

As a relaxation, we used to go to the nearby birch grove, "hunting" for white mushrooms. Sergeĭ Ivanovich was a great expert in this complicated art, whereas I was quite useless.

A congress of Soviet physicists took place during that summer in Odessa. I do not cite its number because there is considerable confusion about this. In a word, I am referring to the All-Union Congress of Physicists in Odessa in which foreign scientists participated. Sergeĭ Ivanovich and I decided to travel to the Congress direct from the country, and went straight to the railroad station without going to the town. The Congress attracted a large number of delegates, including many eminent foreign physicists. I will not mention many of the well-known names because it is easy to make a mistake after such a long time. I mention only those whom I clearly remember. They included Bothe, who had just discovered (together with Becker) the "strongly penetrating

Λ -radiation" which was soon to be shown by Chadwick to have been a stream of neutrons. There was also Sommerfeld, whose paper on the theory of metals attracted an overflow audience. Of course, one remembers the monumental figure of Pauli. He was constantly engaged in solving physics problems, even on the way between the University where the Congress took place and the hotel where he was staying. This was clear from the concentration with which Pauli walked along the street, gesticulating slightly. Sergeĭ Ivanovich read a paper to one of the parallel sessions of the Congress. I have only a vague memory of this paper.

At the end of the Congress, the delegates were taken for a trip by motorlaunch from Odessa to Batumi and back. However, Sergeĭ Ivanovich and I decided not to take part (for reasons which I do not now recall) and returned to Bol'shoe Tsarevo the same way we went to Odessa.

S. I. Vavilov—teacher of young scientists

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I first met Sergeĭ Ivanovich Vavilov in 1925 when I was a student, attending the first course in the Physics Department of Moscow University. My generation was very lucky. Between 1925 and 1930, while I was a student, our teachers included S. I. Vavilov, G. S. Landsberg, L. I. Mandel'shtam, and I. E. Tamm. Postgraduates A. A. Andronov, A. A. Vitt, M. A. Leontovich, and S. E. Khaikin also participated in various types of activity with the students.

We felt our teachers' preoccupation with science, and this had a very strong effect on the formation of our outlook generally. Sergeĭ Ivanovich immediately captured the hearts of the students, whom he treated as equals. He did this without trace of compulsion, quite naturally. We were immediately struck by the breadth of his interests and knowledge. He presented a surprising combination of restraint and sociability. And he readily shared his thoughts and worries.

We gradually began to understand the originality of Sergeĭ Ivanovich as a scientist and valued his characteristically unhurried but penetrating approach to the problems of science and its history. His cast of mind could be described by the somewhat old-fashioned phrase "natural philosopher" although he was always closely in touch with the latest events in physics.

Sergeĭ Ivanovich had a sense of humor which we found attractive. I recall one particular general physics laboratory class. Sergeĭ Ivanovich appeared unexpectedly and made us watch a female student trying to adjust the vertical position of a cathetometer (which was nearly falling over) through the fine adjustment of the micrometer screw instead of first arranging the instrument to be vertical "by eye" and then methodically using the screw for precise vertical adjustment. Sergeĭ Ivanovich bit his lip trying not to laugh aloud, but one could see the twinkle in his eye! He then tried to explain to the student without offending her how she should proceed. For us, this was a lesson in a reasoned approach to instrumentation which we were unlikely to forget.

Sergeĭ Ivanovich's enthusiasm for the history of physics was unavoidably reflected in our own interests. I recall the animated discussion between S. I. Vavilov and L. I. Mandel'shtam in 1927, just after the publication of the third volume of "History of Scientific Literature in New Languages" by Leonardo Olschki which was devoted to Galileo and his period. Some years later, this book was translated into Russian and some of the thoughts in the brilliant paper "Galileo in the History of Optics" by Sergeĭ Ivanovich were clearly stimulated by Olschki's book, especially the emphasis on Galileo as a popularizer of science, writing in the native language rather than in scientific Latin.

I have since been reminded, in somewhat unusual circumstances, of all that I had learnt about Galileo directly from Sergeĭ Ivanovich and from his books.

This happened in 1964 in Florence. I was attending a reception at Palazzo dei Signori, given by the Mayor of Florence for the delegation from "Znanie", a society of which I was a member. The Mayor, a professor of Roman law, made an emotional speech and, unexpectedly, I discovered that I had to reply. I was rescued from my embarrassment by Sergeĭ Ivanovich. It frequently happens that, in a moment of danger, one's memory becomes sharper. On that occasion, without a mere twinge of conscience, I simply repeated all that I learnt from Sergeĭ Ivanovich about Galileo. This was very appropriate because 1964 was the 400th anniversary of the birth of Galileo. The Mayor was clearly surprised and touched by this piece of plagiarism.

In the fall of 1930, Sergeĭ Ivanovich telephoned and asked me to give the course on physical optics at the Moscow Engineering Institute which he previously gave himself. Naturally, I tried to decline but Sergeĭ Ivanovich insisted that I did it. I then asked for the syllabus of the course. His reply was that he changed it from year to year and asked me to call on him at his house so that we could discuss the content of the course. I do not remember precisely what was said at this discussion, but I do

remember that the syllabus was mentioned least. Sergei Ivanovich spoke extensively about Italy and Leonardo da Vinci.

I started the series of lectures a week or two later. They were terrible. For some reason, I decided to base geometric optics on variational principles and the result was that the students could not understand a word. This was aggravated by the fact that I got into a muddle with the drawings (the sagittal section was particularly difficult). The students revolted and asked for my removal. They had heard rumors from more senior students about Sergei Ivanovich's lectures. Somehow, the students were pacified, but a week later the trouble recurred. The Dean sent the representatives of the students to Sergei Ivanovich, who advised patience. Sergei Ivanovich's charm did the trick and, by the end of the semester, all was well again.

At about the same time, Sergei Ivanovich assigned to me an experimental project. Until then, I was working under the supervision of G. S. Landsberg. Sergei Ivanovich was worried by the fact that, in his paper on the quantum yield of fluorescence (Vavilov's Law), he had to use published data on the energy distribution in the spectrum of a mercury lamp. The necessary equipment was not available and he used to joke about his unsuccessful attempts to use an old galvanometer which gave him a lot of trouble. Sergei Ivanovich suggested that this work should be repeated, and measurements should be carried out not only of the fluorescence intensity but also of the intensity of the spectral lines producing this emission. After some unsuccessful attempts to use the old galvanometer, I replaced it with an ordinary low-resistance mirror galvanometer and developed a

photoelectric circuit for detecting the deflection of the light spot. At the time, such systems were not available commercially and the device helped to solve the problem.

Although Sergei Ivanovich gave me a free hand, he always enquired in detail about the progress of my researches whenever he visited the All-Union Electrical Engineering Institute where this work was being done. Having obtained the results, I continued to delay publication of the paper and Sergei Ivanovich published these data (with the appropriate reference to me) in tables which were issued under his editorship.

When I finally wrote the paper, which Sergei Ivanovich carefully read and edited, I naturally suggested that he should be one of the authors. He declined, despite all my arguments, and this too, was an important lesson to me.

During the last years of his life, Sergei Ivanovich was, of course, totally overburdened by a mass of different duties. However, he never gave the impression of being in a hurry and we were so used to this that we took it for granted. Later, when Sergei Ivanovich was no longer with us, we realized in retrospect the sheer volume of all his work and that, despite its superficial variety, there was an underlying internal unity.

I last saw Sergei Ivanovich directing a seminar. He complained about his heart which interfered with his work. He died next morning.

These brief recollections can hardly do justice to the debt which I owe to this remarkable man.

Sergei Ivanovich Vavilov in the Optics Institute

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Having survived the initial preparatory period of its development during the early thirties, the optical industry of the Soviet Union was, in the words of D. S. Rozhdestvenskiĭ, "ready for takeoff" and was preparing to deploy "all its resources for peaceful but also military purposes." The growth of the industry presented new and previously unfamiliar problems to science. On the other hand, scientific problems had to become more closely linked with the problems presented by industry.

The Optics Institute was prepared for these new demands by its history, beginning with the original ideas of D. S. Rozhdestvenskiĭ about "a scientific institution of a new kind in which science and technology would be intimately connected." At this time, the State Optics Institute had a broad range of interests with a differentiated structure and employed about 160 scientists. However, this was not enough to satisfy the needs of the optical industry which in 1930 was unified in the All-Union Association of Optico-Mechanical Industry. D. S. Rozhdestvenskiĭ wrote at the time that the staff of the

State Optics Institute should increase by a factor of 4-5 in the course of the next 5-6 years. Having foreseen this development of the Institute, D. S. Rozhdestvenskiĭ began to look for a successor, a young energetic scientist with extensive knowledge of optics, who would be capable of directing a complex scientific organization such as the Optics Institute already was at that time. His choice was Sergei Ivanovich Vavilov, a professor at Moscow University, well-known for his work in optics, who had only just been elected Member of the Academy of Sciences. After some negotiations which, in addition to D. S. Rozhdestvenskiĭ, involved T. P. Kravets (who knew Vavilov well from the Lebedev School and from Lazarev's Institute of Physics and Biophysics), and after a number of difficulties were overcome, Vavilov arrived in Leningrad in 1932 and took over the post of Scientific Chief of the State Optics Institute, which he held until he was elected President of the USSR Academy of Sciences in 1945.

His years as Scientific Chief of the State Optics Institute were not easy. They saw the rapid growth of the Institute, an expansion of its range of interests, the unavoidable growing pains, and finally the War, when all possible effort had to be mobilized for the front line, but

²Based on rewritten chapters of the paper "Sergei Ivanovich Vavilov" published in "Fifty Years of the S. I. Vavilov State Optics Institute" (Mashinostroenie, Leningrad, 1968, p. 587).