

DAAD Summer School "Quantum Statistics" at the JINR Dubna

In 2001 the German Academic Exchange Council (DAAD) has launched a new program called "Export of German Academic Training" devoted to the funding of three types of activities: summer schools, teaching moduli and "off-shore" campuses. Out of the many proposals which were submitted to the DAAD only a few could receive funding, among them the project of the Physics Department at the University of Rostock devoted to performing a series of annual summer schools on "Many-Particle Physics" at the Bogolyubov Laboratory for Theoretical Physics in Dubna.

After a successful start of this new activity with a two-week program on "Dense Matter in Particle and Astrophysics" in the summer 2001, this years summer school was entitled "Quantum Statistics of Many-Particle Systems" - a topic with a long-standing tradition and expertise in Dubna and in Rostock. This was reflected in the lecture program which started out with an introduction to Greens functions and Kinetic Theory for Many-Particle systems in thermodynamical equilibrium and non-equilibrium as well as their applications for plasmas, a course developed in Germany at the Universities of Rostock, Berlin, Greifswald, Darmstadt and Erlangen. Lecturers in this first part of the school were the Professors Ebeling, Knoll, Kraeft, Redmer, Röpke, Toepffer on topics such as: Density functional theory, Bound states and clusters, Phase transitions in plasmas, Monte Carlo simulations of Coulomb systems.

The second part of the school was devoted to the extension to relativistic and strongly interacting many-particle systems such as nuclear matter and the quark gluon plasma (QGP). In order to create and investigate the hypothetical QGP big experimental programs with ultrarelativistic heavy-ion collisions are currently conducted at the worlds largest collider facilities at CERN Geneva and at the Brookhaven National Laboratory. This elusive state of matter was present a few microseconds after the Big Bang and may presently be found at much lower temperatures but much larger baryonic densities in the interiors of compact stars. Before these fascinating applications could be discussed at the school, the students got acquainted with advanced tools of finite temperature field theory such as Feynman Path Integrals and QCD Dyson Schwinger Equations. Lecturers included Professors Bass, Blaschke, Kunihiro, Lombardo, Ripka, Sedrakian, Tatsumi, Toneev, Voskresensky.

A particularly interesting topic at the school was superconductivity, a phenomenon which was discovered as early as 1913 but could only be explained in 1957 by the schematic theory of Bardeen, Cooper and Schrieffer which was profoundly developed at about the same time by Bogolyubov and his school. Professor Plakida as a member of the Bogolyubov school gave an excellent series of lectures about the basics and recent development of this theory in applications for electronic systems. The phenomenon itself, which is due to Bose condensation in dense Fermi systems is so general that it can occur even in nuclear matter as well as in quark matter and thus became relevant for explaining the structure and evolution of neutron stars. These challenging developments in the quantum statistics of many-particle systems were addressed by the lecturers of the second part of the school. It is planned to issue the course of Lectures held at this summer school as a book in the series "Lecture Notes in Physics" of the Springer Verlag.

A very important aspect of the Dubna summer schools is the get-together of students from different regions of the world, but mostly from the countries of the former Soviet Union. They learn to make contacts with their fellow students but also with the lecturers

which in many cases may open for them possibilities of postgraduate and postdoctoral studies. This year the school united 43 students and 21 lecturers from 13 different countries, whereby Germans and Russians dominated the broad spectrum of nationalities, which covered besides of Europeans even participants from Japan and South Korea as well as USA and Argentina. With great interest both students and lecturers have visited the experimental facilities, in particular the Frank Laboratory of Neutron Physics and the Baldin-Veksler Laboratory of High Energy Physics.

Dubna is an ideal and charming place for those meetings. The shashlik partys at the shores of the Dubna river with sailing yacht trips up and down the Volga river, camp fire and folk song celebration became already famous among the insiders. Participants of Dubna summer schools explore (often for the first time) the city of Moscow and its fast development as well as the historic site of the monastery complex "Sergiev Posad" with the school of Icon painters and the theological academy.

The next DAAD summer school on Many-Particle Physics is already scheduled: it will take place at the BLTP from July 28 to August 17, 2003 and is devoted to interesting recent applications of the methods of statistical physics in social-economic systems under the title "Traffic and Econophysics". Dubna physicists are active also in this field which opens interesting career paths in many branches and attracts therefore the interest of talented young scientists which we expect as participants at the next summer school in Dubna.