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Commemoration of the 80th anniversary of the birth of Academician B B Kadomtsev (Scientific session of the Physical Sciences Division of the Russian Academy of Sciences, 10 December 2008)

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The scientific session of the Physical Sciences Division of the Russian Academy of Sciences (RAS) was held on December 10, 2008 at the conference hall of the P N Lebedev Physical Institute, RAS. It was devoted to the commemoration of the 80th anniversary of the birth of Academician B B Kadomtsev. The following reports were presented at the session:

(1) **Smirnov V P** (Nuclear Fusion Institute of the Russian Research Centre 'Kurchatov Institute', Moscow) "Commemorating the 80th anniversary of the birth of Boris Borisovich Kadomtsev (opening address)";

(2) **Mirnov S V** (State Scientific Center of the Russian Federation 'Troitsk Institute of Innovative and Thermonuclear Research', Troitsk, Moscow region) "Academician B B Kadomtsev and the International Thermonuclear Experimental Reactor (ITER)";

(3) **Kruglyakov E P** (G I Budker Institute of Nuclear Physics of the Siberian Branch of the RAS, Novosibirsk) "Open magnetic systems for plasma confinement";

(4) **Kovrizhnyh L M** (A M Prokhorov Institute of General Physics, RAS, Moscow) "The current status of the stellarator program";

(5) **Gurevich A V** (P N Lebedev Physical Institute, RAS, Moscow) "Nonlinear phenomena in the ionospheric plasma";

(6) **Ilgisonis V I** (Nuclear Fusion Institute of the Russian Research Centre 'Kurchatov Institute', Moscow) "Classical results of B B Kadomtsev and the plasma rotation in modern tokamaks".

An abridge version of the opening address and reports 2, 4, and 6, as well as a paper written on the basis of report 5, is given below.

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Boris Borisovich Kadomtsev
(09.11.1928 – 19.08.1998)

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Commemorating the 80th anniversary of the birth of Boris Borisovich Kadomtsev (opening address)

V P Smirnov

Today's session is unusual. Recently we have conducted at the Physical Sciences Division of the RAS a relatively large number of sessions commemorating centenaries of the births of outstanding Russian scientists. Today, however, Boris

Borisovich Kadomtsev would be only 80 years old; all of us still remember him very well and it feels as if he may walk in right now, right into this hall.

The first thing I wish to tell you, on behalf of Evgenii Pavlovich Velikhov, is that he very much wanted to be present at this session and deliver the opening address, but his many responsibilities in the Civic Chamber of the Russian Federation — I talked to him today — truly precluded him from doing it. Therefore, E P Velikhov has begged us to excuse him for his inability to be present in person at this gathering and requested that I say a few words on his behalf.

Boris Borisovich is no more... . This is a colossal loss to the entire Kurchatov Institute pursuing plasma research, and, I believe, a huge loss for the entire Russian physics community, not to mention the world physics community. The talks that we are to hear today are a reflection of the large scale of Boris Borisovich's activities in the physics of hot plasma and thermonuclear fusion that he conducted during his entire span of work at the Kurchatov Institute. B B Kadomtsev laid the scientific foundation for the tokamak reactor, and together with L A Artsimovich they for the first time formulated a very important statement: tokamak-based thermonuclear fusion is feasible — a thermonuclear reactor can be built, and it can be built in spite of those numerous instabilities and physical problems we keep coming across. S V Mirnov will speak today about the analysis of these instabilities, including those of magnetohydrodynamic (MHD) processes.

Boris Borisovich made an enormous contribution to finding a solution to the problem of thermonuclear fusion, and when we meet at our traditional conference — the biannual IAEA conference on thermonuclear fusion — the ideas advanced by Boris Borisovich surface again and again, and people do not forget it.

We need to say too that it was not only hot plasma physics and controlled thermonuclear fusion that lost their great scientist, one who had this ability to find order in enormously complicated processes with incomparable clarity. Boris Borisovich's scientific interests were never limited to plasma physics and nuclear fusion; all of us who had any sufficiently close interaction with Boris Borisovich were amazed by the ease with which he would perceive the most diverse fields of physics. When, for instance, I or my colleagues talked to him about papers that seemed to lie far from the boundaries of his everyday scientific activities, he would catch on very fast to the subject and pose key questions. This was Boris Borisovich's wonderful ability.

And I wish to add that he was a great teacher. He headed for a long time Chair of Plasma Physics and Chemistry at the Moscow Institute of Physics and Technology (MFTI in *Russ. abbr.*), and many of those who are now at the frontline of research in plasma theory and plasma experiment, and perhaps not only in Russia, passed through this chair, heard his lectures, absorbed the system of perceiving the physical processes that he succeeded in somehow instilling into his students. In fact, the work being done now by his students still bears the very imprint that he left on all of us.

We feel especially happy of course that when we commemorate B B Kadomtsev's 80th birthday today, we witness very positive steps in the progress of thermonuclear fusion that at the same time place very high responsibility on our shoulders. We all know well that Russia is a member of the international cooperation that is building the International Thermonuclear Experimental Reactor (ITER). The creation of this reactor extends the activity linked to the research at the I V Kurchatov Institute of Atomic Energy that started as early as the 1970s; B B Kadomtsev played a very important and significant role in this program. When working on the ITER project, B B Kadomtsev was a permanent member of the ITER International Research and Consultative Committee opened under the auspices of the IAEA, and he introduced into the committee a number of outstanding representatives of our technology and our nuclear science. I need to mention among these the names of Academician V A Glukhikh and E O Adamov who, by his criticism, contributed very positively to designing the ITER, and M I Solonin (now Corresponding Member of the RAS). On the whole, this was a delightful team that accomplished its work so well that Russia's contribution during the times of the funding crisis and minimum support of science from the Russian State became commensurate to the contributions of other participants of the project.

B B Kadomtsev thought much about thermonuclear fusion as an energy source and came up with sometimes positive, but on other occasions rather negative, assessments of specific solutions concerning thermonuclear fusion. He understood at the same time that the road to thermonuclear fusion is extremely hard and will require enormous efforts, including the efforts of physicists performing fundamental research.

I should also mention another area of research which began on B B Kadomtsev's initiative. A department was set up in the I V Kurchatov Institute of Atomic Energy, headed by Viktor Vladimirovich Orlov. This department worked on technological and physical aspects of thermonuclear reactors and, in particular, on the analysis of the feasibility of creating a hybrid thermonuclear reactor. At this moment, after complete rejection following the activities of the 'green opposition', this idea is reborn, not only in this country (in fact, in Russia it mostly has 'acoustic', not real, power; nevertheless, we are discussing it). However, in other countries — those participating in thermonuclear fusion activities — the idea of the hybrid reactor is attracting more and more attention. We have a proposal from the United States to collaborate on it, and China is manifesting a very active and perfectly focused desire to solve the problems of producing fuel for the atomic power industry at hybrid power stations. In a word, the activities of Boris Borisovich, both as a scientist and as the actual leader of the thermonuclear program at the Kurchatov Institute, have created inroads into, and opened access to, very many research avenues. I see that Aleksandr Grigor'evich Litvak is looking at me. I am obliged to say that through Kadomtsev's support, work on gyrotrons was commissioned and extended, and this work was carried out at the highest physical and technological level with excellent results by the Institute of Applied Physics of the RAS in Nizhny Novgorod, now headed by Academician A G Litvak. This wide scope of studies that were accomplished at the Kurchatov Institute when Kadomtsev was Head of the Plasma Studies Division is very important and promises great gains in the future.

The talks prepared for this session will describe in detail the progress of a number of Kadomtsev's ideas at the current stage of our science.