Uni.-Frankfurt & GSI, Darmstadt, Germany), Sommer R. (NIC, DESY, Zeuthen, Germany), Peardon M. (Trinity College, Dublin, Ireland), Polikarpov M. (ITEP, Moscow, Russia), Urbach C. (Helmholtz Inst. für Strahlen- und Kernphysik & Bethe Center for Theor. Phys., Uni. Bonn, Germany), Petreczky P. (Phys. Dept., BNL, USA), Polyakov M. (Petersburg NPI, Gatchina, Russia & ITP, Uni. Bochum, Germany), Radyushkin A.V. (JLAB, USA & JINR, Dubna, Russia), Sorin A.S. (BLTP, JINR, Dubna, Russia), Teryaev O. V. (BLTP, JINR, Dubna, Russia) .

The school was attended by 50 university students, post-graduates and young researchers from Austria, Albania, Armenia, Germany, India, Italy, Iran, Ireland, Poland, Russia, Ukraine, France and JINR.

The participants of the School had an opportunity to visit the Veksler and Baldin Laboratory of High Energies Physics where they got acquainted with the works carried out at the accelerator complex NICA.

The school was supported by the Helmholtz Association, JINR, RFBR and Foundation "Dynasty".

The lectures given at the school are available on the web. site:

<http://theor.jinr.ru/~diastp/summer11/program.html>



Countries

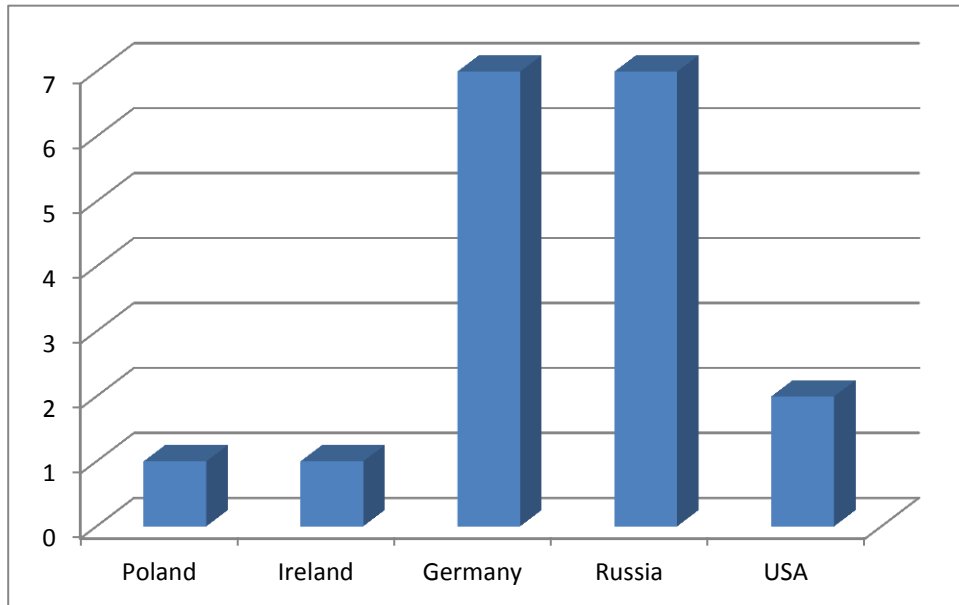
Lectures

Poland
Ireland
Germany
Russia
USA

1
1
7
7
2

Total

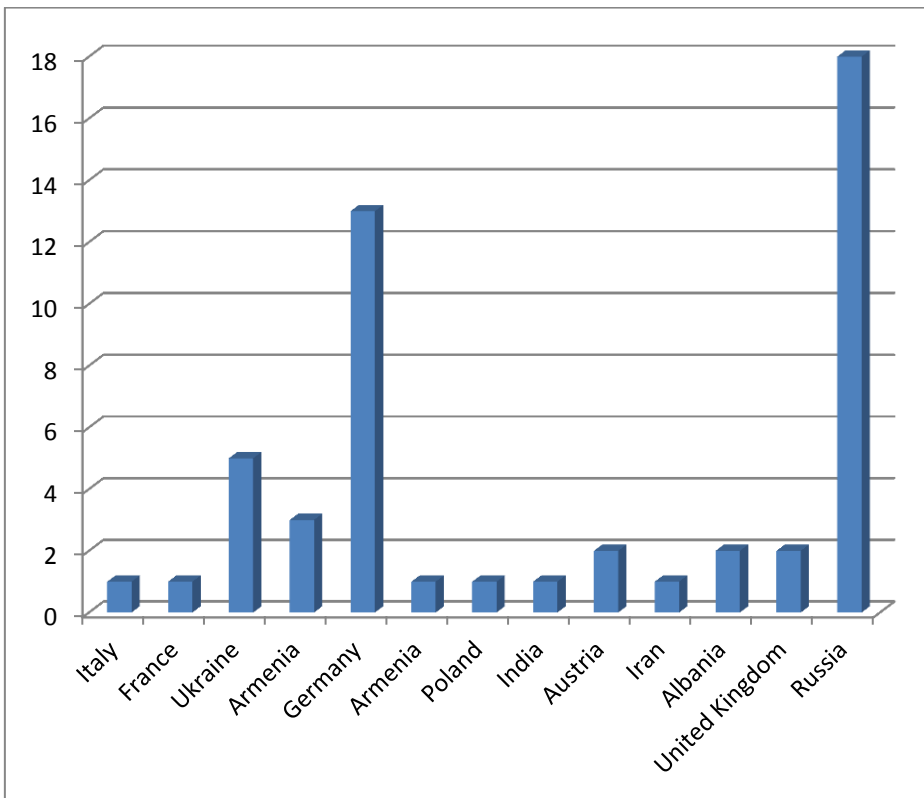
18



Countries

Students

| | |
|----------------|-----------|
| Italy | 1 |
| France | 1 |
| Ukraine | 5 |
| Armenia | 3 |
| Germany | 13 |
| Armenia | 1 |
| Poland | 1 |
| India | 1 |
| Austria | 2 |
| Iran | 1 |
| Albania | 2 |
| United Kingdom | 2 |
| Russia | 18 |
| TOTAL | 48 |



Schedule

Arrival day: September 4, Sunday

| | Sept 5, Mon | Sept 6, Tue | Sept 7, Wed | Sept 8, Thu | Sept 9, Fri | Sept 10, Sat |
|---------------|---------------------------|-------------------------|------------------------|---|-----------------|------------------|
| 8:15 – 9:30 | Registration* 8:15 – 9:15 | | | | | |
| | Opening 9:15 – 9:30 | | | | | |
| 9:30 – 10:30 | Mueller-Preussker (I) | Mueller-Preussker (III) | Mueller-Preussker (IV) | .Jansen (I) | .Jansen (III) | Excursion |
| 10:30 – 11:00 | Coffee break | | | | | |
| 11:00 – 12:00 | Mueller-Preussker (II) | Teryaev (I) | Teryaev (II) | Jansen (II) | .Jansen (IV) | |
| 12:00 – 12:10 | Break (10 min.) | | | | | |
| 12:10 – 13:10 | Blaschke (I) | Blaschke (III) | Blaschke (V) | Zakharov (I) | Zakharov (II) | |
| 13:10 – 15:00 | Lunch | | | | | |
| 15:00 – 16:00 | Blaschke (II) | Blaschke (IV) | Polikarpov (I) | Kazakov (III) | Kazakov (IV) | |
| 16:00 – 16:30 | Coffee break | | | | | |
| 16:30 – 17:30 | Kazakov (I) | Kazakov (II) | Petreczky (III) | Polikarpov (II) | Urbach (I) | Picnic |
| 17:30 – 17:40 | Break (10 min.) | | | Excursion to NICA site | Break (10 min.) | |
| 17:40 – 18:40 | Petreczky (I) | Petreczky (II) | Mueller-Preussker | | Jansen | |
| 18:40 – 18:50 | Break (10 min.) | | | | Break (10 min.) | |
| 18:50 – 19:50 | | | Discussion | | Discussion | |

* Registration will be carried out in the Organizing Committee room (Bogoliubov Laboratory of Theoretical Physics, 2nd floor)

| | Sept 11, Sun | Sept 12, Mon | Sept 13, Tue | Sept 14, Wed | Sept 15, Thu | Sept 16, Fri |
|---------------|-----------------|-----------------------|---------------|-----------------------|--|-----------------------|
| 9:30 – 10:30 | Free day | Karsch (I) | Karsch (III) | Catterall (III) | Catterall (IV) | Sommer (III) |
| 10:30 – 11:00 | | Coffee break | | | | |
| 11:00 – 12:00 | | Karsch (II) | Karsch (IV) | Schmidt (I) | Schmidt (II) | Radyushkin (I) |
| 12:00 – 12:10 | | Break (10 min) | | | | |
| 12:10 – 13:10 | | Peardon (I) | Peardon (II) | Sommer (I) | Sommer (II) | Radyushkin (II) |
| 13:10 – 15:00 | | Lunch | | | | |
| 15:00 – 16:00 | | Catterall (I) | Polyakov (I) | Polyakov (II) | Polyakov (III) | Polyakov (IV) |
| 16:00 – 16:30 | | Coffee break | | | Break (10') | Coffee break |
| 16:30 – 17:30 | | Catterall (II) | Goeckeler (I) | Goeckeler (II) | Goeckeler (III) 16:10 – 17:10 | Goeckeler (IV) |
| 17:30 – 17:40 | | Break (10 min) | | | Poster session (coffee) | Break (10 min) |
| 17:40 – 18:40 | | Urbach (II) | NICA | Urbach Buividovich | | Urbach Buividovich |
| 18:40 – 18:50 | | Break (10 min) | | | | |
| 18:50 – 19:50 | | Urbach Buividovich | Discussion | Urbach Buividovich | | Urbach Buividovich |
| | | | | | | Closing |

The lectures and other studies will be held in the Conference Hall of the Bogoliubov Laboratory of Theoretical Physics (2nd floor)



Helmholtz International Summer School - HISS
Dubna International Advanced School of Theoretical Physics - DIAS TH

**INTERNATIONAL SCHOOL-WORKSHOP
“CALCULATIONS FOR MODERN AND FUTURE COLLIDERS”**

July 23 - August 2, 2012, Dubna, Russia

TOPICS

- Precision theoretical calculations for experiments at LHC and other modern colliders
- Methods of multiloop calculations and resummation
- Computer codes for calculations in high energy physics
- Theoretical predictions beyond the Standard Model
- Physical program of future experiments in high energy physics

LECTURERS

T. Hahn (Munich, Germany)
J. Henn (Princeton, USA)
F. Jegerlehner (Berlin & Zeuthen, Germany)
V. Kim (St. Petersburg, Russia)
S. Moch (Zeuthen, Germany)
M. Muehleitner (Karlsruhe, Germany)
A. Nisati (Rome, Italy)
G. Passarino (Torino, Italy)
F. Piccinini (Pavia, Italy)
S. Riemann (Zeuthen, Germany)

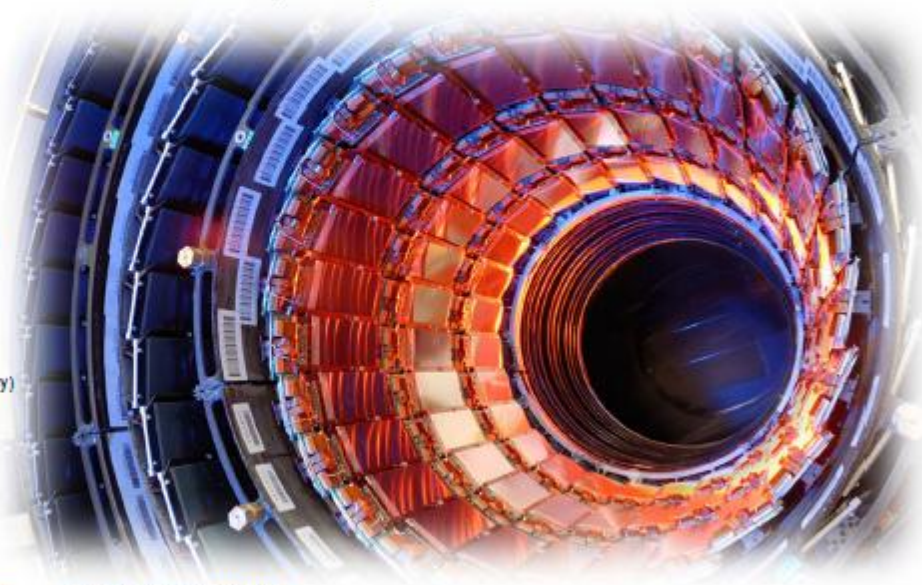
CONTACTS

Dr. Andrej Arbuzov, calc2012@theor.jinr.ru
Visas, accommodation, transportation:
Olga Matyukhina, omatyukhina@jinr.ru

<http://theor.jinr.ru/~calc2012>

ORGANIZING COMMITTEE

D. Kazakov (JINR) – Chairman, T. Riemann (DESY, Zeuthen) – Co-Chairman, A. Arbuzov (JINR) – Sci Secretary,
O. Matyukhina (JINR) – Secretary, D. Bardin (JINR), A. Bednyakov (JINR), A. Gladyshev (JINR),
L. Kalinovskaya (JINR), S. Moch (DESY, Zeuthen), J. Schmeizer (JINR & Uni Rostock), I. Smirnova (JINR)



**DIAS-TH: Dubna International Advanced School of Theoretical
Physics
Hemholtz International Summer School (HISS):
Calculations for Modern and Future Colliders**

Place: JINR Dubna, Russia
Date: July 23 – August 2, 2012

Organizers: T. Riemann (DESY, Zeuthen)
D. Kazakov (JINR, Dubna)

Local Organizers:

D. Bardin (JINR, Dubna)
A. Arbuzov (JINR, Dubna) - Scientific Secretary
O. Matykhina (JINR, Dubna) - Secretary
A. Bednyakov (JINR, Dubna)
A. Gladyshev (JINR, Dubna)
L. Kalinovskaya (JINR, Dubna)
S. Moch (DESY, Zeuthen)
J. W. P. Schmelzer (JINR, Dubna & Uni Rostock)
I. Smirnova (JINR, Dubna)

Website: <http://theor.jinr.ru/~calc2012>

The Helmholtz International Summer School (HISS) on "CALCULATIONS FOR MODERN AND FUTURE COLLIDERS" stands in the tradition line of scientific collaboration initiated by German and Russian research centers, which was started with a series of school-workshops on this topic held in Dubna (2000, 2003, 2006, 2009). Due to the excellent renomnee of the workshop and school events organized in Dubna, we succeeded also this year in appointing leading experts as lecturers who covered the main topics in modern quantum field theory and elementary particle physics.

According to the planned program, the school-workshop was devoted to the discussions of actual problems of quantum field theory and high energy physics, including accurate theoretical calculations for the Large Hadron Collider in CERN, new methods of multi-loop calculations and re-summation in quantum field theory, computer codes for calculations in high energy physics, theoretical predictions of particle physics models beyond the Standard Model and search for new physics in both accelerator and non-accelerator experiments, physics program for future experiments in high energy physics.

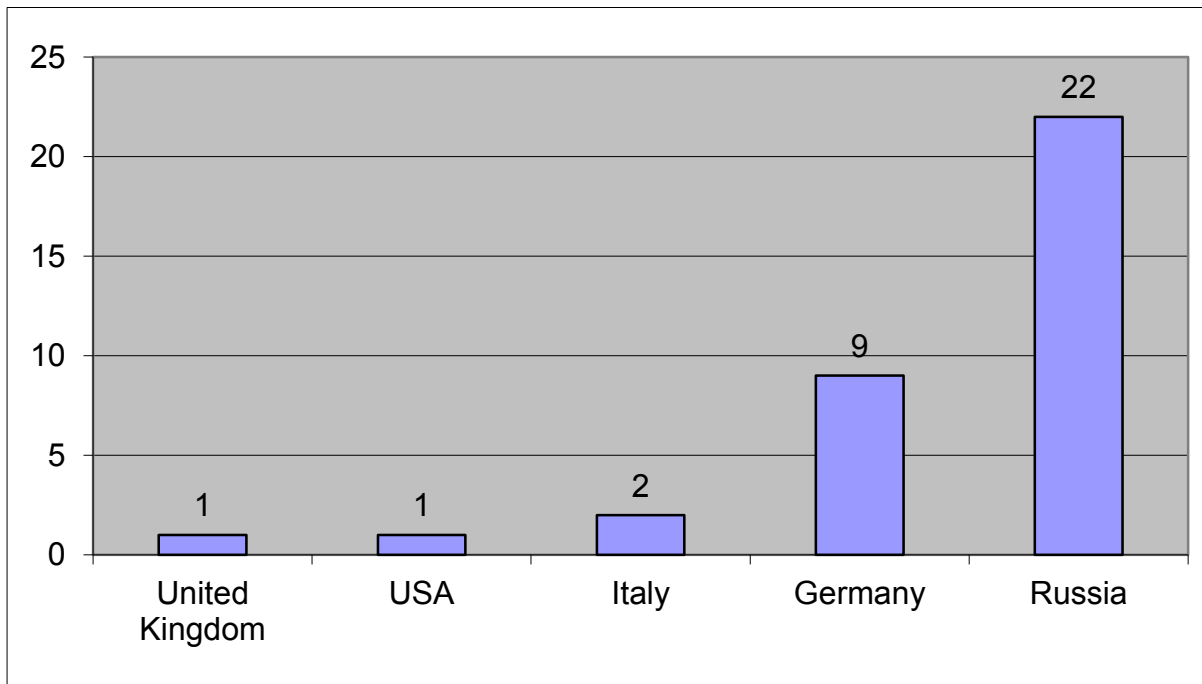
The program the following included lecture courses:

- T. Hahn** (Max-Planck-Institut fur Physik, Munich, Germany)
"Symbolic and numeric programming in HEP" (Lectures & Examples)
- J. Henn** (Institute for Advanced Study, Princeton, USA)
"New methods and results for scattering amplitudes" (Parts I and II, Part III)
- F. Jegerlehner** (Humboldt Universitat, Berlin, and DESY, Zeuthen, Germany)
"Anomalous magnetic moment of muon" (Part I, Parts II and III)
- V. Kim** (Polytechnic Inst., and INP, St.Petersburg, Russia)
"Introduction into GLAPD- and BFKL- evolutions of Perturbative QCD"
- S. Moch** (DESY, Zeuthen, Germany)
"QCD studies and Higgs searches at the LHC" (Part I, Part II, Part III)
- M. Muehlleitner** (KIT, Karlsruhe, Germany)
"Composite Higgs and SUSY Physics at the LHC"
- A. Nisati** (Rome, Italy)
"Physics at LHC"
- F. Piccinini** (Universita di Pavia, and INFN, Pavia, Italy)
"Precise theoretical predictions for Drell-Yan processes at hadron colliders" (Part I, Part II, Part III)
- S. Riemann** (DESY, Zeuthen, Germany)
"High energy linear $e+e-$ collider projects" (Part I, Part II)

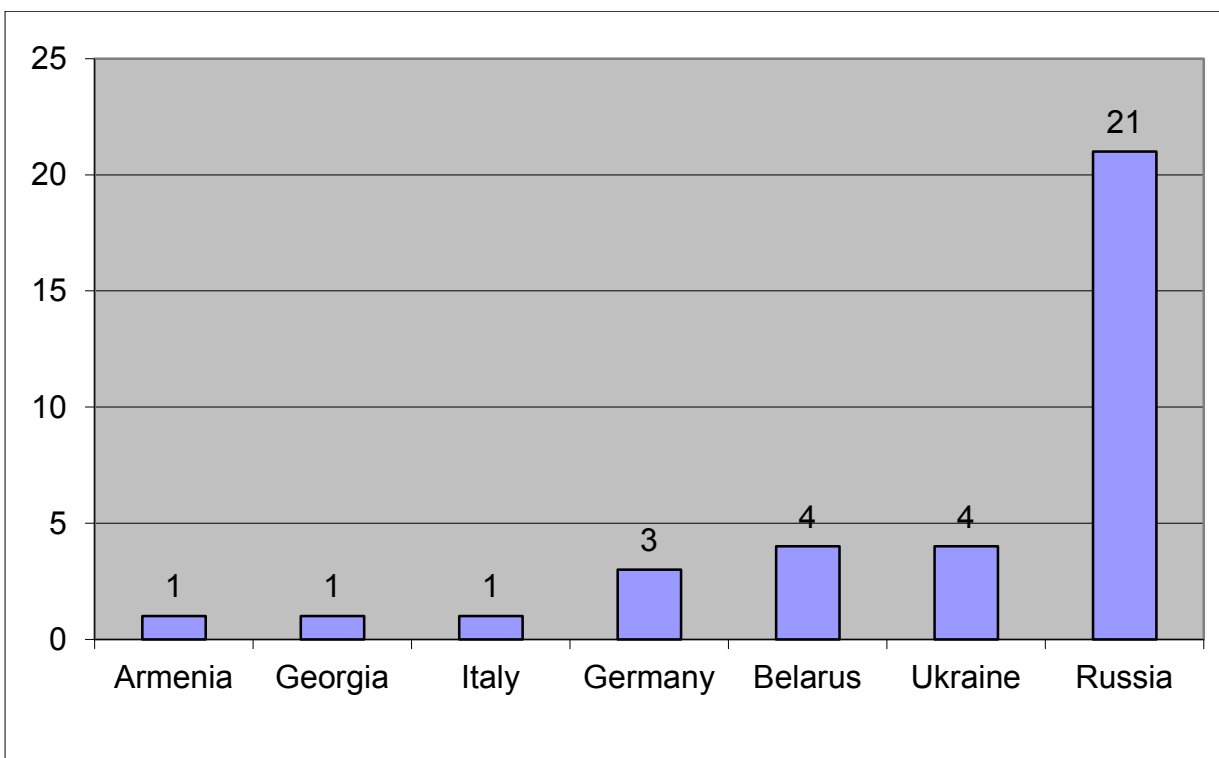
In addition, the workshop participants gave a large number of original talks. Some talks were presented by students from Russia, Germany and other countries.

The school-workshop was surely successful, and compared to the previous events of this series was more representative in involving a large number of participants

LECTURERS



STUDENTS



DIAS-TH: Dubna International Advanced School for Theoretical Physics

Helmholtz International Summer School
**Dense Matter in Heavy Ion Collisions
and Astrophysics:
Theory and Experiment**

Dubna, Russia, August 28 - September 8, 2012

Organisers

H. Stöcker (GSI)
A. Sorin (JINR)
D. Blaschke (Wroclaw & JINR)

Local Organisers

V. Zhuravlev (JINR)
J. Schmelzer (Rostock & JINR)
A. Khvorostukhin (JINR)
A. Friesen (JINR)
V. Nesterenko (JINR)
V. Novikova (JINR)

Topics

- Equation of state & QCD phase transitions
- Transport properties in dense QCD matter
- Hadronization & freeze-out in heavy ion collisions (HIC)
- Astrophysics of compact stars (CS)
- Simulations of dense QCD, HIC and CS
- Experiments and observational programs

Contact

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HISS on Dense Matter, Heavy-Ion Collisions and Astrophysics

The Helmholtz International Summer Schools (HISS), as part of the Dubna International Advanced Schools on Theoretical Physics (DIAS-TH), have been organized at the Bogoliubov Laboratory of Theoretical Physics (BLTP) since 2004 with major support from the Helmholtz Association of German Research Centres, GSI Darmstadt, DESY Hamburg/Zeuthen, the Russian Foundation for Basic Research, the Dynasty foundation and the JINR Dubna. The school on “Dense Matter in Heavy-Ion Collisions and Astrophysics: Theory and Experiment” (DM2012) which took place for two weeks from August 28 to September 8, plays a special role within the HISS program as it is devoted to the key topics forming the scientific basis for NICA, the flagship project of the roadmap for future development of the JINR Dubna.

The DM2012 Summer School has brought together 14 lecturers from 8 countries: Russia (2), Germany (6), USA, Israel, Austria, Armenia, Ukraine and South Africa and 42 participants (Diploma, Ph.D. students and young postdocs) from 12 countries, the majority from Germany, Russia and JINR Member States, but also from Austria, Croatia, India, Italy and Mexico.

The program of the School was rather dense: each lecturer was entitled to give three lectures of one hour each and be ready for answers to questions from students in an additional one-hour seminar in the late afternoons. Due to the proximity of the upcoming heavy-ion collision experiments at NICA, the astrophysical topic was covered in the lecture series on “Dense Matter in Neutron Stars” by Hovik Grigorian (Yerevan). The program of DM2012 was aimed at teaching the fundamental questions in understanding the structure and phase transitions of strongly interacting matter by combining lectures on theory and experiment, where this was possible, or by presenting different theoretical approaches to a given problem. According to this scheme, the lectures on “Dileptons in heavy-ion collisions” had an experimental part given by Itzhak Tserruya (Rehovot) and a theoretical one by Hendrik van Hees (Frankfurt). The excellent review on experiments with “Beam energy scan programs in HIC” by Christoph Blume (Frankfurt) was complemented by lectures on their main theoretical aspects such as the “Statistical model of hadron production” by Jean Cleymans (Cape Town), “Hydrodynamics of heavy-ion collisions” by Pasi Huovinen (Frankfurt), “Quark confinement and universal

hadrosynthesis” by Helmut Satz (Bielefeld) and “Statistical models for the QCD phase diagram” by Kyrill Bugaev (Kiev). The lectures by Andreas Schmitt (Vienna) and Vyatcheslav Toneev (Dubna) covered different aspects of the implications that strong magnetic fields created in nuclear collisions may have on the QCD phase structure and experimental observables. The central topic of particular significance for experiments at NICA is the first-order phase transitions and their observable signatures discussed in the lectures by Jorgen Randrup (Berkeley) on “Spinodal decomposition”, Dmitry Voskresensky (Moscow) on “Kinetics of phase transitions” and Gerd Röpke (Rostock) on “Cluster formation and liquid-gas phase transition in nuclear matter”. In his review on “Lattice QCD for extreme matter” Michael Ilgenfritz (JINR), one of the pioneers of lattice gauge theories, gave a concise introduction into the investigation of the QCD phase diagram and the equation of state in ab-initio Monte-Carlo simulations.

All participants were interested in the progress in the preparation and construction of the NICA complex at the Veksler and Baldin Laboratory of High Energy Physics (VBLHEP). Therefore, a podium discussion with leading scientists of this project (see Fig. 1) and an excursion to the VBLHEP were organized (Fig. 2). More information about actual developments in this direction can be found on the website of the NICA-MPD collaboration (<http://nica.jinr.ru>) and the NICA White Paper (<http://theor.jinr.ru/twiki/cgi/view/NICA/WebHome>), an open access document collecting physics inputs to the upcoming experiments, to which all members of the dense matter community are invited to contribute.



Fig. 1: NICA podium discussion in the BLTP conference hall with A. Sorin, O. Rogachevsky, V. Kekelidze, A. Sidorin, I. Tserruya (from left to right), D. Blaschke and K. Bugaev (not on this picture).



Fig. 2: Excursion of students and lecturers of the HISS “Dense Matter in Heavy Ion Collisions and Astrophysics” to the NICA construction site.

Upper picture: A. Schmitt, V. Rolando, S. Stetina, N.-U. Bastian, R. Kumar, G. Röpke, H. van Hees (from left to right) at the nuclotron superconducting accelerator ring.

Lower picture: F. Wunderlich, V. Rolando, S. Stetina, N.-U. Bastian, S. Liebing, D. Alvarez, E. Bodnariuc, A. Kachanovich, S. Benic and C. Jaeh in front of the former synchrotron which is to become a part of the booster ring for the NICA accelerator complex.



DM2012 offered opportunities for students to take active part in the scientific and social events during the school. Ample time was reserved for a “Soft Skill Training Programme (SSTP)”, alternatively translated as “Short Student Talk Programme”, where the participants could present

the status and problems of their own research and graduation work and receive valuable comments and suggestions from lecturers and fellow students.

Meanwhile a good tradition, during the bulk of the program students would act as chairpersons for lectures and contributions. In this way, they could still better identify themselves with the summer school programme and consider it as “theirs”.



Fig. 3: Premiere of the “HISS Dubna Song” by David Blaschke (Wroclaw & Dubna) using the melody of “Gaudeamus Igitur” at the farewell barbeque of DM2012 (David Blaschke with his wife, Narine Gevorgyan), see <http://theor.jinr.ru/~dm12>.

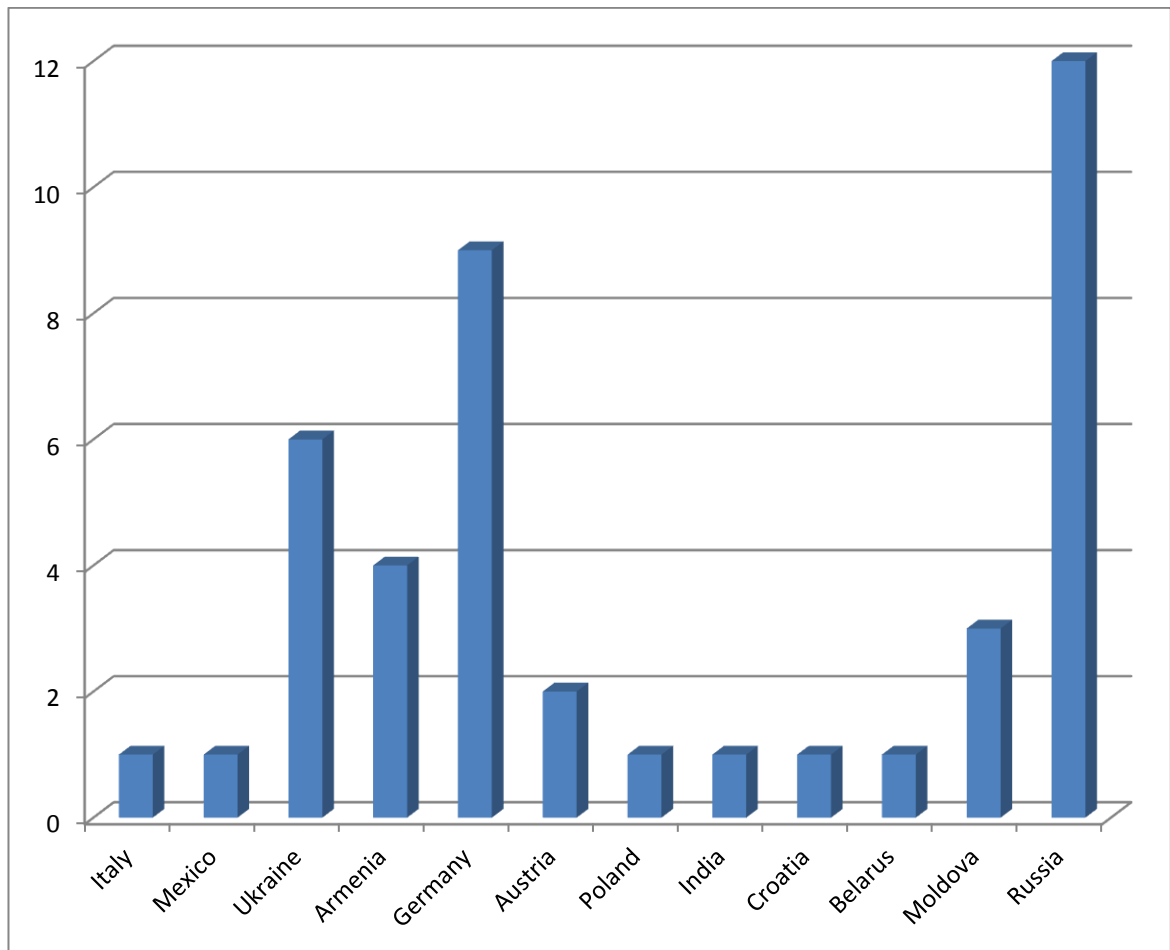
The Summer Schools at JINR Dubna are famous for their atmosphere which brings lecturers and students from all over the world into personal contacts which leave ever-lasting memories. To these belong the international song contests during the final farewell barbeque, which celebrate classic songs like “podmoscovnye vechera” but also self-made songs (see Fig. 3). At DM2012, David Blaschke presented an anthem for the Dubna schools which also can be found together with snapshots from lectures and excursions on the homepage of the school (www.theor.jinr.ru/~dm12).

Thanks to the restless activity of Andrey Khvorostukhin and Vladimir Nesterenko (BLTP) the lectures and presentations were available online on the homepage of the summer school (<http://theor.jinr.ru/~dm12>) already during the running event. The participants of DM2012 highly appreciated that hardcopies of published lecture notes from previous schools (2006, 2008, and 2010) were made available to them. A decision about a possible publication of lecture notes based on the lectures given at DM2012 has not yet been made. In any case, some of the new insights presented during the school shall find entry into the NICA White Paper, see above.

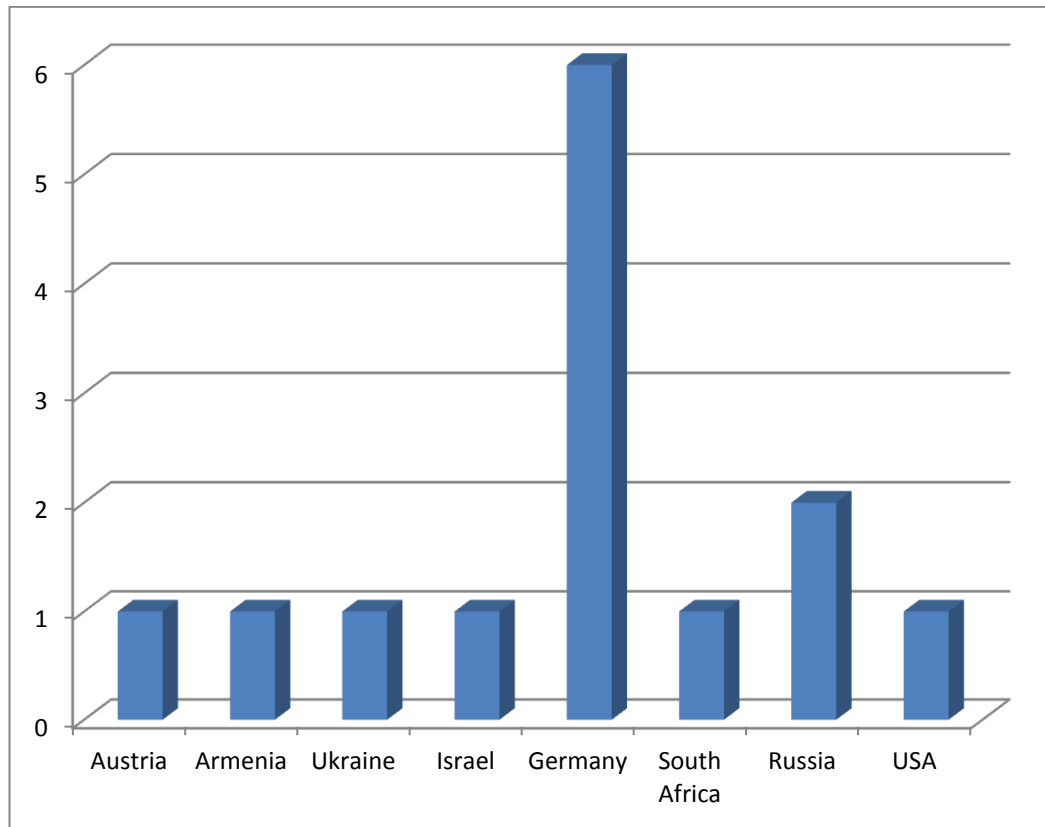
During DM2012 we saw some students, again, who had participated already at one of the predecessor schools. We hope to see many of this year participants and lecturers again in Dubna, at conferences, summer schools or as active members of the collaborations which are formed now to use the NICA facility for making discoveries in the large world of the physics of “Dense Matter in Heavy-Ion Collisions and Astrophysics”.

Students

Armenia 4; Austria 2; Belarus 1; Croatia 1; Germany 9; India 1; Italy 1; Mexico 1; Moldova 3; Poland 1; Russia 12; Ukraine 6



Lecturers



Program

| Time | TUE 28.08 | WED 29.08 | THU 30.08 | FRI 31.08 | SAT 01.09 |
|---------------|----------------------------------|----------------|-----------------|------------------|--------------|
| 09:00 | Registration | | | | |
| 09:45 | Opening | | | | |
| 10:00 – 11:00 | Satz I | Cleymans I | Randrup II | Voskresensky III | Huovinen III |
| 11:00 – 11:30 | coffee break | | | | |
| 11:30 – 12:30 | Randrup I | Voskresensky I | Voskresensky II | Cleymans III | Randrup III |
| 12:30 – 13:30 | Huovinen I | Grigorian II | Satz II | Grigorian III | Toneev I |
| 13:30 – 15:30 | lunch break | | | | |
| 15:30 – 16:30 | Grigorian I | Huovinen II | Cleymans II | Ilgenfritz I | Röpke I |
| 16:30 – 17:00 | coffee break | | | | |
| 17:00 – 18:00 | Informal Get Together | PS I | PS II | PS III | PS IV |
| 18:00 – 19:00 | | SSTP I | SSTP II | SSTP III | PSIV |

| Time | MON 03.09 | TUE 04.09 | WED 05.09 | THU 06.09 | FRI 07.09 |
|---------------|-----------------------------------|--------------|--------------|--------------|--|
| 10:00 – 11:00 | Röpke II | Schmitt II | Blume II | Blume III | Ilgenfritz II |
| 11:00 – 11:30 | coffee break | | | | |
| 11:30 – 12:30 | Toneev II | Tserruya I | Tserruya II | van Hees III | Schmitt III |
| 12:30 – 13:30 | van Hees I | Blume I | van Hees II | Tserruya III | Bugaev III |
| 13:30 – 15:30 | lunch break | | | | |
| 15:30 – 16:30 | Excursion to NICA site | Bugaev I | Bugaev II | Schmitt II | Closing & Farewell Barbecue |
| 16:30 – 17:00 | | coffee break | | | |
| 17:00 – 18:00 | RTDiscussion: | PS V | PS VI | PS VII | |
| 18:00 – 19:00 | NICA | SSTP IV | SSTP V | SSTP VI | |