

## Scientific activity of academician Sergei Vernov in Apatity (Kola Peninsula) and Leningrad during the years 1968 – 1982

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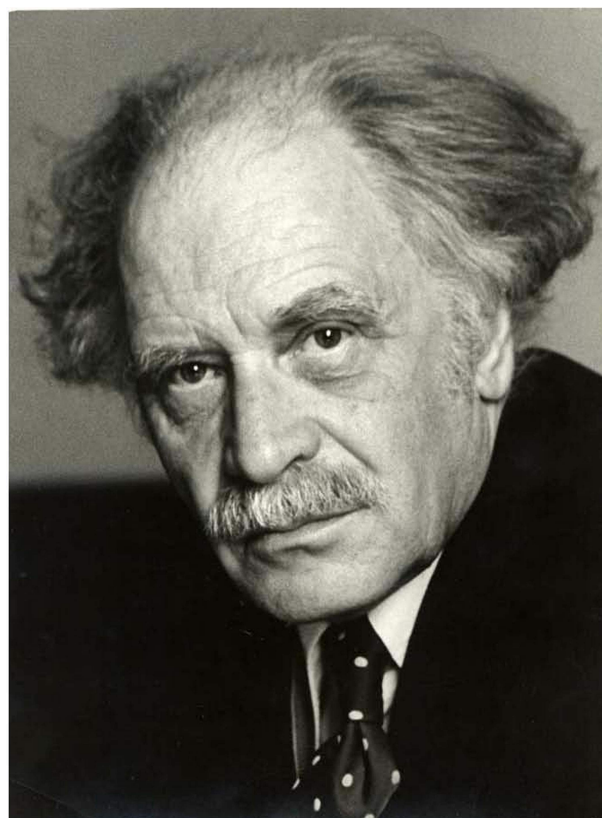
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**Abstract.** This paper is dedicated to the 100th birthday anniversary of academician S. N. Vernov. Academician Sergei Vernov (1910 – 1982), an outstanding Russian space physicist, was the first national scientist who initiated the cosmic ray programme and radiation studies onboard the first Soviet artificial satellites. He initiated the holding of All-Union conferences, seminars and winter schools on space physics and was the chairman of these events.

### 1 From the biography of S. N. Vernov (life in Leningrad)

S. N. Vernov (11 July 1910 – 26 September 1982) is an outstanding Soviet physicist (Fig. 1). He was the first Russian scientist who started the study of cosmic rays (both charged and neutral) onboard the first Soviet satellites.

S. N. Vernov was born in Sestroretsk, a small town close to Leningrad. His father was a post officer and his mother, a teacher of mathematics in school. After his graduation from the middle school in 1926 as the best graduating pupil, Vernov entered the technical secondary school and, already in 1927, became a first year student at the physical-mechanical faculty of Leningrad Polytechnic Institute (now St. Petersburg State Polytechnic University). S. N. Vernov graduated from this institute in 1931 and received a diploma as a physicist-engineer. The physical-mechanical faculty, founded by Abram Ioffe, was considered to be a smithy of young physicists. In 1930, being a 4th year student, he began to work at the Radium Institute, first in a temporary position and then as a postgraduate student at that institute. It was necessary to select a topic for his PhD thesis. He selected the cosmic rays as the topic after being acquainted at Poly-



**Fig. 1.** Academician Sergei Nikolaevich Vernov.

technic Institute with D. V. Skobeltsyn, discoverer of charged particles in the cosmic rays, whom he considered his teacher. Moreover, since that time and until the end of his life, Vernov's main scientific interests were connected with the cosmic rays.

S. N. Vernov worked at the Radium Institute from 1930 until 1936. During his postgraduate period he investigated



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the cosmic ray flux with Geiger-Mueller counters and wrote a review, "New data in cosmic ray study". He showed that a small gas counter could be very useful in both surface and balloon experiments. Already in 1934, S. N. Vernov took part in the First All-Union conference on stratospheric studies, dedicated to "COSMIC RAYS" where he presented a talk, "An application of Geiger-Mueller counters in cosmic ray study in the stratosphere".

During the same period of time, S. N. Vernov was sent to the Main Geophysical Observatory in Leningrad to study cosmic rays in the stratosphere. For this purpose, he was included in the crew for a balloon flight, but suffering from quinsy he was unable to make such a flight. Instead of him, Ilya Usyskin participated in this flight, where he found his death. The fate saved S. N. Vernov's life for his future numerous scientific achievements.

After establishing himself at the Lebedev Physical Institute, S. N. Vernov started to work on his next professor thesis in 1935. Under the supervision of S. I. Vavilov and D. V. Skobeltsyn, he formed his own scientific style combining the experiment with a comprehensive scientific analysis. Nonetheless, the connection of S. N. Vernov with the Radium Institute was continued for a long time.

The peak of Vernov's scientific and organizational activities was in the 1950s – 1960s. The sphere of his scientific interests in the field of cosmic rays considerably increased when he started to use cosmic rays as a tool to investigate interplanetary space, solar activity and other objects.

There is a memorial board on the wall of the first building of the Radium Institute (St. Petersburg, Roentgen street 1) where the names of academicians, who worked in this institute at different periods of time, are written. Academician S. N. Vernov is among them.

In the year of S. N. Vernov's 100th birthday anniversary, we should remember the bright pages he added to the history of cosmic ray and interplanetary space exploration.

## 2 How did I get acquainted with S. N. Vernov?

Despite many requests, for a long time, I could not write my remembrances about Sergei Nikolaevich on occasions of the preceding anniversaries. The main obstacle for me was our close relation and understanding resulting from "hot" events devoted to cosmic rays in 1968 – 1969, where I participated and which I partially organized. Of course, there was doubt about publishing details that were too private, moreover, there had been much already published about S. N. Vernov. But the upcoming jubilee, and requests from his children, convinced me to say several good words about the person who lived in an interesting and complicated epoch. Mankind should not forget the achievements made by others.

I was lucky to meet many bright scientists, particularly S. N. Vernov, whom we stayed in contact with since 1968 and almost until his death. Now a little bit about myself.

In 1964, I was a 5th year student of the physical-mechanical faculty at the Leningrad Polytechnic Institute. I was among the few students who participated in the cosmic ray meeting in Apatity (Kola Peninsula), on 24 – 29 August. It was the first conference I had ever attended and I was the youngest participant. This meeting, presided by S. N. Vernov, was held in accordance with the decision of the Scientific Council of the Academy of Sciences.

I came to the Ioffe Institute when I was a 3rd year student at the department of Experimental Nuclear Physics. I was involved with G. E. Kocharov in the investigations of solar nuclear reactions and relationship between solar neutrinos and parameters in the solar interior. After my graduation, I continued to study neutrinos at the Ioffe Institute and had prepared several publications on this topic before 1968. There was a goal to simulate the model of the Sun and, according to G. E. Kocharov's opinion, this would be enough for a PhD.

In the beginning of 1968, G. E. Kocharov asked me to help in the preparation of the 5th School on Space Physics in Apatity. We started our trips to Moscow and meetings with S. N. Vernov. It was necessary to decide on the members of the organizing committee, programme, speakers, etc. Since that time, as the scientific secretary of schools, seminars and conferences, I frequently visited the Skobeltsyn Institute of Nuclear Physics of Moscow State University (SINP MSU), where S. N. Vernov was director and the Nuclear Physics Section of the Academy of Sciences (where S. N. Vernov was a vice-secretary).

## 3 Apatity period of the space physics schools (1968 – 1969)

One should emphasize the role of S. N. Vernov in the further development of the cosmic ray studies and in the organization of conferences, meetings, workshops, seminars and schools on cosmic rays. Issues related to cosmic rays physics were widely discussed at seminars at SINP MSU. S. N. Vernov tried to hold such scientific events not only in Moscow, but also in other towns and cities (Apatity, Irkutsk, Yakutsk, Alma-Ata, Erevan and so on). This not only promoted the development of science in these cities, but also attracted young scientists, as well as local governments. The latter was very important for the financial support of scientific institutes.

Different to others, schools had their own main goal – receiving a new knowledge by participants in different aspects of cosmic ray physics. Topics of discussion at these schools ranged from neutrino astrophysics and cosmology to physics of the Sun. Vernov paid considerable attention to the selection of topics for lectures and presentations and invited leading scientists in different fields of cosmic ray physics. Of course, these schools required much more time for all topics than the conferences and meetings traditionally for the Academy of Sciences.

Four schools on space physics had already taken place when I was included in the organizing committee of the winter school in Apatity. The idea to hold such a Soviet school belonged to the group headed by L. I. Dorman. The I (first) and the II (second) Soviet Schools on Space Physics took place in Alma-Ata (1964, 1965). The III and IV winter schools were organized by the Geophysical Institute, Georgian Academy of Sciences, at Bakuriany (1966, 1967). The fifth and sixth (V, 21 March – 5 April 1968 and VI, 18 March – 1 April) winter schools were carried out in Apatity, at the Polar Geophysical Institute (with Vernov as chairman). There were 150 participants and 57 presentations in the V school, and 300 participants and 116 presentations in the VI. At that time the Polar Geophysical Institute was well equipped and allowed researchers to study the ionosphere, auroras, geomagnetic field and cosmic rays. After these schools I was lucky to collaborate with S. N. Vernov and his colleagues for a long time in many other scientific events.

At least 3 – 4 months before the V and VI schools, the organizing committees outlined the programme and asked famous scientists to give lectures at the schools. For instance, the organizing committee of the V school invited such leading scientists of the Soviet Union as V. L. Ginzburg, Ya. B. Zeldovich, B. M. Pontekorvo, E. R. Mustel, E. L. Feinberg, L. E. Gurevich, A. Z. Dolginov, G. T. Zatsepin, L. I. Dorman, S. I. Syrovatsky and many others.

At the same time, the information was sent to numerous scientific institutes. After receiving the answers, we were able to make the detailed programme and publish it before the beginning of the conference. It turned out that scientists from the Ioffe Physical-Technical Institute did the main work in organizing the V and VI schools. Of course, S. N. Vernov had discussions with G. E. Kocharov and me about all questions – including the accommodation of the participants which was difficult in a small town. Additionally, S. N. Vernov emphasized the importance of publications of the proceedings and suggested to do that (earlier the proceedings had not been published). It was necessary to publish the proceedings of one school before the beginning of the next school. We started to do that, not foreseeing all the future difficulties. Until the end of May 1968, we accepted articles, then there was an editing procedure, verification of the results, frequent changes of figures and tables, typing on a special machine, writing formulas by hand, numerous check and, finally, printing at a typographer. In 1968, I had to spend all the three summer months in Apatity. I had to work not only during the day, but also during the white nights. At that time, we had a very good collaboration with the publishing company. As a result, the proceedings of the fifth school were published 4 months after the end of the school (Vernov et al., 1968). S. N. Vernov was very pleased, and on any occasion he demonstrated these proceedings.

When we were preparing the next, VI school, a wide announcement as for the V-school was an inside joke for us,



**Fig. 2.** 1969. Apatity. Opening ceremony of the VI school on Space Physics. From left to right: Yu. A. Volkov, scientific secretary of the Polar Geophysical Institute (PGI); S. I. Isaev, director of the PGI; S. N. Vernov, chairman of the Organizing Committee; E. K. Kozlov, chairman of the Kola department of the Academy of Sciences; G. E. Kocharov, vice-chairman of the Organizing Committee of the School; P. V. Prokoshin, secretary of the local division of the Communist party; and V. A. Dergachev, scientific secretary of the Organizing Committee of the School.

because the amount of suggested presentations and lectures was expected so huge that it was impossible to include all of them in the programme. The number of participants was also very large, 300. I will not mention all the problems with accommodation but one: Vernov applied to the secretary of a local division of the Communist party for additional housing. The secretary solved the problem by asking the local people not to move into a part of a new house until the end of the school. This house was then used for accommodation by the participants. Well, the science was considered to be very important at that time (Fig. 2)!

At the beginning of the VI school on Space Physics, we became friendly with all the scientists in Apatity and regularly discussed many questions together. For example, the vice-chairman of the Kola department of the Academy of Sciences and its scientific secretary helped us tremendously in the printing of the proceedings in typography. The director of the Polar Geophysical Institute (PGI), S. I. Isaev, and scientific secretary, Yu. A. Volkov, looked into all the details of arising problems. They also helped us to organize our free time: we visited a number of laboratories and some families. We highly appreciated the hospitality of Yu. A. Volkov, L. L. Lazutin, I. N. Kapustin and others. We became almost as close as relatives and even after tens of years our meetings still were very sincere (Figs. 3 and 4).

Once, during the break, we discussed the possibility of including an additional talk to the evening session. There was a young participant, standing at the programme board. S. N. Vernov said, "Please, pay attention to this young guy. He will become famous". That was Michael Panasyuk, yet



**Fig. 3.** 1969. Apatity. Polar Geophysical institute. Visit to the laboratory of I. A. Kuzmin. From left to right: L. I. Miroshnichenko, G. E. Kocharov, S. N. Vernov, I. A. Kuzmin.

not a scientist, but future postgraduate student. Vernov did not make a mistake!

Because of the large number of presentations at the VI school, the organizing committee decided to publish mainly invited and survey talks, which might be interesting for a wide audience (Proc., 1969). S. N. Vernov estimated the work of the organizing committee at the scientific council meeting concerning the programme “Cosmic Rays” on the last day of the school. Of course, it was necessary to publish the proceedings of the school as soon as possible. Two volumes of proceedings were issued within a short time. Unfortunately, the sequence of further schools stopped at this stage. The main reason was the difficulty in keeping the same scientific level and the speed of publication of the proceedings. Nonetheless, the schools were unique and not only reflected, but rather determined the evolution of the Space Physics Society. One had to look for other possibilities.

#### **4 Leningrad period of space physics: International seminars on cosmic rays, All-Union conferences on cosmic rays and ECRS (1969 – 1983)**

S. N. Vernov loved Leningrad. This resulted in the organizing of international seminars devoted to different problems of space physics under the guidance of Sergei Nikolaevich. International seminars on cosmic rays, organized by the nuclear physics department of the Soviet Academy of Sciences, became a tradition since 1969 in Leningrad. It should be emphasized that the accommodation during the white nights period was complicated because of the limited number of hotels. Many questions had to be discussed with the local government. There were mostly invited talks, parallel translation was organized.



**Fig. 4.** 1969. Apatity. Polar Geophysical institute. During the lecture: E. K. Kozlov, S. N. Vernov, L. L. Lazutin, A. E. Chudakov.

The first seminar was held at the Ioffe Institute on 3 – 7 June. The director of Ioffe Institute B. P. Konstantinov (who unexpectedly died on 9 July 1969), carried out the opening ceremony of the seminar. He appreciated the idea of organizing such seminars. Academician B. P. Konstantinov outlined the most important problems of modern physics. In conclusion to his speech, Konstantinov acknowledged the foreign colleagues, who participated in this seminar: H. Alfvén (Sweden), D. J. Williams, J. R. Winkler, and S. M. Krimigis (USA), U. R. Webber (England), A. Somogyi and A. Valash (Hungary), K. G. McCracken (Australia), P. Velinov (Bulgaria), and Knut (East Germany).

It was natural to publish the proceedings within the same year. Although the publication of the proceedings on a rotaprint required a lot of work, the proceedings of the first Leningrad seminar on space physics were published in 1969 (Proc., 1969a).

S. N. Vernov suggested the publishing of the proceedings of future seminars at SINP MSU, because there were powerful facilities and one could expect many helpers. The proceedings of the second and third Leningrad seminar were published at SINP MSU, but only the following year after the conference. The II International seminar on space physics, devoted to the problem “Generation of cosmic rays on the Sun”, was held in Leningrad on 8 – 12 December 1970. In his introductory words, Vernov said that the existing experimental data and theory allowed one to investigate physical processes of particle acceleration on the Sun and their propagation in interplanetary space and to make suggestions on further work on the problem (Proc., 1971). The III International seminar (Leningrad, 13 – 15 July 1971) had a title “Particle acceleration in space (interplanetary and near-Earth), Galactic and Meta galactic”. The proceedings were published in 1972 at SINP MSU (Proc., 1972).

A prompt publication of the proceedings was considered by S. N. Vernov to be very important. He asked



**Fig. 5.** 1969. Leningrad. Discussion with academician Vernov near Ioffe Physical-Technical Institute during the seminar 3–7 June 1969. In the first row from left to right: G. Kocharov, V. Chesnokov, K. Gringaus, J. Winkler, I. Podgorny, J. Williams, S. N. Vernov, S. M. Krimigis, K. G. McCracken.

G. E. Kocharov to estimate this possibility. Grant Egorovich said that this depends on V. A. Dergachev. I was not able to refuse Sergei Vernov. I had this “noble” duty basically until the last seminar held under the guidance of Vernov. And the proceedings of the subsequent seminars were published in Leningrad (Proc., 1972a, 1973–1976, 1978, 1978a, 1979–1980, 1982–1983). During the time of S. N. Vernov’s life, there were 12 Leningrad seminars on different topics of space physics. Many scientists from a number of countries visited these seminars and presented their talks.

American academician, S. M. Krimigis, team leader of several NASA projects and participant of the 1st Leningrad seminar, visited Russia again in 2007, when the 50th anniversary of the first Soviet satellite launch was celebrated. He said: “I remember very well my first visit to the USSR in 1969 (Fig. 5). I was invited by academician Vernov to take part in the conference at the Ioffe Physical-Technical Institute (Leningrad). There were several western scientists (H. Alfvén, K. G. McCracken, W. R. Webber, J. R. Winkler, D. J. Williams). We had a number of fruitful discussions and for the first time compared the data from satellites of the US and USSR.” (Krimigis, 2007).

In addition to this seminar, the All-Union Conference on Cosmic Rays took place in Leningrad in 1969. At the opening ceremony of the Conference on Cosmic Rays in 1969, the president of the Polytechnic Institute, K. P. Seleznev, awarded S. N. Vernov with a medal devoted to the 50th foundation anniversary of the physical-mechanical faculty, where he studied.

At the seminars it was possible to discuss many scientific problems, which attracted many Soviet and foreign scientists.

Let me consider, as an example, the VIII Leningrad seminar. It took place at the Ioffe Physical-Technical Institute on 25 – 27 September 1976, and its topic was “Active processes on the Sun and the problem of solar neutrinos” (Proc.,



**Fig. 6.** 1976. Leningrad. The opening ceremony. The speech of A. Somogyi (Hungary). B. Kuhovich (Poland), S. N. Vernov, G. E. Kocharov, J. Simpson (USA), V. A. Dergachev, E. Bagge (Germany), P. Povinec (Czechoslovakia).

1976). There were speakers from different countries, e.g., from USSR: G. E. Kocharov, G. V. Domogatsky, N. N. Stepanyan, B. V. Somov, B. I. Luchkov, M. I. Pudovkin, V. A. Krat, T. N. Charachchian, A. Z. Dolginov, A. K. Lavrukhhina, L. I. Dorman, I. M. Podgorny, B. M. Vladimirsky and so on; from Hungary: Prof. A. Somogyi, Dr. D. Benko, Dr. G. Erdesch; from Poland: Dr. Z. Kobylinsky, Prof. Kuhovich; from Czechoslovakia: Dr. K. Kudela, Dr. S. Pinter, Prof. P. Povinets; from Western Germany: Prof. E. Bagge. Prof. L. E. Gurevich and academician B. M. Pontekorvo also participated in the discussion.

The chairman of the organizing committee, academician Vernov, emphasized at the opening ceremony that these Leningrad seminars were very useful, especially for space physics. The chairman of the international committee on cosmic rays mentioned that the attraction of the seminar is not only its topic, but also the magnificent city of Leningrad and the friendly atmosphere of the seminar. The director of the Fermi Institute at the University of Chicago, Prof. John A. Simpson, considered the importance of the seminar to be due to both the presentations and discussion at the high scientific level and the opportunity to visit USSR and meet Soviet scientists, especially young ones. He thought that these seminars promoted the collaboration between the US and USSR. The closing words were said by the director of the Nuclear Physics Institute at the University of Kiel, Prof. E. Bagge; director of the Geophysical Observatory Hurbanovo (Czechoslovakia), S. Pinter; and vice-chairmen of the organizing committee.

Figure 6 shows the opening moment of the seminar. In the presidium, one can see some foreign scientists: A. Somogyi (Hungary), J. Simpson (USA), E. Bagge (Germany), P. Povinec (Czechoslovakia).

In his introductory speech at the 10th seminar, S. N. Vernov said that the idea of seminars devoted to different topics,

with the guests from many countries, was initialized by the secretary of the Nuclear Physics Division of the Academy of Sciences, Moisei Alexandrovich Markov.

Vernov emphasized that the past seminars covered many aspects of space physics. He said: “We could have connected different sides of these complicated and interfering processes, building a bridge between them. From one seminar to another we expanded the topic, involving more and more institutions and scientists, who afterwards become “patriots” of our seminars. Science was also developing very successfully. We were working and are working in the field where satellites and rockets bring new data. It is natural that our seminars are always devoted to key questions, which arose recently (very new and very interesting), which require a discussion from different a point-of-view, and prompt solution.”

Scientists noticed a good scientific yield at these seminars. Additionally, we had to organize the conference and International symposium on cosmic rays.

I would like to draw the attention to S. N. Vernov’s understanding of the position occupied by space physics. For example, he said: “We are divided in two parts. Some are dealing with astronomy and have no relation to nuclear physics, others are vice versa. Nonetheless, some of us should be cut in two, with one half belonging to nuclear physics, and the other, to astronomy”.

D. N. Skobeltsyn called the astronomical part of cosmic rays as space-physical. Since that time, it became accepted to divide the cosmic ray physics into space-physical and nuclear-physical parts. This division was also kept for the conferences. One more citation of S. N. Vernov: “The question is what we will obtain if we divide the physics of cosmic rays into two separate parts – astronomy and nuclear physics. We will get nonsense, dear colleagues!” Such conferences took place in Leningrad, in 1969 – with S. N. Vernov as a chairman and the 30th one – already without him.

S. N. Vernov gave a cordial speech at the opening ceremony of the VII European Symposium on Cosmic Rays at the Leningrad Polytechnic Institute on 15 September 1980 (Proc. 1981). He spoke emotionally about his teacher, Dmitry Skobeltsyn, whom Vernov met in 1932 at the Polytechnic Institute and to whom we are obliged not only for cosmic ray physics, but also for the physics of high energies. In 1980, Skobeltsyn still was a head of the cosmic ray school in the Soviet Union, despite his 88 years of age.

The following speakers welcomed the participants of the VII Symposium on Cosmic Rays: the secretary of the International Commission on Cosmic Rays and its future chairman, Prof. Wolfendale from England; former Chairman of the same commission, Prof. Somogyi from Hungary; and vice-rector of the Polytechnic Institute, Prof. Alexandrov.

At the symposium, Vernov emphasized that many problems had been solved at the international Leningrad seminars (11 seminars had been held by that time). He said in acknowledgement to these seminars: “We got used to getting

together so much during the Leningrad seminars, that I even made a mistake by calling the symposium a seminar”.

At the end of his speech, Vernov suggested not to stop on what was done: “What do we have to do now in the cosmic ray field? Academician Markov, the head of Nuclear Physics Division, consider that we do not work well, because we did not create an industrial approach in cosmic rays opposite to people working on accelerators. We should feel safe in building large instruments, involve computers and substitute human work by computer work. We should not be afraid of huge scale, same as scientists who now create giant accelerators for hundreds of millions roubles. This is also important at present”.

On behalf of the Leningrad Polytechnic Institute, Prof. G. N. Aleksandrov congratulated Vernov with his 70th birthday and with his being awarded the title of Hero of Socialist Labour for his outstanding achievements in scientific, teaching and social activities.

Finally, Vernov highly estimated the symposium, with the number of participants more than 300 scientists. The whole number of contributed talks was 455, and the number of invited talks, 22. Different to previous symposiums, the proceedings of this one were published, both as a separate issue, and in the Bulletin of the Academy of Sciences: Physics.

Vernov also mentioned: “I think that the cosmic ray field is so large and science is developing so fast that we should meet every year. Every second year there should be International conferences, and in between, European symposiums. One year is a long enough period.” On the whole, Symposiums influenced the structure of the International Leningrad seminars.

The death of Sergei Vernov was an irretrievable loss. His life was very fruitful, he left a large scientific inheritance and reminiscences in hearts of many people who were lucky enough to know him. We will always remember S. N. Vernov and keep his vivid image affecting our life.

## 5 S. N. Vernov as a person

I was happy to meet two brilliant scientists: B. P. Konstantinov and S. N. Vernov, whose 100th birthday anniversaries are celebrated this year. They both influenced not only my scientific career, but, moreover, the purpose in staying human in any situation in my life.

I had been working together with Sergei Nikolaevich for more than 12 years as a scientific secretary of seminars, conferences and schools. He was distinguished by his talent as physicist, his artistic features, high capacity for work and many other features.

Frequently visiting SINP MSU, I was convinced by his sincere care about people working for him, and in his easy accessibility for employees. For example, once, going along a corridor, he met an office typist. She said that she had some problems. Vernov started to listen to her right away, trying

to get in the details. He never pretended, never set anyone on the path, but rather taught.

What was the attitude of people at the institute to Sergei Nikolaevich? Most of the people felt respect and even warm heartedness to him. People understood his importance to the institute and, therefore, to everybody. Many of them were grateful for his help at many steps. I don't know whether he had enemies or not. Vernov was very respectful and sincere to everybody. Nobody remembered him firing or punishing anybody without serious reason. He appreciated people for good manners and appropriate behavior.

Vernov's character was rather soft. He was a non-malicious and non-rancorous person, except for situations when science was involved.

Until now, I remember my elevated mood during each of my visits to Vernov, either in Moscow (SINP MSU or Nuclear Physics Department of the Academy of Sciences) or in Leningrad, in the house of his daughter, Lena. Now, almost 40 years later it is difficult to remember our conversations in detail. Because I was living at that time on Grazhdansky avenue, same as his daughter, Vernov called me each time he visited Leningrad and asked about unsolved questions and necessary assistance. Preliminary and final programmes were discussed as well. Once, when I visited him at Grazhdansky avenue, he had a cold. Vernov asked for my opinion about a glass of "Zubrovka", which he was taking as a medicine and which was not understood by his relatives. I supported him in that medical question.

Usually, when I was leaving, Vernov used to say: "Let's go together, I will follow you as far as your house". I understood that Vernov needed to walk and we were walking, first, from Lena's apartment to my house, and then, back. It looked that Sergei Nikolaevich wanted to share his thoughts about successors, about people who will continue his work. For instance, we discussed the candidates for the vice-director position at SINP MSU and the management of the Baikal neutrinos experiment. Saying "good bye" after each of these walks, he would say, "Well, we have discussed not only scientific, but also political problems".

During one of my visits to SINP MSU, when I entered his study room, he said that now he has to go home, because nobody was sitting together with his wife, who was heavily ill and required permanent attention. Apologizing for involving me, a stranger, in his family problems, he invited me for dinner and a discussion at his home. The dinner was in a simple (student) style: cheese, sausage and dry wine. Vernov told me about the severe disease his wife had and I understood how much of his power and energy this problem took out of him. The care for his wife was very touching.

Fate gives to everybody his own time, showing all his abilities. S. N. Vernov showed how much one can do if one is faithful to the goal of his life. Vernov was a unique person, all his life was dedicated to science. Let us recognize that, at present, nobody is able to join two aspects of cosmic ray physics: space physics and nuclear physics. Was it not re-



**Fig. 7.** Moscow. 1980. Vernov's 70th birthday celebration. From left to right: S. N. Vernov; V. A. Dergachev; director of the SINP MSU department, G. B. Christiansen; scientific secretary of the 'Cosmic ray council of the Russian Academy of Sciences, G. V. Kulikov; G. E. Kocharov; and G. Y. Goryacheva (Lebedev Physical Institute, Moscow).

ally important to collect talented scientists around himself in SINP MSU, develop the space science and bring the Institute to one of the most recognized institutions not only in the Soviet Union, but in the world?

I felt his special attitude to the experiment when he asked to introduce the details of the radiocarbon method. He said that, if one has created a device to measure any physical process, he should not change it right away. Otherwise you can lose the information. He took, as an example, the balloons, where simple, but long measurements furnished good results. One should think about a link between old and new data, when creating new instruments. Vernov really thought that the experiment is a base for cosmic ray physics. He told me: "Never stop the experiment!" Being the head of the Laboratory of Cosmic Rays, I am continuing his "experimental" will. Right now, there are two experiments in our lab: the study of energy and charge spectra of cosmic rays via solid state nuclear track detectors onboard international space stations and investigation of polarized solar x-ray on satellites.

100 years is an important jubilee, different thinking has been achieved. What are these thoughts about? They are about the past, present and future. Everything is connected, nothing disappears. S. N. Vernov left us a long time ago, but today you look with interest over his life and, it seems to you, that he is close to us and soon you will meet, in many respects, this really nice person. You are waiting for his suggestions. We will always remember Sergei Vernov. Now we are remembering his 70th birthday celebration (Fig. 7).

## 6 Instead of conclusion

The period when Vernov lived was really grandiose. It is connected with the dream: to jump into space. This finally had happened. Vernov was among people who implemented this dream. To estimate this period of time more

realistically, I will cite some words from the article, “Years of great achievements” by Prof. Krimigis (2007):

“Thinking about the start of the space era, we are struck by the key role of the cold war. It is difficult to imagine that the powerful rockets, which are able to launch satellites, would be designed without the military competition between two world powers. Probably, such rockets finally would have been created, but later. In this case, the beginning of space epoch would be postponed. Thus, space physics have benefited from the cold war, however strange that would be. No doubt that the space era was an inevitable step in mankind’s evolution and that mankind has benefited from it. We should acknowledge the pioneers of this era: Korolev, von Braun, van Allen, Vernov and all other colleagues, who followed their dream and have fulfilled it by their imagination and skills.”

The active life of S. N. Vernov took place during the Soviet era. It was not an easy time, but the Soviet government created better conditions for scientists than the present one. One should keep the high level of space physics and involve young talent. How can we help the younger generation choose their own way? For this purpose, we should publish a book about Vernov’s life in the series, “Life of outstanding people”. One can tell the whole history of space physics via Vernov’s life and about the contemporaries who made successful carrier in space science. Young, talented readers will definitely pay attention to the role of science in Vernov’s life and this might influence their own choice.

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