

# Second All-Union School on Current Problems in Physics for Young Scientists

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The Second All-Union School on Current Problems in Physics for Young Scientists was held within the ancient walls of the Rostov kremlin (citadel) May 17-23, 1978. This had also been the site of the First School, held two years earlier. These Schools, which were originally founded at the initiative of the Department of Scientific Youth of the Central Committee of the All-Union Leninist Komsomol (Communist Youth League) and the Council of Young Scientists of the Lebedev Physics Institute of the Academy of Sciences of the USSR, in accordance with a decision of the Soviet Academy of Sciences and the Central Committee of the All-Union Komsomol, have now become a tradition.

In this century of scientific and technological revolution, new scientific and technological fields are appearing literally in front of our eyes. New technological processes are being developed, and changes are occurring in the organization of labor and the control of production. The various fields of knowledge are intertwined and bursting with information, and discoveries are being made at the boundaries between the various scientific fields. The specialized education acquired in the past is becoming obsolescent ever more rapidly, scientific apparatus is becoming outdated, and the time lag between the birth of a scientific idea and its practical implementation is becoming ever shorter. Clearly, there is an objective need for constantly supplementing formal education for refresher courses, and, in certain cases, for retraining into related fields which are developing most rapidly. More and more we are seeing the need for such retraining of young people in some field of specialization. The possibility that a person will be rapidly "switched" from one direction to another must be planned for and predicted. It is with this goal in mind—to help the young people entering the sciences to become oriented toward and to help solve the most pressing (the "hottest") problems of modern science and technology—that the Presidium of the Soviet Academy of Sciences and the Central Committee of the All-Union Komsomol organized the broad-scope All-Union School on Current Problems in Physics in 1976. The success of the first sessions of this School has already been mentioned in pages of this journal.<sup>1</sup>

There is another reason for schools with a broad subject range: the rapidly increasing specialization of science, such that physicists in different fields are finding it difficult to understand each other. Physicists, must, however, understand each other: it is right at

the borderline between different fields that many of the new discoveries are occurring. Unfortunately, the convergence of interest of people from different fields is usually unpredictable. Yet another possible benefit of broad-scope schools is to encourage overlapping interests among people in different fields and to encourage joint research. At such schools, there will inevitably be an exchange of ideas among young researchers in various fields, and this contact will be made in an atmosphere of the unity of physics. This unity may in fact be one of the leading characteristics of the Rostov School; it has been mentioned by many of the participants, and it confirms that physics is a single science, all of whose fields are equally interesting and equally intriguing. We find this unity not only in the elementary laws but even in the physicists' style of discussion and logic. In the words of O. N. Krokhin, the vice president of the Organizational Committee, upon the opening of the school, "... The school gives the young scientist an opportunity to sense that physics is a single science, with various directions which enrich each other, and this is one reason for the continuous and rapid growth of physics... only a broad understanding of the various fields of physics can lead to success."

The Rostov School of physicists is unique in its unusually broad subject range and in the makeup of the lecturers and the audience. The program basically spans all modern physics, from astrophysics to the microworld. Scientists who are leaders in their fields are invited to give lectures, while leading figures from the Academy of Sciences and its institutes draw a picture of the development of science as a whole. This was the case at the sessions of the First All-Union School in 1976, where review papers were given by N. G. Basov, E. P. Velikhov, V. L. Ginzburg, A. V. Novoselova, N. M. Émanuél', and other leading scientists. The sessions of the Second School in the Rostov kremlin were also distinguished by a broad range of problems in modern physics and by lecturers with impressive credentials (see the list of lectures at the end of this paper). Here the audience heard such well-known scientists as B. M. Vul, Ya. B. Zel'dovich, B. B. Kadomtsev, L. V. Keldysh, and N. M. Émanuél', among other eminent scientists, leaders in their fields.

As at the First School, the Uspekhi Fizicheskikh Nauk Day, honoring this journal, was a very successful event. Papers were delivered by B. B. Kadomtsev (editor in chief) and by Ya. B. Zel'dovich, L. V. Keldysh, and B. M. Smirnov, all members of the editorial board. The students extended their warm congratulations to the Journal on its sixtieth birthday and presented it with the Russian souvenir of souvenirs from time immemorial:

<sup>1</sup>V. A. Goncharov and R. G. Maev, Usp. Fiz. Nauk 122, 341 (1977) [Sov. Phys. Usp. 20, 555 (1977)].

a samovar.

There is apparently no point in reviewing in detail the contents of the lectures here; in particular, many of these lecturers stem from reviews which have been submitted for publication or already published in this journal. On the whole, however, it can be said that the program emphasized both fundamental problems (study of the microworld, cosmology, geophysics, and oceanic physics) and applied problems (the present state of controlled thermonuclear fusion, problems from solid state physics, questions from biophysics and biochemistry, new research methods, and related problems such as physical methods in medicine, the automation of scientific research, and problems of education in physics).

It would be difficult to overestimate the value of the information and the creative spirit acquired by the young scientists at Rostov. Testimony to the usefulness of this School is its increasing popularity among young scientists. The School has an impact which extends beyond the participants, in that its sessions lead to a "chain-reaction" dissemination of new knowledge. Those who attend the School bring back word of it to others in their own institutions. The privilege of attending the School has become a way to encourage young scientists in their work. Some 500 applications were submitted for the 130 places in the Second School. Information on the Second School and invitations to participate were sent to all the physics institutes of the Soviet Academy of Sciences, its branches, the Academies of Sciences of the Union republics, universities, engineering-physics and polytechnical colleges, and applied-research institutes. The Organizational Committee selected participants on a competitive basis, focusing on the scientific and civic activity of the young scientist. In this selection an attempt was made to give special consideration to young scientists from the more remote parts of the country, e.g., from the Physicotechnical Institute of Problems of the North (in the city of Yakutsk) and the Institute of Physics of the Siberian branch of the Soviet Academy of Sciences (Krasnoyarsk). For seven days, young physicists from ten Union republics, including 90 candidates of science, 45 leaders of scientific teams, and 17 winners of the Leninist Komsomol Prize, attended this unique course in modern physics, where the leading scientists of the nation were the lecturers. This is a course which could not be found in the proceedings of any conference or any monograph. There is no book which could substitute for the direct personal contact with leading scientists in the relaxed environment of the courtyards of the Rostov kremlin, which had been converted into "lecture halls" for the days of the School. The young scientists at the School were unusually active. In the words of V. A. Fabrikant, "It's pleasant to address an audience which shows active interest. It's been a long time since I have received so many questions, and I mean sensible questions." Although the number of questions permitted after a lecture had to be limited because of the very tight schedule throughout the seven days, these questions were pursued outside the conference rooms in the courtyards. For this reason, the breaks between the

lectures were largely symbolic, for both the lecturers and most of the audience. This seminal contact which was initiated in the lectures did not end with the lectures. After the lectures, furthermore, the flow of information was in both directions. This thought was expressed by N. M. Émanuél': "An important result was that many of the young scientists suggested new fields for collaboration. The benefit was mutual." In addition, it is very important for a young researcher to hear a gracious and objective assessment of his work from an eminent scientist. In the formative years of a young scientist, such an assessment, even if it turns out to be very critical, is a powerful stimulus to creative work.

The closing session, chaired by S. P. Kapitsa, summarized the work of the Second All-Union School of Young Scientists on Current Problems in Physics, and both the lecturers and the students commented on the obvious success of the School, its high scientific level, and its good organization. "It was a useful and interesting beginning, which captured the attention and inspired both the audience (at least, I hope so) and the lecturers," commented Ya. B. Zel'dovich. He was essentially expressing the general feeling of the scientists who lectured at both the First and Second Schools. The Third School is planned for 1980.

Finally, we would like to express our real gratitude to all the scientists, who, despite their busy schedules, were generous in their time and effort to meet with representatives of the young generation of physicists, to share their knowledge, their rich experience, and their own ideas about our world. We believe that this unbreakable bond between generations will guarantee the future success of Soviet physics.

## LIST OF LECTURES

- <sup>1</sup>Introductory lecture (O. N. Krokhin).
- <sup>2</sup>Electronic phenomena in a two-dimensional medium (B. M. Vul).
- <sup>3</sup>Problems of optoacoustics (L. M. Lyamshev).
- <sup>4</sup>Thermonuclear fusion with relativistic electron beams (L. I. Rudakov).
- <sup>5</sup>Present state of laser thermonuclear fusion (O. N. Krokhin).
- <sup>6</sup>Outlook for laser fusion (L. P. Feoktistov).
- <sup>7</sup>New results in cosmology (Ya. B. Zel'dovich).
- <sup>8</sup>Effect of solar activity on weather and climate (É. R. Mustel').
- <sup>9</sup>Oceanic acoustics (Yu. Yu. Zhitkovskii).
- <sup>10</sup>Mu-mesic atoms (V. G. Kirillov-Ugryumov).
- <sup>11</sup>Problems of energy conversion in biology (D. S. Chernavskii).
- <sup>12</sup>Current problems in chemistry and biology and their practical importance (N. M. Émanuél').
- <sup>13</sup>Modern ideas about elementary particles (A. A. Komar).
- <sup>14</sup>Anomalously low friction (V. L. Tal'roze).
- <sup>15</sup>Laser microscopy (G. G. Petrash).
- <sup>16</sup>Synchrotron radiation (S. P. Kapitsa).
- <sup>17</sup>Activity of the Advanced Degree Commission in the certification of scientists (V. G. Kirillov-Ugryumov).
- <sup>18</sup>Problems of education in physics (V. A. Fabrikant).
- <sup>19</sup>Problems of education in physics and experience in the train-

ing of physicists at the Moscow Physicotechnical Institute  
(S. P. Kapitsa).

#### Roundtable discussion on physical methods in medicine

- <sup>20</sup>Lasers in ophthalmology (V. S. Akopyan).
- <sup>21</sup>Lasers in endoscopic surgery (Yu. M. Pantsyrev).
- <sup>22</sup>The laser scalpel in gastrointestinal surgery (O. K. Skobelkin).

#### Roundtable discussion on automation of scientific experiments

- <sup>23</sup>Automation of physics experiments (A. N. Vystavkin).

<sup>24</sup>Small computers (B. N. Naumov).

<sup>25</sup>Physical problems in microelectronics (R. A. Suris).

#### Roundtable discussion on advances in the physical sciences

- <sup>26</sup>Present state of the effort toward controlled thermonuclear fusion (B. B. Kadomtsev).
- <sup>27</sup>Some problems of the microworld (Ya. B. Zel'dovich).
- <sup>28</sup>Metal-dielectric transitions (L. V. Keldysh).
- <sup>29</sup>Research on ball lightning (B. M. Smirnov).

Translated by Dave Parsons