First All-Union Young Scientists' Workshop on "Priority Problems of Physics"

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The first business of the All-Union Young Scientists' Workshop on "Priority Problems of Physics" was conducted from 17 through 27 May 1976 in the Kremlin of the ancient Russian city of Rostov Velikiĭ, which houses the International Youth Camp of the Central Committee of the All-Union Lenin Young Communist League (TsK VLKSM). The workshop was organized by the Presidium of the USSR Academy of Sciences and the Central Committee of the TsK VLKSM on the initiative of the Junior Scientists' Council of the USSR Academy of Sciences P. N. Lebedev Physics Institute and the Scientific Youth Division of the TsK VLKSM. Though only one of several dozen workshops held by this division for young specialists each year, it was unique both for its cast of lecturers and auditors and for the unusual breadth of its subject matter. The scientists invited to lecture were leading specialists in their fields, who, at the same time, represented the pattern of development of science as a whole, directors from the Academy of Sciences and its institutes and of various other scientific-organizational agencies of our country. The 130 auditors, most of them from 30 to 35 years of age, are working actively in 50 academic, educational, and industrial institutes (about half of them were Candidates of Sciences, and eight were holders of Lenin Komsomol Prizes in Physics).

Since the war, the practice of holding congresses, conferences, workshops, etc. with all physics as their subject matter seems to have nearly died out in our country and, apparently, abroad as well. This was because of the increase in the number of studies produced and, consequently, the numbers of speakers and participants, but, most importantly, because of the sharply narrower specialization in science, as a result of which physicists in different branches could no longer "understand" each other. Fortunately though, this tendency was not as strong "in print," as is illustrated by the existence of such journals as the "Zhurnal Éksperimental' noĭ i Teoreticheskoĭ Fiziki" [Sov. Phys. JETP] and the "Uspekhi Fizicheskikh Nauk" [Sov. Phys. Usp]. The latter publishes the papers with the closest resemblance to those presented at this workshop.

The idea of helping young persons embarking on scientific careers to orient themselves and directing them toward the solution of the highest-priority problems of modern physics had been voiced in publications by many of our country's leading scientists, such as N. G. Basov D. I. Blokhintsev, V. L. Ginzburg, Ya. B. Zel'dovich and A. M. Prokhorov. Most of them also took part in organization of the workshop. The objective need for it was demonstrated by a level of activity rarely observed in such undertakings and by the interest of the auditors in literally all of the present papers. This suggests that the idea of reviving the tradition of conferences on general physics is not *a priori* absurd.

Thus, the natural skepticism that initially affected even the participants at the workshop was dissipated within the first few days. Here we should register certain observations that it will be helpful to remember in organizing such workshops for the future (perhaps not only in physics). The objectively existing "uncertainty relation" between the creative impulse of the scientist and the probability of its becoming manifest "at a given point in space" (at Rostov) "within a given interval of time" (10 days) required a large reserve of potential lecturers (in this case there was twofold redundancy). It was necessary to accept the uncertainty of the workshop's program (and even uncertainty regarding each day of its work) and to compensate these deficiencies with lectures on a high level.

The workshop was opened by E. P. Velikhov, Chairman of the Council of Young Scientists in the TsK VLKSM. V. M. Kuznetsov, director of the Scientific Youth Division of the TsK VLKSM, told of the work of the Komsomol in the training of Svoiet scientists. This was followed by delivery of a paper by A. M. Prokhorov, Academician-Secretary of the Division of General Physics and Astronomy of the USSR Academy of Sciences.

There is evidently no point in attempting a detailed account of the presented lectures in this article. Many of them were based on materials from reviews that had been published recently in this journal or were in the editors' portfolio. Some of the lecturers agreed to rework their lectures for publication at the request of the editorial staffs of various journals. This, incidentally, eliminates the problem of issuing the workshop's lectures in the form of a special publication. We shall confine ourselves to the list of lectures given at the end of this paper.

The workshop is organically related to the journal "Uspekhi Fizicheskikh Nauk." Some of the members of the Uspekhi's editorial staff worked on the program committee of the workshop, one representative was on the Steering Committee, and a special "Uspekhi Day" was conducted. Introductory remarks by Academician

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B. B. Kadomtsev, the Deputy Editor-in-Chief of the journal, were followed by presentation of the lectures[6,7,19,24,26][1]; members of the editorial staff answered numerous questions from members of the audience.

It will be well to note one new concern that was manifested in several of the papers delivered at the workshop (it was brought up both by auditors and by lecturers and became the subject of numerous discussions): the great interest devoted to the economic and organizational problems of scientific development.

Modern laboratory experiments are becoming as expensive, complex, bulky, energy-demanding, etc. as major industrial enterprises, i.e., in addition to a characteristic aspect of modern science—its transformation into productive force—, we must also speak of the dialectically related transformation of science into a branch of modern productive industry. Five or ten years ago, when the "junior" physicists present at the workshop were studying at the universities, this industrialization of science concerned for the most part only scientists dealing with accelerators and reactors and perhaps also astronomers, but it can now be stated that practically all really urgent problems of modern physics can be solved only by making large material, financial, and human investments, i.e., by work done under what are known as "themes," "resolutions," "projects," or "programs."

Reasonable combination of these problems, their screening, determination of their priorities, and, finally, collaboration on them at all levels from the interlaboratory and institute sectors to collaboration with industry and intergovernmental collaboration—the modern physicist must participate in solution of all of these problems. The experimentor constructing his "own" apparatus with the aid of the laboratory workshop, independent (at most with the aid of a graduate student and laboratory assistant) conduct of measurements on it with "simple" instruments—oscillographs, spectrometers, etc., processing of the results with the slide rule and graph paper, and publication of the paper—such was the "production cycle" in the solution of physical problems in the recent past. Today, on the other hand, the basic aspects of the approach to solution of the problems confronting science are establishment of the priority of the problem and the need to solve it by precisely this method, obtaining the necessary appropriations, placing orders, designing and building the experimental equipment and even special buildings to house it, delegation of different stages in the experiment to different research groups, automating the conduct of the experiment and the processing of its results with electronic computers, and, finally, applications of the results in industry (or science).

It was shown at the workshop that the same procedures are or should be followed both in solution of problems in applied physics: the controlled thermonuclear reaction,[15–18] high-temperature superconductivity,[9,10] the creation of unique substances or physical conditions,[8,11,12,20,21] the development of new physical instruments,[19,22,23] and solution of physical problems in biology, medicine, and ecology[13,14,24] and in fundamental problems: investigation of the microscopic universe;[5–7] general relativity theory, astrophysics and astronomy.[25–27]

Although the subject matter of the workshop papers may seem to have been rather wide-ranging, the impression left with the auditors was far from disjointed. This was due in large part to successful combination of a high level of exposition with ease of comprehension and the "live" audience response that greeted most of the lecturers.

Inevitably, a whole series of important branches of modern physics (for example, geophysics, solid-state physics, microelectronics, computer applications and automation of the experiment, organization of science) were represented inadequately or not at all at this workshop. At the final session, which was chaired by A. N. Georgobiani, chief of the Steering Committee, there was unanimous agreement that the workshop had been an unqualified success and should be continued. It was proposed that the next workshop be held in 1978.

LIST OF LECTURES

1. Introductory lecture (E. P. Velikhov).
2. Basic trends in work with the young scientific-technical intelligentsia (V. M. Kuznetsov).
3. The relationship between fundamental and applied science (A. M. Prokhorov; read by N. V. Karlov).
4. New policy concerning the award of academic degrees and titles (V. G. Kirillov-Ugryumov).
5. The fundamental unit of length (D. A. Kirzhnits).
6. New elementary particles (L. B. Okun').
7. Strong interactions at high energies (I. M. Dremin).
8. Muonic atoms (V. G. Kirillov-Ugryumov).
9. Superconductivity and superfluidity (V. L. Ginzburg).
10. High-temperature superconductivity (N. A. Chernoplekov).
11. Ultrastrong magnetic fields (V. G. Veselago).
12. Problems in the chemistry of semiconductors (A. V. Novoselova).
13. Chemical physics of biological processes (N. M. Émanuél').
14. Thermodynamics, information theory and biology (M. V. Vol'kenshteĭn).
15. Nuclear power engineering (V. A. Sidorenko).
16. The thermonuclear reactor (E. P. Velikhov).
17. Laser thermonuclear fusion (O. N. Krokhin).
18. Lasers and their applications (N. G. Basov).
19. High-resolution in-the-resonator spectroscopy (A. F. Suchkov).
20. Laser separation of isotopes (N. V. Karlov).
21. New high-temperature materials (V. V. Osiko).
22. Optical storage devices (Yu. M. Popov).
23. Acoustoelectronics (Yu. V. Gulyaev).
24. Man-made changes in the earth's atmosphere (B. M. Smirnov).
25. News of the planets (M. Ya. Marov).
26. Cosmic rays and black holes (R. A. Syunyaev).
27. Gravity waves (V. B. Braginskiĭ).

Translated by R. W. Bowers

[1]See list of lectures at the end of the article.