

From the History of Physics*THREE LETTERS OF RUSSIAN PHYSICISTS TO W. K. ROENTGEN**

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SEVEN decades separate us from the year 1896 which can rightfully be called the Roentgen year.

In the beginning of January, 1896 the paper "On A New Kind Of Rays" by Wilhelm Konrad Roentgen, professor of physics in Würzburg University was published in the Sitz.-Ber. Phys.-med. Ges. Würzburg. In this paper which has a subtitle "Preliminary Communication" and which was written in the form of an abstract in an unusually simple laconic manner a description was given of the properties of "x-rays" which had just been discovered by Roentgen. Roentgen mailed reprints of the article to his close friends and colleagues. The most prominent physicists of different countries of the world expressed their congratulations to the German scientific genius and their admiration elicited by the discovery of "x-rays."

In connection with this event three letters written by the prominent Russian physicists P. N. Lebedev, I. I. Borgman and O. D. Khvol'son to Roentgen soon after the discovery of x-rays in January-February of 1896 are of interest. These letters unknown to our readers until now were published in May 1965 in "Sonderdruck aus Röntgen-Blätter-18" published by the German Roentgen Museum in the city of Remscheid-Lennep, the birthplace of the scientist, by the curator of the Museum Ernst Streller who kindly sent a copy of this publication to the present author. The letters were written in German and are given in translation.

The prominent Russian physicist, a brilliant experimenter and the organizer of the first large school of physics in Russia, professor of Moscow University Petr Nikolaevich Lebedev wrote to W. K. Roentgen:

"Moscow 20.1.96

Highly esteemed Herr Professor!

At the last meeting of the Moscow Physics Society I reported on your communication on x-rays on the basis of the reprint of the article which you so kindly sent to me.

The interest in your discovery exceeded all expectations and the Society urgently requested me to demonstrate your experiments at one of the sessions.

*The letters from P. N. Lebedev are given as translated by L. P. Morozova.

On the basis of personal interest I also would gladly repeat your experiments but I am afraid that they will require considerable preparation and will distract me for a long time from my investigations of the problem of the mechanical action of acoustic waves on resonators. Therefore I permit myself to request you that you should send me (Physics Laboratory of the Moscow University) some prints from your negatives from which I shall then make slides and when the occasion presents itself shall immediately send back to you your prints. If sufficient material will become available then we shall plan a separate session since the reports of your experiments in the Royal Palace in Berlin have been abbreviated in many Russian publications (some of these, unfortunately, have had physico-technical editorial comments added to them!) and this raises numerous questions. I would be very grateful to you if you would send me a photograph of yourself which I could show in conclusion. This wish may, probably, appear to be quite naive, but I attach great significance to it: the general public for which every investigation and every discovery appears to be something impossible and even transcendental will, due to the photograph of the investigator, return to the thought that science is advanced not by x-spirits, but by real living people - and such a thought by itself is already a tremendous step forward in the spiritual development of man; but one must, and especially in our country, take special care to emphasize this point.

With deep respect

Petr Lebedev"

X-rays aroused the interest of Petr Nikolaevich and he spent some time in investigating them. It is well known that Roentgen having discovered x-rays and having described their properties* did not establish their physical nature. The similarity between x-rays and light rays correctly noted by him led him to the incorrect supposition regarding their nature as longitudinal vibrations of the ether. Working with

*In addition to the already cited first communication of Roentgen dated December 28, 1895 "On a New Kind of Rays," a second one "On a New Kind of Rays" followed on March 9, 1896, and on March 10, 1897 a third one was published "Further Investigation of the Properties of X-rays."

x-rays Lebedev had a clear conception that success will depend "not on innumerable repetition of x-ray pictures of apparatus which happens to be at hand, but on a systematic investigation of the phenomenon itself." It is of interest that the attitude of Lebedev to the nature of x-rays expressed by him in 1896 was closer to the truth: "The assumption that x-rays are ultra-ultraviolet rays . . . is . . . quite a possible hypothesis".*

On January 29 and February 8, 1896 P. N. Lebedev twice gave at the Moscow University a lecture "On X-rays Discovered by Roentgen" illustrating it by x-ray photographs obtained by himself. In May 1896 in the periodical "Russkaya Mysl'" ("Russian Thought") there was published an article by P. N. Lebedev "On X-rays Discovered by Roentgen," while somewhat earlier in Munich there was published his paper "Photography with the Aid of Roentgen Rays".†

During the first days of February 1896 W. K. Roentgen received the following telegram:

"From St.-Petersburg. Sent on 4.2.1896.

The student youth of St. Petersburg assembled in the Physics Laboratory of St. Petersburg University for a brilliant demonstration of Roentgen rays by Professor Borgman and his assistants Gershun‡ and Skobel'tyn** warmly greets Professor Roentgen on the occasion of his great discovery."

On the telegram there is a handwritten note by Roentgen regarding a reply to this telegram by letter mailed on February 9.

The reply to Roentgen's letter was written by the professor of St Petersburg University Ivan Ivanovich Borgman - a prominent lecturer and a remarkable experimenter, one of the founders of the Physics Institute of St. Petersburg University:

"Highly esteemed colleague!

I received your valued letter and shall regard it as my duty to transmit your thanks to the gentlemen who sent you the telegram. At the same time I take the opportunity of explaining to you the origin of this telegram. On January 22nd Russian style (Julian calendar) I read a paper "On Roentgen Rays" at a session of our physics seminar. The announcement of this paper aroused tremendous interest among the

*P. N. Lebedev, *Collected Works*, Moscow, 1913.

†Lebedeff, *Photographien mit Röntgenschen Strahlen*, Munch. med. Wschr. 43, 284 (24 March 1896).

‡Aleksandr L'vovich Gershun—Russian physicist who later became the creator and leader of the optical industry in Russia.

**Vladimir Vladimirovich Skobel'tsyn—Russian physicist, professor of the Electrotechnical, and later of the Polytechnical Institute in St. Petersburg. The father of the prominent Soviet physicist Dmitri Vladimirovich Skobel'tsyn.

students of all the institutions of higher learning in St. Petersburg, so that the usually small number of auditors increased to 400. At the end of my report the audience consisting of students of the university, of the higher technical schools, and of the higher women's schools expressed the desire to transmit to you their most cordial good wishes in connection with your discovery. To illustrate the report I took two photographs in front of the audience and they can rightly be said to be the best of all those obtained by us earlier. I permit myself to enclose prints of both photographs in the hope that these prints will be of interest to you.

Some experiments which we (I myself and my assistant Dr. A. Gershun) have carried out appeared to show that x-rays dissipate positive electricity much more rapidly than negative electricity, and at short distances even produce negative electrification. An aluminum plate (0.1 mm in thickness, grounded) interposed in the gap, or ebonite, somewhat weakened the action of the rays, while a glass plate of 10 mm thickness completely stopped the x-rays. The spark gap of a small induction coil could be noticeably increased when irradiated with Roentgen rays. A zinc plate grounded through a galvanometer coil shows on irradiation a very weak but still noticeable current in the galvanometer.

With deep respect

Devotedly yours

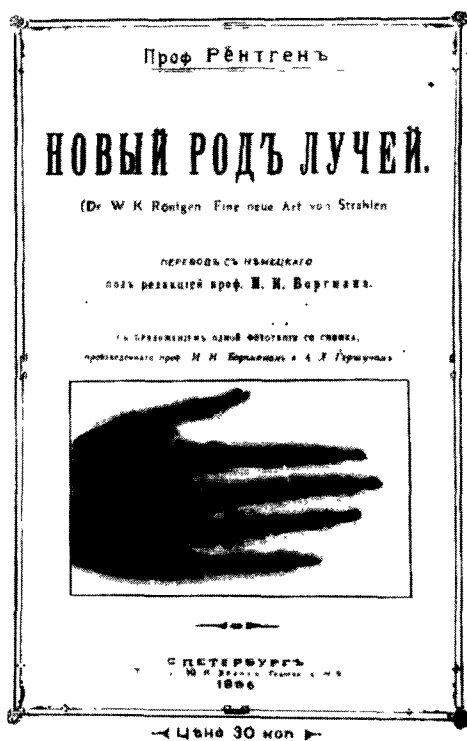
Dr I. I. Borgman.

St.-Petersburg, 3/15 Feb. 1896"

As can be seen from the letter of I. I. Borgman he together with A. L. Gershun had already in February 1896 observed the ionizing action of x-rays. It is of interest to note that in his first article "On a New Kind of Rays" Roentgen did not report the ionizing effect of the rays. Roentgen described the ionizing effect of x-rays observed by him only in his second communication of March 9 1896, but in doing so noted that he had observed this phenomenon earlier.

Under the editorship of I. I. Borgman a translation into Russian was made of the first communication by W. K. Roentgen which was published in St. Petersburg in January 1896 under the title "A New Kind of Rays." To the Russian edition of Roentgen's paper there was appended a print of an x-ray photograph obtained by I. I. Borgman and A. L. Gershun; on the last page there was a note that "the first photograph by means of Roentgen rays was obtained in the Physics Laboratory of St. Petersburg University on January 12th, the first photograph of a hand was made on January 16th."

The paper by I. I. Borgman and A. L. Gershun "The Effect of Roentgen Rays on Electrostatic



Title page of the first communication of Roentgen in Russian published in St. Petersburg on January 31, 1896.

Charges and on the Size of a Spark''* was published already in February 1896.

Concerning the great interest in Roentgen rays there was also a report in the newspaper "Peterburgskii Listok" ("The St. Petersburg Handbill") of January 25 which reported on the lecture by professor I. I. Borgman given by him for the general public: "If the large auditorium of the Technical Society were five times larger and if it would contain not one thousand but five thousand persons, even then there would not be room in it for all those who wished to attend the lecture by professor Borgman. A burst of applause, loud cries of "Hurrah" rewarded the professor for his communication which gave the first scientific introduction for our public to the great discovery of our time."

Of considerable interest is the letter to Roentgen from the well known Russian physicist, the prominent

*I. I. Borgman and A. L. Gerchun (Petersburg), Wirkung der Röntgenstrahlen auf die elektrostatischen Ladungen und die Funkenstrecke, Compt. rend. 122, 378 (February 17, 1896) Bbl. Wied. Ann. 20, 453 (May 1896). (Ref.)

lecturer and popularizer professor of St. Petersburg University Orest Danilovich Khvol'son.

Khvol'son reports to Roentgen an original application made by him of x-rays not in a direct (i.e. medical sense, at that time no other application for the rays was yet known), but in a different, but also highly humane manner:

"St. Petersburg, February 24th, 96.

Highly esteemed colleague!

You will probably be very glad to hear that I have given for charitable purposes three public lectures regarding your discovery.

The first lecture brought 450 rubles for poor students of our local higher women's courses (2 faculties with a complete university course).

The second lecture also yielded a considerable amount for the Society looking after small children of poor parents (Creche).

The third one yielded 600 rubles for summer camp - this is quite sufficient to send 17 poor sick children for the summer to Arensburg on Esel island.

A total of approximately 3700 marks.

I express to you my gratitude and benediction.

With great greetings

Devotedly yours

Prof. Dr. O. Khvol'son,

The University''.

In the same year O. D. Khvol'son published an article "Roentgen Rays."

The letters printed above clearly show the great interest which was aroused in Russia, just as in the rest of the world, by the discovery by W. K. Roentgen of a new kind of rays. Although in the first days following their discovery x-rays found actual application only in medicine in which they brought about a real revolution, not much time elapsed before their remarkable properties enabled applications for them to be found in very different domains of science and technology making for science a pathway into the atom.

Contributions to the investigation of X-rays were also made by the remarkable Russian scientists P. N. Lebedev, Yu. V. Vul'f, A. F. Ioffe, I. I. Borgman, B. B. Golitsyn and many many others.

Translated by: G. Volkoff