

50 years of the laser era

From the Editorial Board

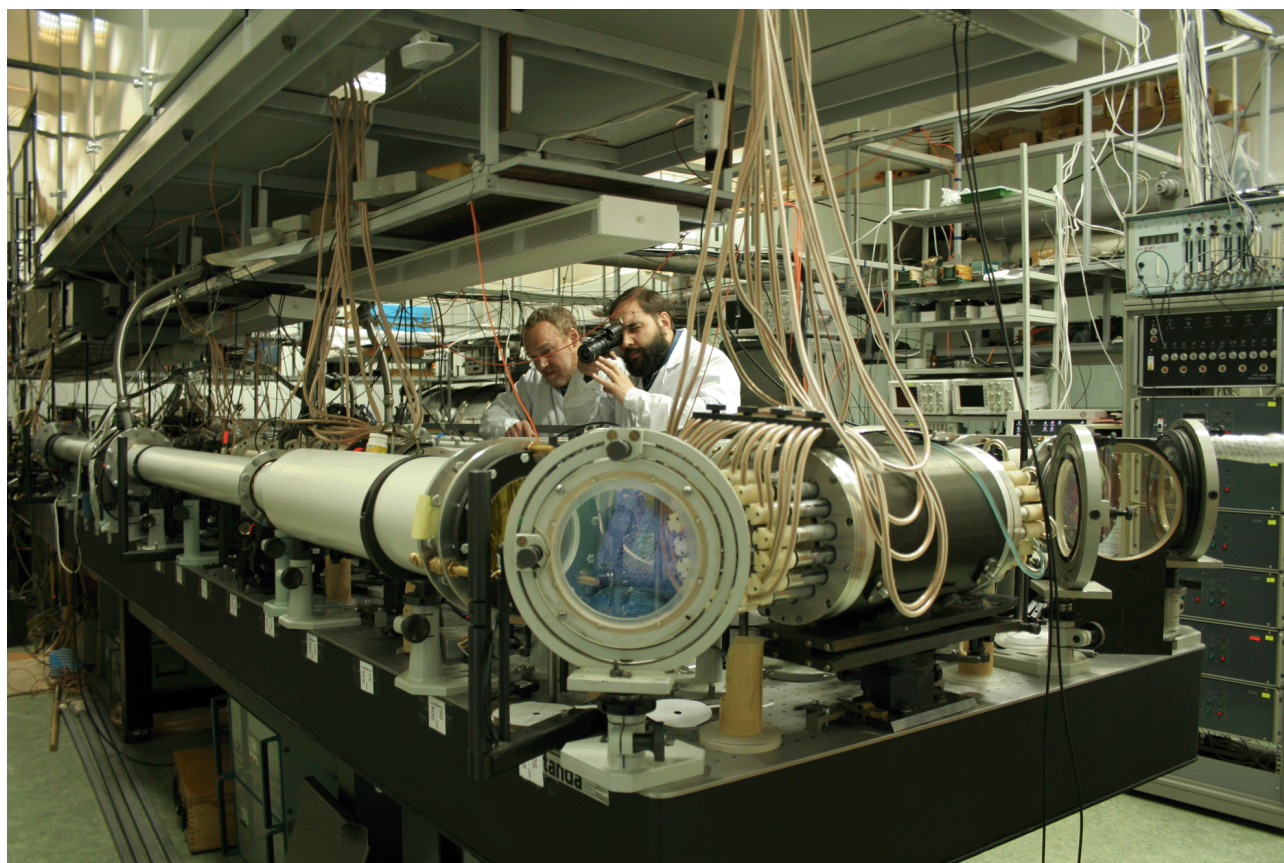
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The laser was born on 16 May 1960 when Theodore Maiman succeeded in generating red coherent light in a ruby crystal and wrote about this in his notebook. This event was a revolutionary achievement of the world science in the 20th century. Work on the development of quantum systems for generating, amplifying, and indicating optical radiation was carried out in the USSR beginning from 1959 under the supervision of N G Basov at the Lebedev Physics Institute (FIAN) in Moscow. Similar works on the development of quantum optical oscillators was also performed at the Vavilov State Optical Institute (GOI) in Leningrad. The first laser in the USSR was created at GOI and FIAN in 1961 (see pp. 73, 77, and 87 in this issue).

The year 2010 was declared the International Year of the Laser, and the scientific community of Russia and many countries in the world (especially the USA, France, and

Germany) widely celebrated the 50th anniversary of the laser. The US House of Representatives adopted a special resolution in which the outstanding role of American and Russian scientists in the creation and development of quantum electronics and lasers was pointed out. Within the framework of these events, in Russia and France a round table devoted to laser physics was held in September 2010 with the participation of scientists from the Russian Academy of Sciences and the Academy of Natural Sciences of France. Several scientific meetings devoted to the laser jubilee were conducted at the Russian Academy of Sciences.

On 21 April 2010, the joint meeting of the scientific session of the Department of Physical Sciences (DPS, RAS) and Scientific Councils of FIAN and the Prokhorov Institute of General Physics, RAS (IGP RAS) devoted to the 50th anniversary of the laser was held at the conference hall at



The 50th anniversary of the laser: One of the world's most powerful petawatt laser facilities created at the Institute of Applied Physics, Russian Academy of Sciences (IAP, RAS, Nizhny Novgorod, Russia). A V Vorontsov and I V Yakovlev, researchers at IAP, RAS.

FIAN (the proceedings of this session are published in this special issue of *Physics – Uspekhi* (see p. 87).

On 13 December 2010, the scientific session of the general meeting of the Department of Physical Sciences (DPS), Russian Academy of Sciences, devoted to the 50th anniversary of the laser was held. The following reports were presented in the session program:

The opening of the scientific session: **V A Matveev** and **S N Bagaev**.

(1) **Bratman V L, Litvak A G, Suvorov E V** “Mastering of the terahertz range: sources and applications”;

(2) **Balykin V I** “Ultracold atoms and atomic optics”;

(3) **Ledentsov N N** “The new generation of vertical-cavity surface-emitting lasers as a key element of the computer-communication era”;

(4) **Krasil’nik Z F** “Lasers for silicon optoelectronics”;

(5) **Shalagin A M** “High-power diode-pumped alkali-metal vapor lasers”;

(6) **Kul’chin Yu N** “The photonics of self-organizing biomineral nanostructures”;

(7) **Kolachevskii N N** “Laser cooling of rare-earth atoms and precision measurements.”

The proceedings of the scientific session of the general meeting of the DPS, RAS will also be published in *Physics – Uspekhi* in 2011.

Apart from the above-mentioned scientific sessions of the DPS, RAS, the scientific session of the general meeting of the Russian Academy of Sciences, “Lasers: 50 years in science, technologies, and medicine” was held on 14–15 December 2010 at the great hall of the Russian Academy of Sciences. The following reports were presented at this session:

(1) **Osipov Yu S** “Introductory word”;

(2) **Townes C H** “Talk of a Nobel Laureate, Foreign member of the RAS” (USA) (read out by **S N Bagaev**);

(3) **Alferov Zh I** “Semiconductor lasers and nanotechnologies”;

(4) **Krokhin O N, Garanin S G** “High-power lasers and thermonuclear fusion”;

(5) **Bagaev S N** “Lasers in high-precision physics and metrology”;

(6) **Mourou G A, Sergeev A M** “Extremal light fields and their fundamental applications”;

(7) **Il’kaev R I, Fortov V E** “Application of lasers for studying the extreme states of matter”;

(8) **Dianov E M** “Lasers and fiber optics”;

(9) **Vinokurov N A, Skriskii A N, Kulpanov G N** “Free-electron lasers: advances and outlook”;

(10) **Bunkin F V, Velikhov E P, Pashinin P P, Sukharev E M** “The history of the development and creation of high-power industrial and military lasers”;

(11) **Makarov V A** “Nonlinear optics: past, present, and future”;

(12) **Panchenko V Ya** “Laser information technologies in biomedicine”;

(13) **Shuvalov V A, Sarkisov O M** “Femtosecond lasers in chemistry and biology”;

(14) **Shcherbakov I A** “Lasers and medicine”;

(15) **Konov V I** “Laser–plasma micro- and nanotechnologies.”

In the concluding part of the general meeting of RAS on 15 December 2010, A G Litvak pointed out: “Today we can say that the invention of lasers is one of the most important achievements of humankind in the 20th century. It has led to the development of absolutely new fields in science and technology and has also revolutionized many fields of life. Lasers have also become a unique tool for scientific studies in almost all fields of natural science. Lasers are so widely used in numerous applications that it seems that the field of their possible applications is only limited by our imagination.

From the moment the first laser was created in 1960, ten Nobel Prizes have been awarded to scientists for studies related to the development and applications of lasers, including the work of outstanding Russian scientists N G Basov, A M Prokhorov, and Zh I Alferov.

Laser studies in the Soviet Union were considerably supported first of all due to their military applications. For this reason, they maintained competitive positions in the world. The reports presented at this scientific session show that Russian scientists working in a number of fields in laser physics can obtain results at the world level today, as well. This occurs owing to considerable resources created as early as the Soviet times, to scientific schools and research groups preserved since that time, and to collaboration within international projects.”

The editorial board of *Physics–Uspekhi* joins with the words of academician A G Litvak at the general meeting of RAS and celebrates the outstanding 50th anniversary of the laser by publishing this special issue of the journal. Because the advances of our country in this field of science and technology are quite considerable, we will publish articles in this field not only in this special issue but also during all of 2011 under the dedication “Celebrating 50 years of the laser.”