

O. N. Trapeznikova.

Reminiscences about L. V. Shubnikov¹

(English translation by Yaroslav Bazaliy, University of South Carolina. 2019.)

Olga Nikolaevna Trapeznikova² (the widow of L. V. Shubnikov) b. 1901 [- 1997], Doctor of Sciences, senior scientist at Leningrad University. A student of the Department of Physics and Mathematics of the Petrograd University from 1919 till 1924, an assistant at Leiden laboratory from 1927 to 1930, worked at UFTI³ from 1930 till 1937 (joined the Cryogenic Laboratory in 1931).

I first met Lev Vasilievich Shubnikov when both of us were about 9-10 years old. Our families were spending summers in Finland,⁴ and our summer houses were next to each other. Lev Vasilievich was there with his younger sister, Liusia. We were a large and loud group of kids, running around the village, visiting the lake and the forest nearby. Nobody seemed to like Leva and Liusia and we never talked to them too much. During the winter time in St. Petersburg we would never meet and there were no contacts between us during the years in gymnasium.

The Shubnikovs lived in Petrogradsky district on Gatchina Street. Lev Vasilievich was attending the gymnasium on the Lentovskaya Street. This gymnasium had a reputation of being an advanced school.

His parents always complained that he was a pretty turbulent boy, not to be left alone even for a minute. He would do things like sewing through his finger with a sewing machine. I was told by Scheinman, a mathematician, who was a classmate of Shubnikov at the Lentovskaya Street gymnasium

¹From the book “L. V. Shubnikov. Selected works. Memoirs”, Naukova Dumka, Kyiv, 1990 (in Russian). Memoirs of O. N. Trapeznikova were tape-recorded in January of 1987. The book was prepared at the Institute of Low Temperature Physics in Kharkiv, Ukraine, on the initiative of its director B. I. Verkin, who acted as a senior editor of the volume.

²“z” pronounced as in Zeeman [splitting]. This last name probably derives from the word *trapeza*, meaning a feast or banquet. Such last name may have formed from a position of a person at a church or at a nobility court. The last name of Shubnikov looks like a derivative of *shuba*, a fur coat. This might be a last name of coat makers. A real onomastic analysis is needed to say more.

³Ukrainian Physics and Technology Institute, Kharkiv, Ukraine. Presently goes under National Science Center – Kharkiv Physics and Technology Institute.

⁴At that time Finland was a part of Russian Empire.

that Lev was always itching for a fight. Scheinman himself was not a fan of fighting and thus distanced himself from Lev.

I studied at the Stoyunina Gymnasium on Kabinetskaya Street (Pravdy Street these days). Our gymnasium was a progressive school as well, with several courses taught by university professors. Psychology was taught by a well-known philosopher N. O. Lotsky (he was a son-in-law of M. N. Stoyunina), mathematics was taught by G. M. Fichtengolz, the author of the famous three-volume university textbook on calculus.⁵ After the revolution, A. I. Shalnikov and D. D. Shostakovitch attended that very same school. Aleksander Iosifovich Shalnikov was younger than me by about 4-5 years but my sister and I befriended him and remained friends for the rest of our lives.

In 1919 I entered the Petrograd University,⁶ the physics section. At the university I met Lev Vasilievich again. He recognized me and introduced himself. However, his words didn't ring a bell. Only later, after consulting with my sister Valia, I recalled who he was. The encounter did not stir any interest on my part because my childhood memories had Leva and Liusia as quite unpleasant folks.

Lev Vasilievich entered the mathematics section of the University in 1918. At that time the physics section was not yet open. He was the only physics student in his class.⁷ Of course, nobody would teach a course for a single student, so he had to attend courses with students who were either a year older, or a year younger than him.

Among the students of my class was A. V. Timoreva. I already knew her before through my sister. We instantly became friends and were always together since then. Later Lev Vasilievich and Sergey Eduardovich Frisch joined our group. Those friendships remained with me for the whole life.

The courses at the university were given by remarkable professors. Mathematics was taught by N. M. Gunther, V. I. Smirnov, Ya. D. Tamarkin, N. I. Muskhelishvili. Physics — by D. S. Rozhdestvenskii, A. A. Fridman, Yu. A. Krutkov, O. D. Khvolson, V. R. Bursian, V. K. Frederix, P. I. Lukirskii.

Life was quite difficult. After the lecture Lev Vasilievich would compose a list of attendees, the lecturer signed it, and every one would receive a thin

⁵This textbook was still in use in the 1980's, and maybe even later.

⁶Saint Petersburg was renamed Petrograd in 1914, after the start of WWI, then to Leningrad in 1924, finally back to Saint Petersburg in 1991.

⁷In all likelihood, this is a reference to the impossible conditions in Petrograd in 1918, right after the bolshevik revolution.

slice of bread with jam. This was called “tea rations”. Lev Vasilievich would invariably list more people than were actually present, receive extra portions, and distribute them among us.

In 1919 the Optics Institute was already operating, and D. S. Rozhdestvenskii arranged for lab assistant positions for all senior students. These were V. A. Fock, S. E. Frisch, V. K. Prokofieva, M. V. Volkov, L. V. Shubnikov and A. N. Terenin. The GOI⁸ did not yet have a building of its own and used the Physics Institute space at the University. All lab assistants received the so-called “atomic rations” which helped a lot. The same rations were allocated for the lecturers. It was a war time, and an 8 PM curfew was in place. The administration arranged for a special room for us to be able to spend the night at the building. This room was a former electric battery charging station.

D. S. Rozhdestvenskii considered course work to be optional. He maintained that it is important to read and study on your own and attend seminars. Lev Vasilievich would rarely attend lectures. He was doing some work in astronomy with V. A. Fock, and had some kind of other official project. But then the examinations came. O. D. Khvolson, who hardly saw Lev Vasilievich in his class, asked at the exam: “Have you been to my lectures?” Lev Vasilievich replied: “Sporadically”. It has to be said here that O. D. Khvolson was an attendance fanatic and made sure that all of us (and there were only five students) came to listen to his lectures. He would drop by our office in the Physics Institute and personally usher us to the lecture room. When students missed a lecture, Orest Danilovich would always grill them about the reason of absence. So we were really worried that this “sporadically” answer will not play well. However, it somehow happened that Lev Vasilievich got an “exceedingly satisfactory” grade for the course.

There was no fixed exam period at that time. You could go for an examination whenever you wish. I remember how V. A. Fock did not attempt to pass the math exam for a long while. His hesitation period ended when K. K. Baumgart told him “You are solving math problems all the time, do you think you can finally solve the problem of dragging yourself into the exam room?” This made Fock to finally schedule and pass the exam.

Students organized their own physics reading club. Everyone would pick a topic for himself. For instance, I liked the book by Bragg and discussed it at the club little by little.

⁸Abbreviation for *Gosudarstvenny Opticheski Institut*, State Optics Institute.

The university professors were leading seminars. It was a tradition started by Ehrenfest. People like V. P. Bursian, V. K. Fredericks, P. I. Lukirskii, Ya. I. Frenkel, P. L. Kapitza and many others always attended. Some students were coming too. Me, Aleksandra Vasilievna, Lev Vasilievich and Sergey Eduardovich were among the regular attendees.

In 1921 the Second All-Union Physics Congress was held in Kyiv. Many physicists from Petrograd decided to attend. Some students, in particular me and Aleksandra Vasilievna, wanted to go as well. We made it to Moscow, but were not able to go any further for the whole week. We could not get a permission, as one could only go with a military convoy, which nobody would provide for us. After a week spent in Moscow we had to come back. We learned that physicists from Moscow did not make it either. In 1922 we attended the Third Physics Congress in Nizhny Novgorod.

Soon after Lev Vasilievich entered the University his parents moved to Moscow and he was left alone in the city. He did not have much to eat these days. Once he received a lamb's head for a ration. A family man could have benefited from that, but he almost never went home to cook. So he got an idea to wind some nichrome wire around the head and pass a current through it. The stinking smell spread all around the Institute. I am not sure what did he do with this head afterwards. Sergey Eduardovich lived with his mother and aunt, so his home was at least remotely cozy. But Lev Vasilievich had nothing. Aleksandra Vasilievna remembers how she and Tatiana Nikolaevna Krylova helped him to mend his uniform shirt.

No matter what the problems of everyday life were, Lev Vasilievich maintained his spirits high. He would always think of some practical jokes. Once he hanged a dead mouse by its tale on our lamp and put a note "My death should not be blamed on any one". I was disgusted, but we became friends later. He really liked to make fun. Those years at the university were later called "the Shubnikov era". S. E. Frisch had to push him around on roller-skates in the middle of the night. He would not let A. N. Terenin to sleep. Terenin barricaded his room with a wardrobe, but Shubnikov pushed it aside and got in. Once he hid the boots of Lev Sergeevich Sazonov under his very own pillow. We were going to the lecture and called Lev Sergeevich to join us. "I can't, my boots are missing!" Andrey Andreevich Markov, the son of the famous mathematician, was a dreamy fellow devoted to science. For an unknown reason Lev Vasilievich decided that he ought to give him a bath. He grabbed Markov right in the lecture room and proceeded to the faucet. I think he did not actually start the water flowing. Andrey Andreevich was

mad and demanded a duel. Lev Vasilievich later managed to calm him down and turn the whole thing into a joke.

I really liked to dance. There were dance parties at the Polytechnical Institute; me and my cousin had to walk there (public transportation was destroyed at that time). Lev Vasilievich danced as well, but he visited another place. His attitude to dancing was enthusiastic, just as towards anything he did. Julia Vasilievna, the sister of A. V. Timoreva, was an artist. She did acrobatic dancing and got Lev Vasilievich interested in it. They were performing together at the family gatherings. Lev Vasilievich was very strong and acrobatic tricks were not a problem for him.

In the winter time we used to ski. Four of us would go to Yukki near Leningrad. Nowadays they have a ski-jumping center there, but then it was just hills. We used to pull our money together and rent a room to change after skiing and drink some tea. Lev Vasilievich liked skiing a lot.

However, our main pass-time was on a yacht that was rented by the Physics Institute from the former Imperial Yacht-Club. The yacht was not big, but it was a good one, with nice cabin and keel. The cabin was not furnished, and one could only sleep on the floor. There was a whole group of yacht enthusiasts. P. I. Lukirskii, V. R. Bursian were regulars; V. K. Fredericks and I. V. Obreimov joined occasionally.

We sailed the yacht together, and every spring we worked on its maintenance, puttied, and painted. V. R. Bursian and P. I. Lukirskii were the principle captains, and S. E. Frisch was the next in line.

The furthestmost trip the yacht could do was to New Peterhof. It was impossible to get a permission to sail to Kronstadt, and the opposite shore of the Bay of Finland was a dull area of summer houses. A. V. Timoreva and me lived in New Peterhof for a while, working at the Natural Sciences Station. Occasionally the yacht was coming to visit us. Once it was used to carry a microscope and some other equipment for Prof. N. A. Bulgakov. The weather was pretty stormy, a number of tow-boats was floating in a disarray, wooden trunks were in the water. The yacht sailed with its keel showing above the waves. Aleskandra Vasilievna and Sergey Eduardovich almost fell overboard. Throughout the whole journey N. A. Bulgakov was fretting about his microscopes. The weather notwithstanding, everything had successfully reached the destination.

Lev Vasilievich loved sailing and was a pretty good captain. He was generally very fit and deft, and an excellent swimmer. Once we had a sea rescue training exercise, organized by P. I. Lukirskii. Lev Vasilievich volun-

teered to play a man overboard. We could not get the boat close to him for quite a while, the waves were strong and he did not have a life jacket. The whole rescue operation stretched to about an hour. Lev Vasilievich endured the ordeal with flying colors. I doubt that many others would be able to do it.

The yacht club had a manager named Riabov. Once a group of chemistry students from the university asked him to find a sailor to participate in their trip around the bay of Finland. (They had a pretty large yacht and needed extra people to man it). Riabov passed the offer to Lev Vasilievich and he was glad to accept. Time went by, but the yacht was not coming back. Riabov started talking about a possible shipwreck.

What really happened was that those chemists stole a load of platinum from the university laboratory with an idea of running abroad. They found themselves ashore in Finland and where arrested for illegal border crossing. Finnish authorities wanted to expel them from the country, but no one, except for Lev Vasilievich, wanted to go back to Russia. Eventually they were expelled to Germany. The chemist fellows promised Lev Vasilievich to support him, but after two months in Germany they left him behind. He started looking for work and first landed a photographer job, later moving to a quartz factory. Finally, he applied for a permission to return home at our consulate. At that time the university lecturer M. M. Glagolev was in Germany on a trip to purchase electric transformers. He helped Lev Vasilievich to find the right people at the consulate, and a permission was granted.

After his return from Germany in 1922, Lev Vasilievich started working at the Physics and Technology Institute at the laboratory of I. V. Obreimov. Obreimov advised him to transfer to the Polytechnical Institute instead of trying to renew his student status at the university. Since then, Shubnikov studied at the Polytechnical Institute and worked in Obreimov's lab. His graduation was delayed by two years. One year has been spent in Germany, and the other one was added due to the differences in the course requirements at the university and at the Polytechnical institute. All of us were caught by surprise when Lev Vasilievich did not return to the university.

The 1924 was the year when Landau showed up at the university. He was very young at that time, about 16 or 17 years old. I did not know him too well. D. D. Ivanenko and G. A. Gamow were in the same class with Landau. I knew G. A. Gamow much better as he worked at the university under D. S. Rozhdestvenskii.

My student years were running out. I completed my diploma work under

P. I. Lukirskii, doing electrolysis of rock salt. Piotr Ivanovich was a group leader, S. A. Schukarev was doing the chemistry, and I did the experiment. The work was published later and A. F. Ioffe presented it in 1924 at the 4-th Solvay Conference in Brussels. After that, D. D. Ivanenko and G. A. Gamov started calling me “the Queen of salt”.

Lev Vasilievich also worked on rock salt with I. V. Obreimov (studying crystal deformations with optical methods) and sometimes visited me in the lab.

After the diploma defence, me and A. V. Timoreva entered the Graduate School. I worked with P. I. Lukirskii and she worked with V. R. Bursian. We had to pass the graduate examinations and choose a research topic. In those days graduate students had a lot of freedom in choosing a project.

At the same time my family moved to another part of the city. We now lived close to Lev Vasilievich and there were many more chances to meet each other.

I had an asthma, which eventually turned into an open form of tuberculosis. Doctors advised a natural remedy, kumys.⁹ In the spring of 1925 the two of us went for a trip to Bashkiria near Chucharaevo, the region of stipa-grass steppes. There we became a husband and wife.

Lev Vasilievich was paid a salary at his job, and I was getting a graduate stipend, so we had some means. We could finally afford visits to private doctors. Once Lev Vasilievich complained about a chest pain. I was mortified: could it be that he has lung problems as well? We made an appointment with a doctor who treated me. He inspected Lev Vasilievich and then asked: “Do you think you may have a broken rib?” It turned out that Lev Vasilievich indeed broke a rib while wrestling with someone. Lev was clearly above the gymnasium age, he would not fist-fight without a proper cause, but wrestling was an acceptable pastime.

After getting married, we lived with Lev’s parents for a while. I felt myself out of place: Shubnikovs were extremely practical people and we were not practical at all. We just laughed and had fun all the time. There was no help from me around the house.

A. V. Timoreva and S. E. Frisch lived with the family of Sergey Eduardovich in a large multi-family apartment. There was one room for rent there, and we moved in to live next to Frisches. We had a communal kitchen with them, and we ate meals together, and generally spent a lot of time in the

⁹Horse milk.

company of each other.

The new place did not quench Lev Vasilievich's thirst for practical jokes. He tied up the coat sleeves, he stuffed newspapers into the galoshes, he staged electricity blackouts. However, now it did not bother me at all.

Lev Vasilievich worked and studied but the time was coming for him to graduate. Lev's parents would often ask when will he pass the exams and why didn't he do it yet. Once Lev Vasilievich got so irritated that he pounded his fist on the table and left. Those emotional issues seemed so unimportant to me then. Of course, now I have a whole different perspective on the parents' feelings...

In those years Lev Vasilievich interacted a lot with his uncle, a renown crystallographer Aleksey Vasilievich Shubnikov who returned to Leningrad from Ekaterinburg (Sverdlovsk) in 1925. Lev Vasilievich and me visited Aleksey Vasilievich at the Academy, where he had a lab, and of course at home as well.

In 1926 Lev Vasilievich graduated from the Department of Physics and Mechanics of LPI.¹⁰ By that time he had two papers published together with I. V. Obreimov. One was on a new method of crystal growth, and the other on the optical measurements of crystal deformations in rock salt. The diploma research of Lev Vasilievich was very strong, but as S. E. Frisch recalls, its defence was completely overshadowed by a different event that took place during the Academic Council meeting. It was the demonstration of a new music instrument, the "termenvox" invented by L. S. Termen. The unusual instrument had a peculiar tone, resembling both music and voice. Sergey Eduardovich was extremely disappointed by this unfortunate overlap.

Not a long time before Lev Vasilievich's graduation from the Department of Physics and Mathematics, it became known that Prof. W. de Haas,¹¹ the director of the world-famous Leiden laboratory, was looking to hire someone competent in crystal growth. W. de Haas planned a series of experiments with bismuth single crystals. P. S. Ehrenfest, who worked in Leiden as well, wrote about it to A. F. Ioffe. European scientists valued the leading Russian physicists quite high at that time. Partially this was a result of the well known papers by A. F. Ioffe, D. S. Rozhdestvenskii, and A. A. Fridman. But it was also a display of solidarity with the Russian researchers who suffered the consequences of the revolution, civil war, the infrastructure breakdown,

¹⁰Leningrad Polytechnical Institute.

¹¹Wander Johannes de Haas, 1878 - 1960.

and who were largely cut off the international science. A lead helping role was played by P. S. Ehrenfest. He had regular correspondence with our physicists, sent them scientific journals, organized numerous trips abroad for young Soviet physicists and helped to arrange various fellowships for them.

First, Abram Fedorovich gave the Leiden offer to A. V. Shubnikov. However, Aleksey Vasilievich was already a well known crystallographer. He turned the offer down due to the low prestige of the job. Then A. F. Ioffe spoke to Lev Vasilievich. This was not a random choice either. Ioffe new Shubnikov's papers, particularly the one about the rock salt deformations. He was interested in the subject himself: Ioffe's assistant M. V. Klassen-Nekliudova worked on rock salt too, albeit not using the optical methods. Being the author of publications on crystal growth, Lev Vasilievich fitted the candidate description of W. de Haas. As it turned out later, his work style fitted the environment at the W. de Haas' lab extremely well. Lev Vasilievich happily accepted the offer.

In the fall of 1926 we were seeing away Lev Vasilievich at the Vasilievskii Ostrov embarkment, beyond the Lieutenant Schmidt bridge. Lyubov Sergeevna somehow imagined that she will never see her son again. She succumbed on the bench and cried in despair. After a short farewell, the cutter with Lev Vasilievch departed, carrying the passengers to the steamship "Preissan" (Prussian) of the "New Steamboat Company Szczecin, 1856", which operated a regular passenger line between Leningrad and Szczecin. From there Lev Vasilievich had to reach Berlin by train.

The passport received by Lev Vasilievich did not allow him to enter Holland. A visa was required, which had to be signed by the Queen of Holland Wilhelmina herself. Our country did not have representation in Holland, so the paperwork was handled by the Soviet Embassy in Berlin. Of course, the Germans did not need any visas to travel to Holland.

The visa was finally received, and on November 3, 1926 Lev Vasilievich left Berlin for Leiden.

At the time of his arrival W. de Haas was away, so Lev Vasilievich spent some time in a hotel. Afterwards he rented a room with board on Witte Rozenstraat (Street of White Roses), close to the Cryogenic Laboratory and the university, next to the family house of P. S. Ehrenfest.

W. de Haas suggested to Lev Vasilievich a study of bismuth resistance in magnetic field at low temperatures. This problem was far from being simple since earlier results varied substantially from sample to sample. De Haas' opinion was that the imperfections of the crystals were to be blamed.

But to grow a good enough crystal one had to start by learning how to produce extremely pure bismuth. This is why during the first year spent by Lev Vasilievich in Leiden he was doing bismuth purification with the help of local chemists. The procedure gave a result: the resistance in magnetic field exhibited a small growth.

Lev Vasilievich studied a lot, both in the lab and at home. In the evenings, when the lab was closed for the day, he would go to the library, located in the theoretical wing of P. S. Ehrenfest. There he could study till late at night. Taking books away from the library was not allowed. Usually, there was no librarian in sight, and every one had direct access to books that were sitting in old bookcases. A gas fireplace was lit, more to produce a cosy atmosphere than to really heat up the place. Lev Vasilievich spend many evenings there. In addition, he was buying books to read them at home.

He liked the laboratory. “Great people, nice guys” could be read in his letters. W. de Haas was very nice to him, being both respectful, trusting and friendly. Other scientists and technicians were mindful of his many needs. They liked him for an even temper, friendliness, and assertive manner. He was, however, not very talkative and could not befriend people easily. There were no other Russians in the lab. For a while he felt really lonely. At home we had a habit of visiting people without calling first. In Holland this was unthinkable. Only once a colleague from the laboratory, J. Voogd, invited Lev Vasilievich for a dinner. On weekends Lev Vasilievich often rode a bike to the towns nearby to visit museums or see churches and cathedrals. He would send detailed letters describing what he did and what caught his eye. Unfortunately, all this correspondence was lost after being confiscated during the arrest of Lev Vasilievich.

In 1927 I received an invitation from W. de Haas to join the Cryogenic Lab. The letter was sent to the Physics and Technology Institute where I had an assistant position. I. V. Obreimov was a deputy director at that time. He was very supportive and immediately started doing paperwork to arrange for the travel documents for me. In those times receiving a permit for foreign travel was not an easy matter. My first application was rejected. I am indebted to Ivan Vasilievich for his constant help. He went to Moscow together with me to petition for a new consideration of the matter, and we got an appointment with the Narkompros¹² boss M. P. Kristie. This visit produced an official paper, ordering me to undertake a trip to Holland for

¹²Peoples Commissariat of Education of USSR.

three months, for the purpose of working with low temperatures.

In the fall of 1927 me, Ya. I. Frenkel, and I. V. Obreimov boarded the same steamship Preissen going to Germany. The trip was several days long. I did not enjoy it too much. The sea was stormy and all of us had sea sickness of different degree. I was always getting sea-sick even though I was considered a “seasoned yachtswoman”. I would sometimes feel bad even in a streetcar! The most hardened of the three of us was Yakov Iljich. He tried to cheer up the others by playing chess “aveugle” (blind game). He was known to be a good chess-player. Once he even had a match with M. M. Botvinnik.¹³ When we finally arrived to Szczecin, everyone was relieved.

We travelled further to Berlin together, and in Berlin we kept constant company to each other. The wise Ivan Vasilievich warned me about the dangers of window shopping, but I could not resist. We visited the Aquarium and the Zoo, and did not miss a chance to listen to Germans singing over beer. Once me and Yakov Iljich went to the Luna Park and tried all the rides there. Ivan Vasilievich did not join us that time.

About a week later I got a visa. Ya. I. Frenkel and I. V. Obreimov were seeing me off. Lev Vasilievich met me at the border. He was extremely happy with my arrival and said that if I didn’t come he would have quit his job and returned to Russia.

The Cryogenic Laboratory, officially named “The Kamerlingh Onnes Physics Laboratory of Leiden University” impressed me immensely.

The Leiden Laboratory had a special room for measurements (“meet-kamer”). Numerous boy-assistants and employees of the mechanical shop were doing everything necessary for the scientists. There was an atmosphere of high respect to scientific inquiry, and research staff members were highly valued. The lab had its own style. Any measurement had to be precise, and the samples had to be of exceptional purity. This spirit was different from what we had back in Leningrad. At the Leningrad University, and even at the Physics & Technology Institute, people did not dwell on the precision of measurements so much. Besides, we did not have the necessary equipment anyway. Here in Leiden I first saw how good measurements were done.

At that time Leiden Laboratory had two divisions. One was led by Prof. de Haas and the other by Prof. W. Keesom. Professor Keesom’s division studied the equations of state of gases, thermometry (Lev Vasilievich attended a thermometry course by Keesom), heat capacity, and a number of

¹³Soviet and Russian chess grandmaster. https://en.wikipedia.org/wiki/Mikhail_Botvinnik

other materials properties. Keesom worked on getting lower temperatures by helium evaporation using the pumps of ever increasing power. While H. Kamerling Onnes reached 0.82 K this way, Keesom got down to 0.71 K at the time of my stay in Leiden. His division had a glass shop where one could observe large spherical dewars being blown — first the outer glass sphere, and then the one inside it.

The other division was headed by professor W. de Haas. He was short and gave an impression of a slow person. When addressing him, you had to use his title “Professor”. This was unusual for us, as we had always addressed our professors just by their first and patronymic names.¹⁴ Besides, we never made much difference between professors and other research staff members. W. de Haas was a mellow, likable man with a soft steady voice. There was no pretence or condescension in his manners. In a way, he was a exact opposite of the first Lab Director, H. Kamerlingh Onnes.

There existed numerous horror stories about hard life under H. Kamerlingh Onnes. The government did not appropriate enough funds for his research, and he was going out of his way to save on staff salaries and heating bills. We were told that it was so cold in the lab that your hands would swell. H. Kamerlingh Onnes sent his wife to visit staff members at home. At first, everyone gave her a warm reception and tried to cook something tasty. But soon it become evident that this was a wrong strategy. After a visit like that she would report to her husband that the employees are well off and can tighten their belts. The salaries were inevitably cut down.

W. de Haas had a totally different style. He would not save on heating and it was always warm in the lab. He paid more to younger people and not as much to the senior professors. In his opinion the latter did not need much, while the young researchers had a lot of needs. This philosophy was probably rooted in the fact that most of the people working for de Haas were recent university graduates, pursuing their doctoral degrees.

W. de Haas division occupied the first floor of the lab. Several people worked in each of the large rooms. The research directions were diverse. G. Sizo and J. Voogd studied superconductivity. C. J. Gorter mostly studied magnetic properties — he was measuring magnetic susceptibility at low temperatures and paramagnetic properties of salts. Salts were also studied by

¹⁴In Russian language addressing a person in a polite way one uses the first name and the second name, derived from the father’s name.

H. [R.] Woltjer.¹⁵ E. C. Wiersma¹⁶ worked on adiabatic demagnetization of paramagnetic salts for ultra-low temperatures. Later, in 1934, he and W. de Haas reached the temperature of 0.0044 K using diluted chromium alum. A theoretical estimate for the temperature was worked out in collaboration with H. Kramers. H. Bremmer was studying heat conduction in metals. After the departure of Lev Vasilievich, the resistance of metals was measured by [J.] W. Blom, and the magnetic susceptibility was studied by P. van Alfen.

Besides those people mentioned above, there were also J. de Boer, W. [H.] Capel, [J.] van den Handel and others. Neither of them had permanent staff positions. As a rule, people moved out of the lab after the defence of their thesis. Dutch people usually helped each other to do measurements. Like every one else, Lev Vasilievich had to teach lab courses for students.

Except for the foreigners, everybody worked on topics suggested by de Haas and under his guidance. There were six foreign researchers in the lab: [M.] Wolfke (Poland), J. Becquerel (France), [M.] Kinoshita (Japan) and three Russians — L. V. Shubnikov, I. V. Obreimov, and me.

There were no seminars or general discussions in the lab. Every staff member would get a thick green notebook to make daily records of their work. On Saturday, the notebooks were collected and brought to the W. de Haas' house. Next Monday they were returned back. If necessary, he invited an employee for a talk. This way he was following all developments in the lab. Nobody had to write up any research plans in advance.

Sometimes there were unusual entries in the lab books. Once a female researcher wrote “Danced on the foundation”. This was a stability check before the equipment installation.

W. de Haas himself never visited the lab for the purpose of controlling the work of the staff members (they were called “assistants” at the Leiden Laboratory). Probably this task was assigned to E. Wiersma, who was a lab supervisor. Wiersma was in charge of the equipment check-out for the measurements. If a checked-out apparatus was idling, he would ruthlessly recall it and give another person to use. This way all equipment was constantly engaged. Also, E. Wiersma was in charge of the stock room, but many staff members had their own keys. Overall, the lab operation was very well organized, with minimal paperwork.

¹⁵Herman Robert Woltjer, 1887 - 1974. https://id.wikipedia.org/wiki/Herman_Robert_Woltjer Russian text gives an incorrect initial, A. Woltjer.

¹⁶Eliza Cornelis Wiersma, 1901 - 1944. https://nl.wikipedia.org/wiki/Eliza_Cornelis_Wiersma

The administrative support was also minimal. We had one secretary, fraulein Bosscha.¹⁷ She was typing papers for the journals, organizing the correspondence of W. de Haas, ordering equipment and stock room materials and accounting for them. Most of the staff members had their own keys from the stock room. There was one notebook there to sign off for materials taken, and another one—to note what was in short supply.

W. de Haas' office was on the second floor. He also had a personal mechanical shop, ran by a mechanic named van der Starre.¹⁸ Magnetic equipment used by de Haas was housed on the first floor. He always kept the magnet in good shape and well calibrated. I recall one visit by J. Becquerel, who was doing some measurements together with W. de Haas. They were studying magneto-optical phenomena in crystals.

I never saw de Haas angry or out of control. If he was unhappy with something, he usually showed it in an indirect but torturous way. Right before J. Becquerel's arrival, J. Voogd was not careful and approached the magnet with metal lab stand. The stand was sucked into the field and hit the magnet pole's cap, making a dent. The cap had to be re-polished and a new calibration of the magnet had to be performed. A whole year after this event de Haas would ask Voogd "How could this have happened?" each time he met him. I think poor Voogd was suffering from this everyday questioning much more than he ever would from a single burst of scolding.

Every visitor was getting a mandatory tour of the famous Cryogenic Lab. The lab was managed by Mr. Flim,¹⁹ who was a chief mechanic since the time of H. Kamerlingh Onnes. You could certainly tell that he was much more than just a mechanic. There was a lot of glassware in the Cryogenic Lab, including large glass dewars. You would see a lead superconductive ring with a persistent current flowing through it. You would learn about the dangers of working with the liquid hydrogen and about the fact that no insurance company will ever write a policy for the Cryogenic Lab. The lightweight roof would be shown, which was designed to take the first hit in case of a hydrogen gas explosion and be blown up. It was strictly forbidden to smoke in the lab. Neither E. Wiersma, who smoked so intensely that sparks were falling around him, nor I. V. Obreimov, who never parted with his pipe – not

¹⁷https://www.lorentz.leidenuniv.nl/history/KOL_archive/photographs/pages/page_45.html

¹⁸https://www.lorentz.leidenuniv.nl/history/KOL_archive/photographs/pages/page_226.html
https://www.lorentz.leidenuniv.nl/history/KOL_archive/photographs/pages/page_112.html

¹⁹Gerrit Jan Flim.

https://www.lorentz.leidenuniv.nl/history/KOL_archive/photographs/pages/page_273.html

anyone – would ever smoke in the Cryogenic Lab. The only place reserved for smoking was in the lobby of the institute.

I almost never met Mr. Flim in the wing of W. de Haas, but he did all round-the-clock work with liquified gases. Neither do I know how much training did Lev Vasilievich get on the subject of liquefiers, and whether he received any advice from Mr. Flim (this never happened in my presence). However, in his characteristically mysterious way, Lev Vasilievich knew everything about the subject.

The main space of W. de Haas' division was on the first floor. Electrical measurements were performed in a special "measurement room" with an electric switchboard. You could bring a platinum thermometer, or any other resistor you needed to measure, into the "meetkamer" and use one of many highly sensitive Wolf compensators — the best at the time — equipped with Zernike and Moll galvanometers. The room was temperature-controlled. All measuring equipment was mounted on a special foundations to insulate it from the vibrations excited by tow-boats in the nearby canal. Foundations were also available in every other room. To place your equipment you simply had to remove a designated plank from the floor, attach a pedestal to the foundation with some alabaster powder, and put your equipment on top of it. Nothing was ever hanged on the walls.

Back at home we were not acquainted with the state of the art techniques in electric measurements. Neither did we have any experience with low temperatures. Of course, we did have a small amount of liquid oxygen in the lab, but it was used for technical purposes, like cooling the vacuum traps or evaporating metal films on cold substrates. None of the research areas pursued at Leiden were familiar to us in any way. Everything was new.

The lab had several rather powerful Weiss magnets, which were used for all field measurements. The current sources were hidden in the basement. In the lab room one would only see the electric switches and the oil-immersed resistors used to regulate the current. During our stay in Leiden a big magnet was assembled and mounted. One had to climb a staircase to calibrate this magnet's field or to install a dewar into the gap. The maximum field was 30 kGs. At the time only Lev Vasilievich worked with this magnet. Here you can see a picture of W. de Haas, P. Ehrenfest and C.[-A.] Crommelin (all of them were rather short) standing next to the magnet. It was a common joke to say that they were chosen to highlight the scale.

Pipes were laid across the building to collect evaporating cryoliquids, including hydrogen and helium. Measurements in the temperature interval

from -23 C to -217 C were performed using appropriate cycles: methylchloride, ethylene, methane, and oxygen in the interval between the boiling temperature and the triple point. Any intermediate temperature could be stabilized with the accuracy of 0.01 C . In addition, a neon cycle was also available.

There were no technicians in the lab. Instead, we had a large support staff and an enormous mechanical shop, led by good foremen. The jobs submitted to the big shop were completed very fast. Large jobs had to be coordinated with van der Starre, and the smaller ones with the foreman. In addition, there was an electrician shop, a small glasswork shop with one worker who accepted orders immediately without any paperwork. There was a large number of boys who were taught mechanical, electrical and glassware skills by the experienced workers. These students helped the lab scientists to mount the samples, check electric connections, fill the dewars, and make sure there are no leaks of hydrogen or helium. During the measurements they would man the differential oil manometers that regulated the vapor pressure over the cryogenic liquids and controlled the temperature. This kept the boys busy for the whole day.

At his first day in the lab every researcher would get a toolbox with a set of necessary screwdrivers, wrenches, resin-glue cans and the like. You had to put a reasonable deposit for it. At the termination date, the toolbox had to be returned for a refund, minus the price of the lost pieces. Every room had a bookcase for drawings and workbooks. But drawing and calculations were done upstairs, on the second floor. There was a special room (“rekenkamer”) set up for doing the calculations and writing papers. The room had drawing boards, sets of flexible French curves, and other necessary equipment.

In summer the staff members were leaving for holidays. I described the scene in one of my letters addressed to A. V. Timoreva in Leningrad. “We have a pleasant moment, the last working day before we are all sent off for one month. To be honest, nobody worked for the last few days either, except for Lev and Ivan Vasilievich. But the official end of work is today. We will have to visit de Haas and Keesom and wish them happy holidays, then make rounds in the lab, shake hands with all foremen and bow to their students. After that we are supposed to pay a visit to the liquid hydrogen, meaning saying good by to Flim. Shaking hands with Crommellin is a must too. Then one has to stay in the office and wait for the other assistants to visit, shake hands with you, and wish you happy holidays. This is how it is done here. Even before Christmas and Easter, when the holidays are just 1.5 week long,

everyone makes these rounds”.

The main result of the four years spent by Lev Vasilievich at the Leiden Laboratory was the discovery of the new phenomenon, presently universally known as the Shubnikov–de Haas effect. It was reported in five papers, including a publication in *Nature*. In addition, two papers detailed the methods of purification and crystallization of bismuth, and measurements of the resistance of single bismuth crystals in the temperature interval from 0 C to 1.3 K. For these experiments bismuth was taken not just from the standard supply company “Hilger”, but also from “Hartmann and Braun” and “Kollbaum”. I would like to attract special attention to the last two papers by Shubnikov. Only after reading them one can fully appreciate the significance of the work performed by Lev Vasilievich to perfect the process of growing his unique bismuth crystals. Before these papers of Lev Vasilievich, nobody suspected how critical could be the role of contamination, even if it was as small as one impurity atom per million of bismuth atoms.

At the time of my arrival, Lev Vasilievich was about a year into this work. He was still measuring the residual resistance of bismuth and its dependence on the number of re-crystallization cycles, the growth conditions, and deformation. I was helping with this work. Every next crystallization led to a lower residual resistivity. After seven or more re-crystallization the resistivity would stabilize at a value typical for other extra pure metals. It was important to ensure that crystallization did not induce any mechanical stress. For this, a special expandable steatite mold was used. It consisted of two pieces that could slide apart to give room to the growing crystal. Crystallization was performed in vacuum. This research was very important, especially for Leiden laboratory. Lev Vasilievich worked together with W. Blom. As his assistant, Blom learned how to purify materials and grow crystals. Lev Vasilievich also grew single crystal samples of pure bismuth, $5 \times 5 \times 5 \text{ mm}^3$ in size, for de Haas to be used in the measurements of magnetic susceptibility. It was those crystals which W. de Haas and P. van Alphen used for their first papers in 1930. Lev Vasilievich was always very careful about citing other authors’ work. In his paper he cites a lot of crystallization methods due to other people, but never refers to papers on purification methods. I am sure he would not spend this vast amount of work studying the influence of the number of re-crystallization cycles on residual resistivity if he knew about similar research, previously done by someone else. This is why I think that the method of purification by re-crystallization was pioneered by Lev Vasilievich.

When Lev Vasilievich applied magnetic field of variable orientation, the resistance oscillations were discovered. And at that very moment him, de Haas, and Ehrenfest realized that these oscillations were the most important part of the result. At first, the oscillations were non-symmetric. It was left to achieve crystallization with prescribed orientation, so that the growth direction was along a certain crystallographic axis. When that was done, Lev Vasilievich observed clear, symmetric oscillations. All these measurements were performed at nitrogen and hydrogen temperatures, using the large magnet I described above. The complete research effort spanned four years.

All papers on the Shubnikov–de Haas effect were written in German by Lev Vasilievich and given to W. de Haas. The manuscripts of seven papers (six joint papers with de Haas and one paper with Shubnikov as a single author) remained in Leiden. They were published in 1930 in the proceedings of the Leiden Laboratory and Amsterdam Academy of Science. Shubnikov’s name goes first on all papers. This was the initiative of de Haas who wanted to underscore the decisive role of Lev Vasilievich in the discovery of the effect.

It was planned to repeat the experiments at Helium temperatures, but there was not enough time for Lev Vasilievich to do it before our departure from Leiden. W. de Haas and P. Ehrenfest well understood the importance of this work. They had repeatedly contacted A. F. Ioffe asking him to help Lev Vasilievich in obtaining a permission for another visit to Leiden, but all the efforts had failed.²⁰ Nobody worked with the crystals Shubnikov left in Leiden until 1935, when W. de Haas and W. Blom used them to measure the magnetic field strength and orientation dependencies of bismuth resistance at helium temperature. The field effect on resistance and oscillations at 4.22 K turned out to be larger than at 14.15 K. Further cooling to 1.35 K did not produce much of a change. The structure of oscillations at the helium temperatures was found to be more complicated than at the hydrogen temperature. These findings were published in 1935 in a paper with three authors: W. de Haas, W. Blom, and L. V. Shubnikov.

It took a while for the effect to get a deserved recognition. The importance of these oscillations for the determination of the energy spectrum of metals was understood only 30 years later, when Lev Vasilievich was no longer with

²⁰It is not clear from the Russian text how much did Ioffe help, and whether he tried. However, the general meaning of the phrase is that it was extremely hard to obtain a government permission to exit the USSR.

us.

My own work at Leiden Laboratory started about a month and a half after my arrival. At first, I did not have a defined topic of study. I was familiarizing myself with the use of platinum thermometers. My first mentor (and tormentor) was Lev Vasilievich himself. He used to start training sessions by scaring me with the complexity of delicate equipment—to the point where I was afraid to touch the crank arms of the compensator. Then, he would act righteously appalled by my perplexed look. Still, it was a very good school, and I knew it is worth being patient and going through the lessons. Lev Vasilievich could teach you a lot of things. He had a golden touch in experiments and was an extremely fast thinker. This was most apparent during the measurements which he would do faster and better than anybody else. He was also pretty good in the area of the apparatus design: the foreman of the mechanical shop would often consult with him. After mastering the compensator and learning how to measure the platinum thermometer resistance I assisted Lev Vasilievich with many of his measurements.

Most often my job was to control the magnetic field. I was carefully instructed that it is strictly forbidden to turn the current on and off without engaging all the resistors. A charcoaled knife switch was shown to me to make the lesson more vivid. We have agreed upon the system of signals that Lev Vasilievich had to use to tell me to change the current. In all rooms, including the measurement room, three were bells, and by giving a certain number of rings he could tell me to raise or lower the field. The temperature was controlled in the same way, except now the bell signalled to the person in charge of changing the vapor pressure above the cooling liquid. This was usually the job of apprentices. Another person in the measurement room was responsible for taking the temperature measurements with a platinum thermometer. Lev Vasilievich himself was measuring the resistance of the sample.

After a while, I. V. Obreimov came to visit Leiden. He had a plan to measure the oscillatory spectra of some organic crystals, e.g., the nitrobenzole, and the spectra of the crystalline iodine. His interest was to see how they change at low temperatures. I was charged with a task of helping him, so I grew the organic crystals and helped mounting them, and was in charge of developing the photo plates. Later I. V. Obreimov went to England and left all data to me to write a paper. I was preparing the data, mounting the photographs of spectra, and plotting the curves. In the process I started to perform my own measurements and even observed the change of the spec-

trum in the methyl orange crystal. However, at this moment J. Becquerel came to the lab, and the spectrometer was taken away from me. Next, I assisted W. de Haas. He offered me to measure the magnetization curve of an iron rod that was provided by Philips as a high coercivity sample to be used as a permanent magnet. Despite this description, the rod never showed much coercivity in my measurements and it seemed that I am dealing with very soft iron. W. de Haas often inquired about the Philips sample, calling me the “kleine Shubnikov”.²¹

Measurements were repeated many times, but in vain. I used several tricks to reduce the demagnetization effect, but that did not help either. Suddenly an apologetic letter came from Philips, explaining that they sent a wrong sample which was indeed made of magnetically soft iron. After this letter W. de Haas announced that now he will believe in whatever I say. Later, when asking about the situation in Russia and getting my overly patriotic responses, he used to say “I do believe everything you say, but I’d better go and see it for myself”.

At that time a paper by P. L. Kapitza came out, claiming that all bismuth crystals are intrinsically imperfect due to the presence of cracks. The paper showed a dependence of bismuth resistance on crystal deformation. In his experiments Kapitza used the “Kollbaum” bismuth (“Hilger” bismuth was regarded as being a better material). Lev Vasilievich had already grown his unique and extremely pure bismuth crystals and W. de Haas suggested that I should repeat Kapitza’s experiments using the crystals of Lev Vasilievich. My measurements showed that there were no cracks in those samples. The results of this work were published in the Journal of the Amsterdam Academy of Science and in Leiden Communications.

Another topic of my research was temperature dependence of the twist modulus in lead, bismuth, cadmium and zinc at low temperatures. This work was supervised by W. de Haas. It was completed and prepared for submission under his and my names. However, later in Kharkiv I somehow got suspicious about the almost absent temperature dependence of the twist modulus in cadmium and zinc. I chickened out and wrote to W. de Haas asking not to publish this work. Later I much regretted this decision as other people obtained and published similar results. This unpublished manuscript was written by me in German with the help of E. Wiersma.

Lev Vasilievich had much fewer problems with languages. He was fluent

²¹kleine: “small” in Dutch.

in German, especially since he didn't waste the year spent in Germany, and Dutch has a lot in common with German. Besides, everybody in Holland learned three languages in school: Dutch, German, and English. Overall he had no difficulties in communication, except when teasing the locals by calling Dutch a German dialect. On my part, I spoke with W. de Haas in French. He knew it, although his pronunciation was poor, and I had some French background from the gymnasium. With other people I communicated on an ad hoc basis.

Later de Haas assigned van den Handel²² to assist me with measuring Young's modulus of some metals at low temperatures. He suggested using a capacitive sensor for this purpose. We worked our tail off but were unable to finish this job. The reason was that the lab had poor electric ground. We tried to dig and bury large metal sheets to use as ground terminals but the results were never good enough. Many years later I met van der Handel again, now in Leningrad. He visited after WWII to participate in a low-temperatures conference. By that time he was already the director of the Leiden Cryogenic Lab, the position he assumed following C. Gorter.²³

In Leiden we stayed in the apartment on Witte Rozenstraat, 58, rented by Lev Vasilievich after his arrival. The place had two rooms: a sort of study-room on the second floor, and a bedroom on the third floor. The stairs going up to second and third floors were so narrow that there was no way to move any furniture through them. When we rented a piano (I loved playing and wanted to have an instrument), it had to be moved in through the balcony.²⁴ I was surprised by the uncomfortableness of the dwelling. There was no bathtub, and the third floor had no water piping at all. Special jars were used to carry water upstairs. The windows were single-pane. The first floor room had a small stove, which for some reason was called a "Russian" stove. It stood separately, connected by a pipe to a fireplace, which we had never seen being used. The bedroom upstairs had no heating at all. The second floor room was used by Lev Vasilievich to work, and as a dining room. Our

²²Joost van den Handel, 1909-1988. <https://hoogleraren.leidenuniv.nl/id/1027>
https://www.lorentz.leidenuniv.nl/history/KOL_archive/photographs/pages/page_34.html

²³Cornelius Jacob Gorter, 1907-1980.
https://www.lorentz.leidenuniv.nl/history/KOL_archive/photographs/pages/page_230.html
https://www.lorentz.leidenuniv.nl/history/KOL_archive/photographs/pages/page_100.html

²⁴This may not seem unusual for people in the Netherlands but often amazes readers from other countries. In its present state (2019) the Witte Rozenstraat 58 house still has a balcony on the second floor.

contract had meals included. The landlady would bring our meals but she never invited us to visit her.

The meals we were getting from the landlady were not particularly tasty. Breakfast usually consisted of milk, a piece of gingerbread, and some sweat brown syrup, a kind of marmelade that the Dutch people enjoy.²⁵ There was never any butter. Actually, we were always hungry. I started to feel dizzy. Before my arrival, Lev Vasilieich was hungry as well, especially in the evenings, when he would even find it hard to fall sleep. Later, he said, he got used to the feeling. I went to the doctors office and came back with an advice to eat twice as much. After that we started buying eggs, cookies and other things to supplement the dinner. We never complained to the landlady but E. Wiersma was angry about it and used to say that our landlady will never find new tenants with this level of service.

We didn't get much money. Lev Vasilievich was paid 200 Dutch guilders per month from his Rockefeller fellowship (at that time one guilder was equal to 80 kopecks),²⁶ and I was paid 30 guilders per month by W. de Haas. From this amount we paid a ten percent tax, the apartment rent was 160 guilders, some money went for clothes, shoe repair, and other expenses. The rest we saved for summer trips.

Notwithstanding the heavy workload, Lev Vasilievich was always in good spirits. If things didn't go well, he would jokingly say in Dutch that we should just "thee drinken en buiten kijken", which meant having a tea party and watching the street through the windows. He had other favorite sayings, modified from the classic proverbs, like "I had it in the bag, but the bag had a hole, so it fell through" or "Experimentation - celebration, calculation - consternation". He also loved singing.

Our every morning started by singing together. And then we would have breakfast, and go to the lab. The doors of the lab were kept open until 10 AM. After that, the only way in was to ring a bell and wait for the foremen from the mechanical workshop to open up. Whenever I happened to be late, this procedure stressed me a lot, and I always tried to get there on time. Usually I would walk to the lab together with E. Wiersma who lived nearby and picked me up on his way. Him and me would walk or ride bikes together. Lev Vasilievich was always coming after 10 AM. In all probability he was the

²⁵"Appelstroop", https://en.wikipedia.org/wiki/Apple_butter

²⁶Comparing Soviet money with freely convertible currencies is an art, and can be discussed forever.

only lab member for whom such behavior was tolerated. His schedule didn't meet objections because everybody saw how much he works. He even had his own key from the front door and didn't need to bother people inside.

When the lunch time came, everybody in the lab — the scientists, the workers and the apprentices — would jump on their bikes and go home to eat. The streets were full of cyclists at that hour.

At night, when the lab closed, Lev Vassilievich usually went to the library to study. I would go to the shops to buy food. Before I started working in the lab, I spent a lot of time with E. U. Afanasieva, the mother of T. A. Afanasieva-Ehrenfest. I would talk my mind to her until the time when Lev Vasilievich returned home. He was very busy, and I often complained about it in my letters to A. V. Timoreva, my frequent correspondent. On his part, Lev Vasilievich didn't like writing letters at all. I would bug him to write home to his parents, and eventually he would sit down and write something like “Dear parents, I am so sorry I didn't write you for a while. There is really nothing to write about. Yours, Lev.”

Lev Vasilievich had an excellent bike. Before I got my own bike, I rode with him, sitting on the back rack. He never took time to check whether I assumed a balanced position, and would often throw me off the bike when making turns. Such trifles didn't bother us at all. Finally we bought a used bike for me, so I started learning how to ride it. My training proceeded on a narrow path between two canals, a situation inviting a splash into one of them. Luckily I never ended up in water but fell from the machine too frequently. Eventually I mastered the skill of bike riding.

We often walked the streets of Leiden, sometimes with I. V. Obreimov, who kept us company when visiting. During our trips to other Dutch cities we would try to see as much as possible by riding large streetcars that looked similar to the “Americano” streetcars at home.²⁷

In winter, everybody would get excited when it was cold enough for the canals to freeze. The lab would then be shut down for a two-three day break to give all workers and apprentices a chance to skate. Nobody used special shoes for skating: the skates were attached to wooden blocks, which were tied to any type of shoes by a rope. You could even skate on high heels. All Dutch people were quite good in skating. Only two of us from Russia were totally ignorant in this sport. People convinced us to give it a try. Lev

²⁷In 1930's Soviet engineers copied the USA Peter Witt's streetcars for local use. These were colloquially called “Americanos”.

Vassilievich, as ever vigorous, would always ride at high speeds, arguing (not without a reason) that this stabilized his motion. Sometimes he would bump into other people on his way. I, on the other hand, quickly got discouraged and stopped trying.

In spring time we used to travel to the sea in the company of friends, or walk through the parks and forests near Leiden. When hyacinths and tulips were blooming, we would take rides to admire the flower fields. After the season, large heaps of cut tulip heads could be found along the roads. Everybody used them for making garlands to decorate themselves and their bikes. We followed this wonderful tradition.

Often times we visited Katwijk,²⁸ a small fisherman village with a royal palace located in it. The sand of Katwijk beaches was perfect. One could endlessly ride a bike over the wet sand along the surf line. A little further away was Noordwijk, a relatively large town. Both of them were just 7-8 km from Leiden. On longer trips to the Hague we would pass Scheveningen, a posh resort with restaurants and beaches.

As time passed, we made friends with other lab members. W. de Haas invited us of a tea a couple of times. His wife entertained us, and de Haas asked questions about Russia. He said he would be interested to visit some day. Outside of the lab we spent time with E. Wiersma and his wife Alie,²⁹ and with the Ehrenfest family. This was a strong and real friendship, which I remember to this day and will never forget.

As I already wrote, E. Wiersma was a lab supervisor. His wife Alie was a chemist by training but after marriage she became a housewife.³⁰ They lived nearby but initially we had no contact outside of the lab. In Holland there is no custom of visiting people without previous arrangement. Once, shortly after being introduced, I came by the Wiersmas' house. Alie got extremely worried and asked me "Olga, did something happen?" She was completely sure that visiting without a pre-extended invitation can be only warranted by extraordinary circumstances.³¹

E. Wiersma used to invite us on Sundays to his house for dinner. Later

²⁸Katwijk aan Zee.

²⁹Alida Petronella Wiersma.

³⁰Not clear whether Trapeznikova knew that at that time women in the Netherlands were legally required to quit their jobs at public institutions after marriage. Eliza Wiersma and Alida Jöbsis got married in August of 1927, right before the arrival of Trapeznikova to Leiden.

³¹In the USSR the custom was completely opposite. Friends, even in larger cities, would

we would take a stroll together with him and Alie, or go to a cinema. Our connection grew stronger and stronger. We traveled to the sea together. Wiersma's parents lived in Rotterdam. When him and Alie were away visiting parents, they would give us a key from their Leiden apartment. We were very happy to spend time there, away from the watchful eye of our landlady, who was always eager to remind us to switch off the lights when deemed unnecessary. Over the time, Lev Vasilievich and E. Wiersma developed great rapport. Curiously, they were born on the same day, September 29, 1901.

We have been visiting the Wiersmas on workdays as well. They had a pathophone, and we often listened to classical music. Sometimes Ehrenfest would pay a visit. There were long conversations about physics. I had my first experience watching Lev Vasilievich questioning Wiersma for hours about the details of electromagnet construction, cable winding techniques, and other subjects. E. Wiersma would complain afterwards that such conversations left him feeling squeezed as a lemon. Lev Vasilievich, on the contrary, was tireless and could withstand any stress. The more difficulties he encountered, the better his mood seemed to be.

The Ehrenfests lived across the street from us. Their house³² was designed by T. A. Afanasieva-Ehrenfest, the wife of Pawel Sigizmundovich.³³ It differed quite a bit in its appearance from the regular three-story houses on Witte Rozenstraat. The street-side wall of the house was mostly solid with one small window. The entrance was through the garden.

Tatiana Alekseevna³⁴ was unable to find work in Leiden, and hence spent most of her time teaching thermodynamics and statistical physics in Simferopol.³⁵ She would only return to Leiden for two to three months per year. Her mother, Ekaterina Ulyanovna, stayed with the children, who called her "grandma Katya".

The Ehrenfests had four children. The elder sister Tanechka³⁶ was about our age. Galinka was about eight years younger than me. Then were Pavlik

knock on each other's doors to have a chat just because they were passing by. In part it was a result of the scarcity of telephone service. Such state of affairs persisted until the 1990's.

³²<https://nl.wikipedia.org/wiki/Ehrenfesthuis>

³³Paul Ehrenfest is called this way by Trapeznikova throughout the memoir. The second name is a Russian-style patronimic "Sigizmundovich" derived from the name of his father, Sigmund Ehrenfest.

³⁴Afanasieva-Ehrenfest.

³⁵The largest city of the Crimean peninsula.

³⁶Names given in the text are diminutives from the full forms Tatiana, Galina, Pawel, and Vassiliy.

and the youngest, Vasenka, who was never shown to me.³⁷ All of them spoke Russian very well (probably because they communicated in Russian with grandma Katya and Tatiana Alekseevna). Galinka and Pavlik were home-schooled since Pawel Sigizmundovich deemed school education to be useless.

We first got to know Tanechka. She took us to visit her friend Frenny de Graaf, and went for some bicycle trips with us. Then Galinka arrived. She was a wonderful and very interesting person. She danced beautifully, did drawings, and played a violin presented to her by Einstein (though she used to say that the violin was quite bad). We became very close friends with her.

P. S. Ehrenfest was a wondrous man. You would meet him, and first see his shining eyes. Everything was blossoming around him. His eyes made you full of joy. On the flip side, he would occasionally sink into a state of severe depression. I remember a stroll we took with him, Lev Vasilevich, and E. Wiersma. Ehrenfest said he will commit suicide. And added that he will first kill Vasenka, so that his other children will not be burdened. We could not imagine then that these words described exactly what he would eventually do...

At home, Pawel Sigizmundovich spoke and wrote in German. With us he would always use Russian. His speech was full of errors and heavy accent, words were mixed but it came through as witty, interesting and funny. He signed me up for a Movie League club, where we watched classic and famous films. Some Soviet films were shown as well: "The Three Million Trial", "The Battleship Potemkin". The latter was highly praised by Pawel Sigizmundovich.

P. S. Ehrenfest was very kind to us through our whole stay in Leiden. Once, after the visit of I. Langmuir,³⁸ he found that Langmuir's wife forgot her galoshes in his house. He brought them to me to keep me dry. When we were departing Leiden, Ehrenfest and Galinka gave us their suitcases since we could not fit everything in our own ones.

Ehrenfest's role in the academic life of Leiden was enormous. He had about ten theoreticians working with him all the time. He was a good friend of de Haas and knew all about the latest results from the lab, even though he didn't visit it frequently himself. The most important thing was his theory seminar that attracted scientists from all around the world.

Seminar meetings were held in the theory building auditorium. First,

³⁷Vassiliy suffered from Down's syndrome.

³⁸Irving Langmuir, 1881 - 1957.

the visiting hot-shot would give a talk, and then everyone had tea and discussions with no time limit. Lev Vasilievich, E. Wiersma and I attended all Ehrenfest's seminars. Over time we've listened to A. Einstein, M. Plank, M. Born, A. Sommerfeld, W. Pauli, E. Schroedinger, P. Bridgeman, P. Debye, D. Koster, A. Fokker and others. We had not seen N. Bohr or E. Rutherford. W. de Haas and W. Keesom never attended either.

Pawel Sigizmundovich asked me to organize the after-the-talk tea. I had to buy cookies in advance, brew the tea and ask everybody to the table. The trick was to get water boiling before the hissing noise of the gas burner would unnerve Ehrenfest to the point where he would shut it off.

We had a chance to listen to many famous physicists coming to Leiden. I already wrote about Jean Becquerel. A. A. Eichenwald³⁹ visited as well. At that time he was negotiating a return to Russia, specifically to Kharkiv rather than Moscow.⁴⁰ He presented experiments on magnetic fields created by convective currents. These were old but very interesting and clever results. According to him, people in 19-th century didn't believe that convective current produces the same magnetic field as the regular ones, and only his experiments proved the equivalence. Charles Fabry spoke about the ozone absorption spectra in the upper atmosphere of Earth. His talk was so lucid that everybody felt enlightened.

In 1928 P. L. Kapitza visited from England. Him, I. V. Obreimov and us went for a walk in Leiden. The other time A. F. Ioffe came with his wife, Anna Vasilievna. I met him in the office of P. S. Ehrenfest who took a picture of our group. A. N. Terenin visited as well. During his time in Leiden there was a tour of the Philips plant in Eindhoven for the "Russian group" — that is for I. V. Obreimov, A. N. Terenin, me, and Lev Vassilievich. Philips ran a big research lab that was presented to us by A. van Arkel,⁴¹ who worked there. Eindhoven is close to the Belgian border, and plant workers were mostly from Belgium. They were brought every day by buses. Dutch salaries were higher, so it was economically sensible to hire Belgians.

Lev Vasilievich and I were very happy when S. E. Frisch visited us. He travelled to Groeningen to collaborate with D. Koster⁴² and came to Lei-

³⁹https://de.wikipedia.org/wiki/Alexander_Alexandrowitsch_Eichenwald, Aleksander Aleksandrovich Eichenwald, 1864-1944.

⁴⁰In the hyper-centralized Soviet system being willing to reside outside of the capital was distinctively strange.

⁴¹https://en.wikipedia.org/wiki/Anton_Eduard_van_Arkel

⁴²https://en.wikipedia.org/wiki/Dirk_Coster

den for four days. We were really excited to see him and organized a trip to Scheveningen. Together with him and I. V. Obreimov we went to see P. Zeeman in Amsterdam. Zeeman himself showed us around the institute, demonstrating experimental equipment. The institute had vacuum pipes running everywhere, so one didn't have to install a pump in every room.

Many theorists visited P. S. Ehrenfest. A. Einstein and W. Pauli always stayed in his house. Ehrenfest was ordering his lunch meals from a cafe, and this didn't make Einstein happy. He would instead visit Wiersmas to eat: Alie was a great cook and a model housewife. Einstein later wrote her a long versed thank-you note.

P. S. Ehrenfest also organized a visit by I. E. Tamm. Anybody acquainted with Igor Evgenievich could not help but admire and value him. Tamm's visit coincided with the presence of P. Dirac in Leiden. Tamm and Dirac spent a lot of time together. Several times we joined them for walks, and once we all had a boat trip. My letter to A. V. Timoreva describes this event as follows: "... the boat we got was huge and unruly. We didn't sail too far from the shore. That's when Dirac opened up. He has a nerd's look but was a source of much trouble. Tamm was rowing and could not make the boat go straight, no matter how hard he tried. Dirac was teasing him relentlessly. Eventually Tamm got angry and pretended to go to sleep. Then the two of them (I was not participating, obviously) started pouring water on poor Tamm and soaked him completely. Things escalated to a wrestling match, and so it went..."

At some point we got the news that L. D. Landau will be coming to Leiden from Copenhagen. Pawel Sigizmundovich was visibly alarmed. He heard from A. I. Ioffe about the "nasty temper" of Landau and was scared of what could happen. It was true that Landau's behaviour at seminars in Lenigrad PhysTech was defiant. Once he brought a children's air balloon to the talk and played with it, jerking the thing by the thread. I perceived Landau as a shy person acting brash to cover his true nature. Pawel Sigizmundovich assigned me to the mission of mitigating Landau's behavior and making sure there will be "no drama". On our part, Lev Vasilievich and I were happy to meet a new compatriot. We entertained Landau, took him to the movies, and very soon switched from a "polite you" to "intimate you"⁴³ when addressing

⁴³Similar to Dutch and German, Russian language has two forms of address: intimate *ty* for family and close friends, and polite *vy* for official use, strangers, superiors and senior people.

each other. At that time it was a big deal: for example, university students in Russia would normally address each other using a “polite you”. Then we went to see another movie, now in the company of E. Wiersma. L. D. Landau had a somewhat spiky personality, but in Leiden he found himself among the people who genuinely and wholeheartedly liked him. He behaved nicely at the seminar, and everything went smoothly, to the pleasure of P. S. Ehrenfest, who got a very positive impression of our guest. This is how our friendship with L. D. Landau started. It continued later in Kharkiv, and beyond, when Lev Vasilievich was no longer with us.

Among other events in Leiden I remember the wedding of W. Keesom. Everybody from the lab, both from Keesom’s and de Haas’ divisions, was invited to congratulate the groom and the bride. We gathered at a specified hour and entered the house one by one. Inside, we were given a glass of champagne to clink with the newlyweds, drink, and leave, placing the glass on a special tray.

W. Keesom got interested in the possibility of inducing rain by an appropriate artificial intervention. Once he used an airplane to take many Dewar vessels with liquid air up in the sky and poured the cold fluids overboard. He succeeded in producing clouds and mist but the rainfall didn’t happen.

H. Lorentz was loved and respected by the Dutch people and became their symbol of pride. At the end of his life he mostly lived in the city of Haarlem but could be often spotted in Leiden where he delivered lectures and gave talks at the university.

Once I had a chance to meet him in the city. I was going to the doctor’s office and got attacked by the street boys who threw paper balls and harassed me. Then I saw H. Lorentz coming my way and appealed to him in French: “I am sorry Monsieur, but I am under offence from these brutes”. Lorentz raised his cane and boldly moved towards the boys, who immediately ran away.

W. de Haas was married to the daughter of H. Lorentz (she was a theoretical physicist herself). When Lorentz fell ill, everybody in the lab knew about his health condition and related their sympathy to W. de Haas. The atmosphere got more and more tense as H. Lorentz felt progressively worse. He was expected to die any day. When this happened (February 4, 1928), the city of Haarlem declared a day of mourning. The death of Lorentz was a national tragedy. His burial was on February 10,⁴⁴ and the crowd was following the hearse along the streets with street lights covered in black crape

⁴⁴Russian text gives an incorrect date of February 9.

fabrics. Not everybody was allowed to proceed to the cemetery: there were special invitations from the Lorentz family. Lev Vasilievich and I got those passes and were present at the funeral. For that occasion we had to get Lev Vasilievich a proper hat — the cap he was usually wearing would be out of place. I remember Einstein, P. Ehrenfest, and many others speaking during the ceremony.

After so many years I can't clearly remember the whole multitude of events that happened to us in Leiden. Once there was a visit of Queen Wilhelmina to the lab. She came with her daughter Juliana. A demonstration of Brownian motion had been prepared for the royal family (E. Wiersma was responsible for that). The queen was significantly late, professors W. de Haas and W. Keesom were standing at the doors waiting for her. I felt ashamed for their plight and took Lev Vasilievich away from the lab. We went home. It was a kind of ideological rebellion against two Soviet citizens being stood up by some queen. And so we missed our chance to meet a royal dignitary.

Princess Juliana studied at Leiden University. Frenny de Graaf, a friend of Tanechka Ehrenfest, told us that the princess shared a regular room with another girl, and was buying used textbooks, as every other student.

The freedom of the university atmosphere amazed me. The walls of auditoriums in which the students waited to be called for examinations were covered with drawings, cartoons, portraits, caricatures and such. This would be unimaginable at home.

In April of 1928, during the Easter holidays, we decided to have a week-long bicycle trip around Holland. This was probably an initiative of I. E. Tamm, who was in Leiden at the moment. There were four of us: Tanechka Ehrenfest, Igor Evgenievich, Lev Vasilievich and me. Every town in Holland has so much preserved history that it feels like a museum. Leiden was like that as well. Our route first crossed Holland from East to West, from Rotterdam at the sea to Arnhem near the border with Germany, and then turned south through Nijmegen to Maastricht, the southernmost city in the province of Limburg, at the border with Belgium. Overall, we had to cover about 300 km. It was decided that we should go 50 km per day. Igor Evgenievich rented, and the rest of us had their own bicycles. We were riding at an even pace, stopping for the night at small private boarding houses, eating in roadside cafes. We rode along the shores of Rhine, Waal and Maas rivers and saw several ancient cities with cathedrals and museums. The part of the trip along the flatland proceeded very smoothly. But when we turned to the south, the bicycle of Igor Evgenievich started acting up. Very soon

he lost his brakes. On the hilly roads he sped past the whole group, leaving us amazed at his reckless bravery and fearing for him getting a serious injury. Eventually he would get exhausted and ask us to have a break at the roadside.

Riding near the border we once accidentally crossed into Belgium and were stopped by the police. The three of us kept silent, while Tanechka had a conversation with the policemen in Dutch. The Russians were not allowed into Belgium. Only the emigrees with the “Nansen passports”⁴⁵ could legally go there. With Tanechka’s help we safely avoided being detected. After a night in Maastricht and a tour around its quiet streets and museums, we went back by train. The whole trip was extremely satisfying.

Same year me and Lev Vasilievich visited France in August, during the summer holidays. This time E. Wiersma helped us with planning. He advised about a good hotel in Paris, told us where to go and which seaside resort to choose. I already mentioned that we lived very modestly, and Lev Vasilievich was always content with the little we had. We took our bikes to France with us. On August 3 we arrived to Paris. The plan was to store our bikes at another train station, from where the trains to Brittany were departing. We decided to take a bike ride through the city and were lucky to be doing it in the morning, before the rush hour. At the other train station we checked the bikes into a luggage storage, and took off to see Paris.

We rented a room at the “Odeon” hotel on Place de l’Odéon, in the heart of the city, and spent eight days there. Using my modest command of French language and a guidebook, we were able to see all important and interesting places. The metro was an excellent way to move around. We went to the Louvre twice, then observed the paintings of my beloved impressionists in the Musée du Luxembourg. In Versailles we visited the palace — the fountains were unfortunately not in operation. The Notre Dame cathedral occupied us for a while, and we bought a ton of postcards with its views. We climbed the Eiffel tower. We visited Casino de Paris, and for the first time in our lives experienced a variety show. We saw French people having fun in a night club. Walking tirelessly the whole day we saw Les Invalides with the grave of Napoleon, where his heart is buried, the Sorbonne, and the Panthéon.

Following Wiersma’s advice, we continued to the seaside at the Bay of Biscay. The train took us to Vannes, from where we reached a small Brittany

⁴⁵https://en.wikipedia.org/wiki/Nansen_passport

town of Saint-Gildas.⁴⁶ This was the cheapest place on the seashore. We rented a room in a boarding hotel located in an old monastery. Next to us was a 11-th or 12-th century church, an ancient round chapel, and the Saint-Gildas convent. The legend was that Saint Gildas came to this place in 6-th century by the sea, sailing a stone trough, like Abbot Maël from Anatol France's novel. The trough could be viewed in a grotto near the sea. Nearby, a stone staircase descended to the spring of St. Gildas. Our stay overlapped with the St. Gildas holiday. We observed a festive procession of monks and nuns with an image of the saint's head, and watched the celebrations.

Using the Brittany guidebook we went out for short bike tours. Thus we spent two weeks in Saint-Gildas, and then left for a five-day bike trip south,⁴⁷ riding along the shore. In Quimper we observed and photographed one of the prettiest cathedrals of Brittany. In Concarneau there were remains of a fortress with a tower, and a 14-th century cathedral.

Lev Vasilievich was also much interested in prehistoric giant stone structures: dolmens, menhirs, and stone alignments of Carnac. We visited the locations of those monuments. Some menhirs and domens can be found between Concarneau and Pont Aven. But the most famous surviving dolmens are further south, near Carnac. We went there to see them, and this was the last stop on our trip.

We always wanted to visit England. P. L. Kapitza sent us invitations to Cambridge. But such trip would be too expensive for us to afford.

Next year, in 1929, we spent our summer holidays in Germany. First, we went to Cologne, and then boarded a steamship to sail along the Rhine to Mainz. The stop in Cologne was quite long. We took our time to see the great Cathedral that encapsulates all German Gothic architecture, and had been under construction until the middle of the 19-th century. We had an automobile tour around the city. At night we went to watch the city lights, marveling at illuminated buildings, bridges, and embankment. We then got steamboat tickets and sailed along the Rhine. We didn't try to remember the names of the multitude of castles that could be seen from the ship on the nearby hilltops. The universally known Lorelei rock was an exception. In Mainz we inspected the embankment which reminded us of the Neva embankment at home. We continued by train to Worms, Speyer, and

⁴⁶<https://en.wikipedia.org/wiki/Saint-Gildas-de-Rhuys>

⁴⁷The Russian text is not very clear here. Most probably they somehow first got North from St. Gildas, and then returned by bike.

Heidelberg. These are wonderful medieval towns with Roman cathedrals. We stayed longer in Heidelberg, inspecting the university built in the 14-th century, the ruins of the castle of the same period, and the old town. At the train station we studied the timetable and saw a train to Hirschhorn-am-Neckar. We liked the name, and on an impulse decided to spend the rest of our holidays there.

When the time to return to Leiden came, we counted the money left and realized that we can afford to return by air. This seemed to be a thrilling opportunity — we never had a chance to fly before. If only I knew how seasick will I get on the plane! The flight from Cologne to Essen was just a half of an hour. We were ushered to a four-seater plane where we were the only two passengers. The pilot was willing to give us some time to take pictures in front of the aircraft. As we took off, the turbulence hit. The plane was jumping up and down, and I got immediately sick. Lev Vasilievich, as a true yachtsman, was all right. In Essen we changed to a larger, 12-seater plane to Amsterdam. This flight was quieter but I was still feeling bad. It took me three days in Leiden to get over the experience. And that was the end our last journey abroad...

As I have noted before, Lev Vasilievich had to make regular trips to Berlin to extend his visa.⁴⁸ In the spring of 1930 he was told that it is time to return home.

W. de Haas and W. Keesom were certain that after his return to Russia Lev Vasilievich will continue working on low temperature physics, and will be given a lab to run. They pledged to help us in any way they can, and later kept their promises. Their sentiments towards Lev Vasilievich were, of course, based on his extraordinary experimental talent. Lev Vasilievich understood the workings of everything. He had a feeling of machinery and a deep knowledge of its operation. I am still amazed by his energy, determination, and clear understanding of what had to be done. I do not know where and how he got this knowledge. It was clear, however, that now he had chosen the direction of his future research career and took ownership of his field. His work at Leiden played a tremendously important role in shaping him as a physicist.

In the summer of 1930 we left the hospitable Leiden.

⁴⁸Here Trapeznikova means the Soviet exit visa, a government permission to stay abroad that any Soviet citizen had to obtain to leave the home country.

While still in Leiden, Lev Vasilievich got an offer from I. V. Obreimov to come to Kharkiv to work in the newly established UFTI,⁴⁹ where Obreimov was a director. I didn't want to leave Leningrad, and Lev Vasilievich tried to downplay the importance of the choices that had to be made two years in the future. When we were returning from Leiden, no decision was yet made.

However, back in Leningrad we found that the room in the apartment of our friends A. V. Timoreva and S. E. Frisch, where we lived before going abroad, was not available any longer. Aleksandra Vasilievna rented another room for us. It was in the same section of the same building, yet for me living not in the same flat with Aleksandra Vasilievna seemed as bad as being in a different city. Lev Vasilievich really wanted to go to Kharkiv. There was no official business to hold me in Leningrad: the term of my graduate program ended, and no formal connection with the university existed any longer. Both of us were formally on leave from PhysTech, so getting a transfer to Kharkiv presented no problem. I suggested that we move there.

Lev Vasilievich was very happy to hear this. He got some salary advance and received the travel money, which we used to buy furniture and ship it to Kharkiv. Then we traveled there ourselves.

On August 15, 1930, Lev Vasilievich was hired by UFTI as a "senior physicist". A week later we went to Odesa for the All-Union physics congress. The congress was attended by many foreigners. We already met W. Pauli in Leiden. Now Lev Vasilievich got to know R. Peierls⁵⁰ and F. Simon.⁵¹ The latter attended with his wife. For us the congress was a break before the new start in Kharkiv, and a great opportunity to catch up with people we didn't see for a while. A. V. Shubnikov was there. People from Leningrad included our professors V. R. Bursian and his wife, and P. I. Lukirskii. There was also a classmate of L. D. Landau from Leningrad, E. N. Kanegisser, a very lively and witty young woman. She wrote short verses, mostly humorous. The piece dedicated to A. F. Ioffe said⁵²

When you're famous, rich and honored
Everything had worked for you
Stroll through sunny Barcelona

⁴⁹See footnote 3 on p.1.

⁵⁰Rudolf Ernst Peierls, 1907 - 1995. https://en.wikipedia.org/wiki/Rudolf_Peierls

⁵¹Francis Simon, 1893 - 1956. https://en.wikipedia.org/wiki/Francis_Simon

⁵²Verses are translated with an attempt to be true to the tone. They do not follow every detail of the original. No claims of poetic quality are made for the translations.

That's the thing you ought to do.

At the congress she met R. Peierls and they got married. The event was promptly described in a stanza

No fear, skies are clear
Ciao, my looking days
When you hear "physics congress"
Think "a brides parade".

From Odessa we took a boat to Batumi and further to Sukhumi. We then reached Tbilisi by the Georgian Military Road,⁵³ and returned home from there.

A lot of staff members in Kharkiv were known to us back from Leningrad. Most of them either worked in PhysTech or studied at the Leningrad Polytechnical. I. V. Obreimov was the director of the institute. He had his own department with V. S. Gorsky, N. A. Brilliantov, A. F. Prikhotko and others. Among the theorists there were L. V. Rosenkevich and L. D. Landau who arrived in 1932. We also had A. K. Valter, K. D. Sinelnikov, and A. I. Leipunski. Leipunski was a wonderful person and a great physicist, loved by everybody.

Coming to Kharkiv we thought that I. V. Obreimov will give Lev Vasilievich the position of the Cryogenic Lab director. But that did not happen, and it was a big blow. There was a liquid oxygen machine already installed at the Institute (I remember I. V. Obreimov showing off with two buckets of liquid oxygen on a crossbeam). But the Cryogenic Laboratory was not officially organized. Lev Vasilievich with his low temperatures did not fit anywhere. He was not even assigned an office. Trying to do at least something he started working with ice — the coldest object available to him — and built some kind of a shed on the roof for these experiments. As far as I can see today, all this happened because I. V. Obreimov extended an offer for the lab director position to P. L. Kapitza, and was waiting for his response.

Little by little, Lev Vasilievich got depressed. He stopped going to the Institute and would stay in bed for the whole day reading fiction, mostly Lermontov. I would be coming home at night and finding him laying in

⁵³http://en.wikipedia.org/wiki/Georgian_Military_Road

bed in the dark. No light. After such episodes I even feared that he would commit suicide.

As for me, I got a position with K. D. Sinelnikov and A. K. Valter. They were studying electric breakdown of rock salt in the pulsed regime. A. K. Valter was known to me back from Leningrad, but I never met K. D. Sinelnikov before coming to Kharkiv. This work did not interest me too much. I knew little about the equipment and the experimental method, and nobody would explain me the details. Later A. K. Valter and K. D. Sinelnikov had a number of discussion amongst themselves and published two papers. I was included as an author along with I. V. Kurchatov and L. V. Rosenkevich.

A year after our arrival the Institute got a shipment of Hook's hydrogen liquifiers from Holland. However, there were no blueprints coming with them. Nobody, except for Lev Vasilievich, could possibly assemble these machines. He was very talented technologically. In 1931 A. I. Leipunski pushed the decision to appoint him a director of the Cryogenic Lab. As soon as Lev Vasilievich started working in this new capacity, he came back to life. The first goal was to install the hydrogen machines. Lev Vasilievich wrote to Leiden to W. de Haas and W. Keesom asking for help in obtaining the blueprints. At the same time he got busy trying to assemble the equipment. The blueprints eventually arrived, Lev Vasilievich figured out everything, the liquifiers were assembled and installed. The small one became operational first, and then came the big one, producing 12 liters of liquid hydrogen per hour. Things got moving.

Lev Vasilievich used all his vast expertise, acquired in Leiden, to build the UFTI Cryogenic Lab. There were many successes on this route, which, I think, are still appreciated at the institute. First thing he did was to organize the workshops. In contrast with P. L. Kapitza, Lev Vasilievich never used the lathe himself and didn't think it is a required skill. He hired many skilled workers for the shop. This was a trademark of the lab in Kharkiv: the number of supporting staff members far exceeded the number of scientists, and there were zero delays in fulfilling orders.

The large mechanical workshop was headed by I. P. Korolev, an outstanding mechanic and a wonderful person. There were 12 machines for different purposes in the shop.⁵⁴ Among them were large lathes that could machine a

⁵⁴The book of A. Weissberg provides details on what it took to obtain these advanced machines from the Soviet authorities (Alexander Weissberg-Cybulsk "Hexensabbat: Russland im Schmelztiegel der Säuberungen", Frankfurt am Main, 1951; English translation "The Accused", New York, 1951).

compressor shaft, a press for making copper spheres for metal Dewars, etc. V. I. Kostenets was responsible for Dewar production. I. P. Korolev rarely asked for fully prepared formal drawings of the components to be made. It was enough to talk to Ivan Pavlovich, explain the purpose and describe the materials to be used, and he would go on from that. I. P. Korolev had a free hand to hire other mechanics. This way we got V. I. Bogatov and A. I. Sudovtsev.

There was also a glass workshop, ran by E. V. Petushkov and his associates. They didn't require any paperwork at all. The workshop had a large stock of glass pipes and cylindrical glass Dewars. If something broke in the lab, Mr. Zharkov was coming and fixing it right on the spot.

There was a stockroom where one could find everything necessary—no need to search and ask in other departments. This made our work so much easier.

V. I. Bogatov and A. I. Sudovtsev were also running the hydrogen liquifier machine. They worked hard and were very reliable. Lev Vasilievich was of highest opinion on both of them. He knew the machine operation very well too. In the event of a breakdown of compressor or liquifier we often opted to wait for the opinion of “the boss himself”.

Helium machine proved to be a source of many problems. Hook declined selling us a Dutch liquifier, so the institute purchased one from Meissner. The shipment was received but we could not get it operational. Meissner came with his own mechanic but was unable to start it either. They were upset and left Kharkiv without success. A. I. Sudovtsev was eventually charged with the task of finding out the source of the problem. He tinkered with the machine for a long while and finally it started working. The helium output was really meager, only 1.5 liters per hour. Our work plans were often derailed when the liquifier was down. The Simon's liquifier was much more reliable. Everyone could get enough helium for their cryostat. The only downside was that the required amounts were normally accumulated by the end of the day, so experiments had to be started late at night.

The first staff member of the lab was Yu. N. Riabinin. He arrived from Leningrad even before us. Then V. I. Khotkevych joined us. He was a student doing his diploma research project. I already mentioned I. P. Korolev, V. I. Bogatov, and A. I. Sudovtsev. After about half a year I joined the Cryogenic Lab as well. I was so happy when Lev Vasilievich offered me to transfer to his lab. First, I was afraid he will tease me a lot: for example, he used to say that I have quite good memory for numbers but it only works for

the digits after the decimal point. But everything turned out to be alright, and his attitude was perfect. He paid a lot of attention to my work, always helping when needed. And by that time I was not bad at lab work myself. I paid a lot of attention to details, and I think he liked it.

M. F. Fedorova came from Leningrad. After her, G. D. Shepelev joined—I think he was originally from Kharkiv. N. S. Rudenko, and a little later N. M. Tsin and E. S. Borovik, came from Kharkiv University.

In 1932 the Germans arrived. These were Martin and Barbara Ruhemanns,⁵⁵ and a bit later A. Weissberg and F. Steckel.⁵⁶ F. Houtermans⁵⁷ came with them as well. He was not a member of the Cryogenic Lab but Lev Vasiliveich and him had joint publications (with I. V. Kurchatov as another co-author). The nuclear physics lab was joined by Prof. F. Lange⁵⁸ and his assistant Kompeters,⁵⁹ who arrived with his wife. Martin Ruhemann was a really nice person. Every day he would learn three new words in Russian. He started working on two-component mixtures, and his wife Barbara worked on X-rays.

Other people in the Cryogenic Lab were A. I. Lichter, S. A. Zlunitsyn, N. Dorogoi. S. E. Bressler was coming for short visits. G. A. Miliutin started working in the lab while he was still a student. I remember the day when he was due to defend his diploma work. We were seriously afraid that he will not come to his own defence out of fear of public speaking. So we escorted him to the Technology Institute: me holding his hand on one side and Lev

⁵⁵<https://www.geni.com/people/Martin-Ruhemann/6000000026436688747>, see also books by A. Weissberg and other memoirs. There exists a paper about Martin's father: M. D. Saltzman, "Is science a brotherhood? The case of Siegfried Ruhemann", Bull. Hist. Chem. vol. 25, no. 2, p. 116 (2000), <https://publications.ceu.edu/sites/default/files/publications/hall-et-al-ukrainian-physics-2010.pdf>

⁵⁶from "The Life, Science and Times of Lev Vasilevich Shubnikov: Pioneer of Soviet..." by L. J. Reinders, p. 274: "Practically nothing is known about this person. His German name is probably F.A. Steckel. There exist a few papers with an author whose name is variously spelled: F.A. Shtekkel and N.M. Tsin, i.e. Natalja Mironovna Tsin, a collaborator from Shubnikov's group (Determination of the Composition Diagram for the Liquid-Gas System Methane-Nitrogen-Hydrogen, Journal of Chemical Industry (U.S.S.R.) 16 (1939) 24-28), as well as F. Schtekkel (J. Tech. Phys. U.S.S.R. 6 (1936) 137-140) and F. Steckel in Phys. Z. Sow. 8 (1935) 337-341. He also worked with Francis Simon (F. Simon, F. Steckel, Zs. physik. Chem. Bodensteinband (1931) 737).

⁵⁷https://en.wikipedia.org/wiki/Fritz_Houtermans

⁵⁸Russian text gives incorrect initials: K. A. Lange. [https://de.wikipedia.org/wiki/Fritz_Lange_\(Physiker\)](https://de.wikipedia.org/wiki/Fritz_Lange_(Physiker))

⁵⁹other sources in Russian give his name as G. F. Kohn-Peters.

Vasilievich on the other. We released him right before the defence and he passed successfully.

In 1935 Lev Vasilievich made a trip to Leningrad PhysTech and invited three students to do their diploma work at the Cryogenic Lab. These were N. E. Alekseevskii, A. K. Kikoin, and S. S. Shalyt. After the defence they agreed to stay in Kharkiv. Nikolai Evgenievich⁶⁰ had a markedly grumpy personality. When experiments did not go well it was better to avoid talking to him.

In addition to people mentioned above, the lab employed Popov, Kashanov, Gusak,⁶¹ and Maslov during various periods of time.

E. Wiersma provided a lot of help to the lab. Every year, until 1935, he visited Kharkiv and brought a million of things without which we would not be able to go by. After learning about the new helium machine invented by F. Simon, he immediately sent us a sketch of its drawings. His detailed letter from Leiden arrived even before P. Ehrenfest inquired whether we would like to receive this information.

We didn't have thermometers for low temperature measurements. These were made of platinum wire wound on the porcelain cylinders and annealed at high temperatures. Thermometers needed to be calibrated too. We didn't have sufficiently pure platinum and the porcelain was dirty as well, thus leading to further contamination during the annealing process. The only thing we had was a properly calibrated platinum thermometer Pt-38 that W. Keesom gave us as a present. E. Wiersma was bringing pure platinum wire and special porcelain cylinders from Leiden, so we could make our own thermometers.

Cryogenic liquids required Dewars for their handling. When conventional tin was used to solder metal Dewars, it cracked at low temperatures leading to equipment malfunctioning. E. Wiersma brought large quantities of special soldering alloy which could withstand the extreme cooling.

⁶⁰N. E. Alekseevskii, <https://iopscience.iop.org/article/10.3367/UFNe.0183.201302g.0207/pdf>

⁶¹<https://doi.org/10.1098/rsnr.2009.0038> Notes and Records, The Royal Society Journal of the History of Science, Volume 64, Issue 1, pp 43-57 (2010) "... M. G. Evans (FRS 1947), first at Leeds and then at Manchester University, decided to build an apparatus to measure the isothermal coefficient in the late 1940s. He was interested in intermolecular forces, but his choice of this technique may have arisen from his acquaintanceship with Martin Ruhemann, an authority on gas liquefaction [53]. Ruhemann had worked at Kharkov with I. M. Gusak before the war, and the design of Evans's apparatus owed much to Gusak's work."

E. Wiersma brought us many things that were not available in the Soviet Union. He brought a turn counter used to wind the transformers. We had poor quality weights for analytic scales—so he brought the weights. We could not find a band-aid tape, and he even brought the tape with him. Anything we didn't have he would bring, if at all possible. Of course, all that happened with a blessing of W. de Haas, who followed on the promises of help he gave us in Leiden. Sometimes he would send things with Ehrenfest who visited Kharkiv on several occasions. Wiersma helped a lot with the design of our magnets that were similar to those in Leiden. Magnet drawings and winding calculations were often prepared by him. E. Wiersma's help to the lab was very substantial, although not many people realize it now.

The Cryogenic Lab occupied several rooms in a separate structure connected by a corridor to the main lab building. The roof and the walls of the latter were deliberately made weak. This was a precaution to decrease the damage from a possible explosion of hydrogen gas. Similar to how it was done in Leiden, hydrogen and other gases were collected in every room and directed to gas holders through a system of pipes. Only nitrogen was released into the atmosphere. (In the institute of P. L. Kapitza only helium was collected, even though its construction happened later). Unlike in Leiden, we didn't have staff for unskilled work. So we had to fill the Dewars with cryo-liquids and move them around ourselves. We often worked at night. When this happened, someone from the liquefaction plant would also stay to pump the gases from holders to the tanks. In addition, there was someone on duty to inspect everything, make sure that all gas holders are in good order, and check all valves.

Strong magnetic fields, up to 30 kGs, could be generated with three big magnets, similar to those in Leiden. Nobody else in Soviet Union had such magnets at their disposal.

It was strictly forbidden to smoke in the Cryogenic Lab. Lev Vasilievich was very serious about fire security and tough on the violators of the rules. Anybody smoking in the building would be most certainly fired from the job.

Even after coming home from work Lev Vasilievich was preoccupied with the lab business. The windows of our apartment were overlooking the lab. If Lev Vasilivich saw a light in one of the workrooms, he would send me along with our dog named Photon to check what's going on.

One of the walls in the lab had a niche near a big valve. I cannot recall now who gave me the idea, but at some point I made a clay figurine of a woman, which was dubbed Saint Cryogena, the patron of Dewars. The saint

was placed into a niche, and a small bowl was hanged on the valve next to her. Before starting measurements one was supposed to place money into the bowl to ensure the success of experiments. As the bowl filled with coins, the money was collected and used to buy sweets for the lab tea party. Later Yu. N. Riabinin found a figurine of a dog that resembled our Photon, and placed it into the niche as well. Then it became clear to all of us who were the Cryogena and her keeper.

Our lab was the first in the Soviet Union to study superconductors. Measurements were mostly done at night, and Lev Vasilivich was always present at those “night vigils”, as we called them. I petitioned the Directors office and secured a small allowance to buy salami, bread, butter and cookies for people working at night. With these funds I was able to feed the vigils’ participants.

One of the first result of great importance obtained in the lab was the discovery of a phenomenon that was subsequently named the “Meissner effect” (Lev Vasilievich and Yu. N. Riabinin published their paper very shortly after Meissner and Oxenfeld). Lev Vasilievich perfectly understood the importance of this result but was not particularly distressed about being scooped. He said “So what? We are in a good company!”

M. F. Fedorova and G. D. Shepelev were calibrating thermometers for intermediate temperatures. For these purposes they were building a so-called “gas flow cryostat”. N. S. Rudenko studied viscosities of liquids.

The paper of B. G. Lazarev and Lev Vasilievich on the magnetic moment of proton became a classic work.

Of course, I remember best the work I was doing myself. First, I tried to organize measurements of sound speed in NO using Kund’s method. The goal was to build an apparatus to measure the heat capacity of the NO gas at low temperatures. But my sound sensor didn’t work well, and I could not excite standing waves. Radio equipment was always my weak point. Then Lev Vasilievich suggested me to try measuring heat capacity of water-free salts of transition metals: FeCl_2 , CrCl_3 , CoCl_2 , and NiCl_2 . Temperature dependencies of magnetic susceptibility for those salts were measured by H. Woltjer and E. Wiersma, and it was shown that they follow a Curie-Weiss law above the Curie point but do not become ferromagnetic below that point. The salt’s magnetic susceptibility below the Curie point was still field-dependent, especially for FeCl_2 and CrCl_2 . To understand the nature of such anomaly, which was tentatively ascribed to the existence of molecular fields, we suggested measuring the temperature dependence of heat capacity.

I managed to get the salts from the Radium Institute in Leningrad that was directed by V. G. Khlopin. A. A. Greenberg, a Member of the Academy working at the Radium Institute, agreed to prepare the compounds and test their purity. He was assisted by V. Shulman in this work.

Heat capacity measurements are known to be time-consuming and difficult. To perform them successfully one has to be familiar with vacuum techniques, be quick when working with the compensator, and exercise extreme care in calorimeter assembly. I had everything needed for this work. By that time I learned what it takes to accurately measure the temperature changes of the salt. Lev Vasilievich and I designed a calorimeter that was best fitted for the experimental conditions and took into account the properties of the salts. This design proved to be very successful. First, I worked with the assistance of Misha Sternberg, and later, I think in 1933, we were joined by Zhora⁶² Miliutin.

First measurements were performed on FeCl_2 . They showed a strong heat capacity anomaly near the temperature that was determined to be the Curie point by H. Woltjer and E. Wiersma via extrapolation of magnetic data. The increasing branch of the curve was not smooth but had a visible hump. L. D. Landau grilled me whether I am sure that the hump was real. Of course I was sure. Later S. S. Shalyt informed me that all singularities seen in heat capacity are also present on the magnetic susceptibility curves. Overall, our measurements were the first of a kind in the Soviet Union, both in the field of salts, and more generally, in the field of low-temperature calorimetry.

The last experiments conducted by me were the measurements of solid methane heat capacity under pressure. They were performed together with G. A. Miliutin. The topic was suggested by Lev Vasilievich. L. D. Landau was also much interested in it. Construction of high pressure calorimeter was discussed with Lev Vasilievich. Condensation of methane under pressure required a special capillary. We obtained it from Martin Ruhemann—he had a suitable high pressure capillary manufactured by a Swedish company “Akthe Bola”. N. S. Rudenko produced enough clean methane for our measurements.

When the apparatus was ready, we started our measurements, which took a long time. After achieving a successful condensation of methane, we had to measure for about two weeks—round the clock. I had two assistants: one was working during the day, and another at night time. These were Misha Sternberg and another young man, whose name I can't remember

⁶²Diminutive for Georgiy

now. Once there was an accident: my capillary burst, and the methane under pressure escaped into the vacuum system. The whole setup exploded but fortunately there was no fire, only a loud cracking sound. After this accident A. I. Leipunski issued an order requiring everyone to put nylon nets on the Dewars (we didn't do it before). Lev Vasilievich was officially reprimanded, and me as well, of course. After this case he told me: "If you see something bursting—just run away!" And so at some later day, when I and Misha Sternberg were calibrating a platinum thermometer at high pressure, I suddenly saw a rubber band on a Dewar starting to swell. I commanded: "Misha, we've got to run!" And he answered in his phlegmatic low voice: "Olga Nikolaevna, there is no need to make a fuss."

The work on methane was very good. It was clean and well executed. The methane we used was very pure. And the calorimeter design was really simple: a short cylinder cavity was drilled in an iron piece with thick walls. Its diameter gradually decreased towards the upper end, where a capillary was welded in. The lower end was closed by a metal cork with a thread that could be screwed into the cylinder. The heater and the platinum thermometer were mounted on the cork. High pressure, up to 2000 atmospheres, was created by a series of thick-walled cylinders separated by valves. The last cylinder was filled with helium at a 150 atmosphere pressure. All but the last cylinder were cooled by liquid nitrogen. The valves between the cylinders were initially kept open. Then the valve between the last and the last but one cylinder was closed, and the last but one cylinder was heated up. The procedure was repeated sequentially, each time increasing the pressure in the cylinders downstream. This way helium pressure was amplified to 2000 atm. For safety the whole system of cylinders was separated from the rest of the room by a thick wall of armored steel (yet our volunteers were still entering the restricted space to pour liquid nitrogen into the Dewars).

Our results exhibited two clear and narrow maxima of heat capacity. Had they been published right away, no one would have doubted the existence of two phase transitions in methane, and there would be no need to involve various indirect methods of low sensitivity. This was a very good work, nobody had repeated it, and for a long time it remained the best measurement of methane heat capacity under pressure. It was almost ready when in 1937

⁶³Here Trapeznikova assumes that any (Soviet) reader will understand that the work of a person fired under political implications was doomed to be censored, even if it was technical in its nature.

I was fired from the Cryogenic Lab. When this happened, I was almost sure that our results will be never published.⁶³ However, in 1939 G. A. Miliutin took the risk of preparing a brief report and publishing it in “Nature” under both our names. I am grateful to him for making this hard choice under the circumstances of the time. This work has special place in my heart, and I think it is my best paper. I followed the literature on methane until 1966, specifically on the second maximum. It has to be said that even now the nature of the second phase transition is not unambiguously determined.

We also measured heat capacity for NH_4Cl and NH_4Br under pressure. This work was started by S. A. Zlunitsyn with my advisement.

The Cryogenic Lab held regular seminars that were officially named “meetings of the collective”. They were very informal. Everyone could freely stop the speaker and ask a question. There were no restrictions on the types of questions. The speaker was given a chance to answer, and if he was unable to do so a general discussion would follow, usually led by Lev Vasilievich and M. Ruhemann. We had invited speakers as well. I recall how I. K. Kikoin gave a talk on the measurements of Einstein-de Haas effect at low temperatures which he planned to conduct on our equipment. I was responsible for preparing the minutes of the “meetings of the collective”. They included the talk titles, the names of the speakers, and the list of those present in the audience. One of the notebooks with these minutes survived the time. It has a number of humorous inscriptions by Riabinin, who loved attaching funny nicknames to everyone in the lab.

Most of seminar presentations were journal club talks. There was a need to know foreign languages to read the literature. Several of us at the institute—A. F. Prikhotko, Lev Vasilievich, Yu. N. Riabinin, and I—were learning English from Mr. Champagnier, a Canadian from Quebeck.

It seems to me that all papers from our lab were written by Lev Vasilievich. At least this is how it worked in my case. He would ask me to write a draft, I would give it to him, and he would completely re-write it himself.

Administrative duties were not a big burden for Lev Vasilievich. He had very good relationship with A. I. Leipunski, and it was easy to take care of all official matters. Lev Vasilievich found ways to obtain funding and necessary materials for the lab. For example, he secured funds for the construction of three big magnets. I recall the day when L. F. Vereschagin hauled in their cores from a metal works plant. We had a big celebration at the lab, for which I drew a portrait of Leonid Fedorovich and put it up on a wall in the corridor.

Lev Vasilievich acted as a single scientific advisor for every experiment done in the lab and personally participated in measurements every day. This required constant dedication and hard work. He would usually come to the lab late in the morning and stayed for the whole day. He introduced green report books for everyone, just like it was done in Leiden. He frequented the library, where he read a lot and participated in library planning by composing the lists of domestic and foreign journals we should be subscribed to.

Lev Vasilievich was not just a brilliant day-to-day manager. He had a clear vision of the long-term research program. A special notebook of his was reserved for collecting the most interesting and up-to-date ideas. One can see in it how new records were appearing in different types of ink, as the list of research topics was growing over time. He constantly thought about new subjects for the journal club talks, and was choosing papers to review.

Lev Vasilievich was a true master of the Cryogenic Lab. Nevertheless, if somebody suggested an interesting idea he never opposed it. He was very supportive of young people. Friendly with everyone, never applying pressure on people to make them follow his ways. But also vigilantly identifying and preventing mistakes of the personnel and demanding dedication on the part of subordinates. No matter how busy he was, he never looked grim, tired, irritated or downright exhausted. You could always see him serious but upbeat, with healthy face color and resolute walk. His posture was markedly upright, and from aside one could take him as a bit self-important. If the “night vigils” in the lab were not successful, he would return home singing his favorite mellifluous Ukrainian songs.

The Cryogenic Lab was like a child for Lev Vasilievich. He taught the personnel and led people during the equipment installation phase. He provided everything necessary for productive work. He established a cadre of technical specialists. Most importantly, he built a great team of physicists and set it to work on a well-thought-out and really broad plan of scientific research.

We were aware of the uniqueness of our workplace, loved the lab and constantly tried to be ahead of the curve. There was a persistent feeling of joy coming from the spirit of creation and everyday invention. All of us in the lab worked with great enthusiasm and felt surrounded by friends who are always ready to help.

One of the lucent memories from the years in Kharkiv is our friendship with Lev Davidovich Landau. He arrived from Leningrad in 1932, after falling out with A. F. Ioffe. He was an amazing person. Landau seemed

to know solutions to all problems before doing any calculations. Later his derivations always confirmed the intuitive understanding he had in the first place. He worked not at a desk but reclining on a sofa. He had this gift: you could ask him any physics question, and he would start thinking and be immediately ready for a deep discussion. He was the only theorist of this kind I knew (maybe Ya. I. Frenkel was somewhat similar). Because of all that, experimentalists valued L. D. Landau very high. You could ask him anything, no matter what was your field. He was a true universalist.

L. D. Landau immediately surrounded himself with students. Among them were E. M. Lifshits, M. Korets, Gogoberidze Jr. But his most loved student was I. Ya. Pomeranchuk, who arrived from Leningrad together with the trio invited by Lev Vasilievich—N. E. Alekseevskii, A. K. Kikoin, and S. S. Shalyt. I. Ya. Pomeranchuk was an extremely shy person, never went out, never wanted to meet other people. L. D. Landau was dragging him everywhere. The theorists had their offices at the top floor of the laboratory building. They were talking to each other so loud that we could hear them everywhere.

Our friendship with L. D. Landau started in Leiden and continued in Kharkiv. We often spent time together. L. D. Landau would pick me up at the lab and we would go to our place to have dinner. The institute cafe mostly served galushki,⁶⁴ but we had a house help who cooked very well. It was important for Dau who had stomach problems. He engaged in long conversations with Lev Vasilievich, mostly about physics. L. D. Landau didn't like music. In general, we rarely attended concert or theater plays in Kharkiv.

During his last years in Kharkiv, Lev Vasilievich served as a department chair at the university. Him and L. D. Landau were thinking about the ways to change the school- and university-level education. L. D. Landau contemplated writing physics and math textbooks. In his view, physicists were not supposed to study existence theorems but had to practice solving differential equations, taking integrals, and doing other useful things. Sometimes conversations veered away from physics. Lev Vasilievich was not a puritan, and it was important for L. D. Landau. ??? We—L. D. Landau, Lev Vasilievich, and I—talked a lot and discussed many things: the future, the nonsense of today, and the weighty matters. It was decided that I should defend a

⁶⁴Ukrainian version of dumplings—an embodiment of peasant food.

Doctor thesis⁶⁵ in 1939, and it should include the work on heat capacity of salts, methane, and other compounds (NH_4Cl , NH_4Br) under pressure. These measurements were discussed with L. D. Landau and we all agreed that it is a good topic.

It is commonly stated that the work on heat capacity of salts was stimulated by L. D. Landau. This is not really true. Those activities were a continuation of our work in Leiden. But methane measurements were extensively discussed with L. D. Landau. There was an idea that the heat capacity maximum is related to rotation. Experiments on methane were suggested by Lev Vasilievich but we were showing the results to L. D. Landau as well, especially when the second maximum was observed.

L. D. Landau had a one bedroom apartment on the second floor of the new living quarters of the institute. He was then courting his future wife, Kora Drobantseva, and busily preparing the place for her to move in. “Setting up a harem”, as we joked with Lev Vasilievich. I helped him to buy a mattress and a set of pillows at the market. L. D. Landau painted the floor, the simple nightstands and stools that I also helped him buying, the apartment door. We were arranging the lighting in his flat—L. D. Landau was totally preoccupied with that. Lev Vasilievich just chuckled, but L. D. Landau was putting a lot of energy to be ready for Kora’s arrival. A spontaneous support group—me, Misha Koretz, and L. D. Landau himself—emerged. We were developing whole scripts for Landau’s conversations with Kora. I was considered a useful advisor from the women’s perspective. M. Koretz, as the most cunning person of us, was responsible for developing the dialogues. L. D. Landau listened carefully trying to learn his part. All this was in vain, of course. Later Kora told me laughingly that she saw it all through and derailed all attempts to stick to the script. We got to be friends with her as well.

Kharkiv was pretty often visited by our friends from Leiden: P. Ehrenfest and E. Wiersma. P. Ehrenfest usually stayed at Obreimov’s place but came to eat with us. During his visits to Kharkiv he was absolutely happy. But then he would go back and very soon get depressed again. In his letters to us he wrote that it is hard for him to stay in the same place for more than a few days. Everybody loved him in Leiden, and he was not able to live his life there. I. V. Obreimov really wanted to move Ehrenfest to Kharkiv. An offer was generated for Ehrenfest to lecture in Kharkiv, or elsewhere in the

⁶⁵Habilitation thesis. See also footnote 98 on p.54

Soviet Union, concurrently with his position in Leiden. He did not come, and everybody understood that he never will.

Pawel Sigizmundovich thought about helping us all the time. Once our mutual friend, Frenny de Graaf, came to see Tanechka Ehrenfest in Leiden and forgot her coat in the house. Pawel Sigizmundovich, out of best intentions, brought this coat to Kharkiv and gave it to me as a present. A while later Frenny de Graaf was visiting Moscow. She had a philology degree from Leiden University and specialized in Yesenin.⁶⁶ When visiting us after Moscow she was completely surprised to find her coat hanging in the apartment.

E. Wiersma was coming every year using his own vacation time. His last visit was in August of 1935. He mostly just wanted to see us. Once we made an experiment together with him, measuring the absorption spectrum of praseodymium, but it was never published.

E. Wiersma valued Lev Vasilievich very highly. Back in Leiden he once said that if Lev Vasilievich were to be drafted to the army he would volunteer to be his replacement (such things were allowed in Holland).

E. Wiersma did not send us just lab materials. He mailed us parcels with cheese and thought that we were able to stretch it for a while. Then, during his visit, he witnessed how cheese was cut in thick slices—to his complete shock. He went to Torgsin,⁶⁷ bought a whole head of cheese, and ate it up cutting thick. After that he claimed to understand for the first time in his life that this is the way cheese is supposed to be consumed—not in the form of transparent tasteless slices we had in Leiden.

E. Wiersma had strong desire to come to Kharkiv to work with us. He sold all his possessions and was ready to move, but his visa was denied. (This was already after the death of P. S. Ehrenfest).

The institute was visited by many famous physicists. In 1934 P. L. Kapitza stopped for two days on his way to Moscow from vacations in Crimea.

⁶⁶Russian poet in the beginning of 20-th century. https://en.wikipedia.org/wiki/Sergei_Yesenin

⁶⁷Since the “collectivization” of peasantry in 1929, there were constant shortages of food in the Soviet Union. Prices were fixed by the government, but the stores were empty most of the time. The government set up a chain of Torgsin stores (short for *Torgovlia s inostrancami*, retail for foreigners) where hard currency or precious metals and gems could be used to buy food. The stores were mostly used by those fortunate locals who had some jewelry left in their possession from the old days.

He mentioned that V. M. Molotov⁶⁸ hinted to him that it would be good to return to the USSR. Kapitza didn't think it was anything serious but it turned out that this year he was not allowed to leave for UK.⁶⁹

Interactions of Lev Vasilievich and P. L. Kapitza were mostly official. Lev Vasilievich liked to talk about his ongoing research, easily shared his results and discussed his plans for the future work. Piotr Leonidovich, on the other hand, never spoke about his research before it was finished and published.

V. A. Fock often visited Kharkiv to collaborate with Boris Podolsky, an American who stayed at UFTI for several years. Fock often went for a walk with us and visited our apartment. When in Kharkiv, he usually stayed with Alex Weissberg. Igor Vasilievich Kurchatov used to visit us too. He was married to the sister of K. D. Sinelnikov, and was often seen at the institute. There was a visit by Patrick Blackett. When Irene Curie was visiting, we were introduced to her at a party at F. Houterman's place. On various occasions the institute was visited by F. Bloch, R. Peierls, and G. Placzek.

Yakov Iljich Frenkel came to give talks. He was presenting very interesting physics but his manner of speaking was complicated. His seminars were not embraced by everyone. I. E. Tamm's seminars were brilliantly successful. He always stayed in our place when visiting Kharkiv.

Our section of the institute's apartment building hosted flats for research staff. The other section had a café, a social club space, and dormitory rooms. Next door to ours was the apartment of E. V. Petushkov, a virtuoso glass-blower who is well remembered by anyone who worked at UFTI. The yard of the institute was full of trees and flower-beds. All this greenery was introduced by I. V. Obreimov during his tenure as a director.

We often had impromptu parties, drank tea and talked about the Cryogenic Lab. There were not enough chairs, so everybody was sitting on a floor carpet. L. D. Landau was a frequent visitor. Martin Ruhemann was another regular. From time to time we were visited by S. S. Shalyt, Alex Weissberg, Fritz Houtermans and his wife.

In a company of people Lev Vasilievich usually set silent with a friendly expression on his face, and smoked. He wasn't very talkative in public. Same can be said about his conduct in the lab. But at home he was a completely different person. Whenever he would return from the lab, be at 2-3 AM, he

⁶⁸Soviet communist leader, head of the government at that time.

⁶⁹Until 1934 Kapitza lived and worked in Cambridge, UK, but kept the Soviet citizenship. He was coming each summer to USSR for his vacations. In 1934 he was denied an exit visa.

always sang. He could speak in rhymes throughout the whole night. Like in the old days, he loved practical jokes and laughter, and was very happy when his tricks hit the mark. It was never boring with him. I heard that he was a great poker player.

Once a stray dog appeared in the institute yard. She had two puppies. One of them was adopted by Sinelnikovs, and we took the other one. We named him “Photon”. Not really a low-temperature name but at least physics-related. The puppy was like a tiny flower, yellow-blond, with joyful eyes. Photon grew up to be a very smart dog. He new all researchers at the Cryogenic Lab, and all of them new him.

The preferred pastime of Photon was to attend the meetings of the institute’s Academic Council. He usually sat on a chair behind Lev Vasilievich, knowing that he was loved too much to be chased away. And when Lev Vasilievich stepped up to the blackboard, Photon immediately moved to occupy his empty seat.

Photon’s favorite person was Lev Vasilievich Rosenkevich. He was lecturing at the Polytechnical Institute, and Photon would follow him all the way to the lecture hall, jumping around to get attention.⁷⁰ The students were entertained to see that, and L. V. Rosenkevich was left with a difficult task of getting their attention back to the subject of the lecture. He was a very considerate person and had hard time disciplining the students. All he could do was to take Photon out of the door, but the dog would inevitably return after a while.

In 1936 security measures at the institute were drastically ramped up. A tall masonry wall was built around the perimeter. All personnel had to carry numbered tags and hang them on a registration desk while being on-site. People were furious. I attached my tag to Photon’s collar.

People in the Cryogenic Lab were not only good colleagues. We met outside of work and spent good time together. On weekends we had hiking trips, drove to the river Donets near ESKhAR,⁷¹ went for walks in the forest extension of the city park. L. D. Landau and I often took walks through the Shevchenko garden.⁷² Vladimir Aleksandrovich Fock was joining us when visiting. Everyone would attend the demonstrations—in those days they

⁷⁰The campus of Polytechnical Institute is very close to UFTI.

⁷¹A shorthand for Electrical Station of Kharkiv Administrative Region. A coal powered electricity generation plant was built there in 1930. <https://de.wikipedia.org/wiki/Eschar>

⁷²Former university garden, named after the national poet Taras Shevchenko in 1935.

were fun.⁷³

Once we had a costume party at the institute. K. D. Sinelnikov lent his doctor's gown and cap⁷⁴ to Lev Vasilievich. L. D. Landau was wearing a pijama, with a turban made of a towel by me. He was impersonating a serpent-charmer fakir and was so popular that the first prize was awarded to him.

For a while I directed the institute's social club. We organized dancing parties. Lev Vasilievich was not very good at dancing but had a lot of enthusiasm. Him and L. D. Landau were courting the beautiful wife of L. V. Rosenkevich, Vera. This was a very friendly ritual, which did not offend anybody. Lev Vasilievich took a lot of photographs of her.

The club also staged art performances. Once we even played a part of Oscar Wild's "On the Importance of Being Earnest"—in English. Lev Vasilievich was not a big fan of theater. He played only once, and his role was to impersonate himself in a sketch depicting the life at the institute. We wrote such sketches ourselves, and no one was exempt from being ridiculed in them. Anton Karlovich Walter had a gift of composing verses. Here are his lines for Abram Fedorovich Ioffe⁷⁵

In Leningrad you were the best.
You kindled scientific interest,
So we can have no longer fun
Until our physics is number one.

Now in remote Kharkiv lands
We keep your fire in or hands,
And it is growing by the day—
Whether we study nuclei

In search of secrets of the stars,
Or in the freezing cold Dewars
We watch the helium miasma—
And turn away to work on plasma.

⁷³In USSR November 7 and May 1 where the days of people's demonstrations marking the anniversary of the 1917 Russian revolution and the Workers Day, respectively. All employees and students, starting from high school, were required to attend. By 1980s, when Trapeznikova's memoirs were recorded, it was mostly an empty ritual.

⁷⁴Sinelnikov received a Ph.D. degree from Cambridge under Rutherford. This way he had a real university gown from UK.

⁷⁵See footnote 52 on page 34.

Summers were the time of travel. We travelled through the Caucasus with our dear friends A. V. Timoreva and S. E. Frisch. Them and us met in Vladikavkaz. We were accompanied by the younger brother of Lev Vasilievich, Cyril, and our friend, Evgenia Aleksandrovna Smirnova, who was an astronomer. First we went to Tsey,⁷⁶ and then crossed the Mamison pass⁷⁷ and descended to Samgori.⁷⁸ On this route we had a night trek in full darkness, with gorgeous fireflies glowing all around us. From there we went further to Kutaisi. We hired an araba⁷⁹ to carry our packs, and Lev Vasilievich somehow managed to get a horse. He was proudly riding it, and the rest of us were jealous. Before reaching Kuatisi we were forced to do a double distance trek and cover 50 km. in a single day. This happened because a tourist base camp in the middle of the trek had its manager on sick leave, and refused to accommodate us. From Kutaisi we got to Borjomi.⁸⁰ Lev Vasilievich attempted some rock climbing where he should have stayed on the firm ground, and broke his toe. As a result, we were unable to continue the trek and parted with our friends. They went forward, and we stayed in Borjomi for about a week and a half while the toe was healing. There we met the Frenkels family: they were having vacations in Borjomi as well. Yakov Iljich did paintings, Sarah Isaakovna was sawing, their older son Serezha was throwing fits, and the youngest, Vitia,⁸¹ was still a baby. When Lev Vasilievich was ready to walk, we rode a narrow gauge train to Bakuriani.⁸²

We traveled to Caucasus one more time together. In the company of other low-temperature physicists we crossed the Chuchkhur pass to Teberda.⁸³ The Board for Aiding Scientists⁸⁴ operated a recreational camp there. Informally

⁷⁶A scenic gorge with alpine camps and ski resorts. <https://en.wikipedia.org/wiki/Tsey>

⁷⁷A high mountainous pass in the central Greater Caucasus crest. https://en.wikipedia.org/wiki/Mamison_Pass

⁷⁸This toponym awaits for its disambiguation. The widely known *Samgori* is a suburb of Tbilisi, a clearly different location.

⁷⁹An oxen or horse carriage. [https://en.wikipedia.org/wiki/Araba_\(carriage\)](https://en.wikipedia.org/wiki/Araba_(carriage))

⁸⁰Resort town with mineral water springs. <https://en.wikipedia.org/wiki/Borjomi>

⁸¹Serezha and Vitia are diminutives from full names Sergey and Victor.

⁸²Still in service: [https://en.wikipedia.org/wiki/Borjomi-Bakuriani_railway_\"Kukushka](https://en.wikipedia.org/wiki/Borjomi-Bakuriani_railway_\)

⁸³A natural park. https://en.wikipedia.org/wiki/Teberda_Nature_Reserve

⁸⁴*Komissija Sodejstvija Uchenym*, a Soviet government organization established with a goal of preserving technical cadres during the period of “war communism”. Operated during 1921-1937 under different names. In 1930-th provided substantial benefits to about 3,000 top scientists selected by the Soviet bureaucracy.

it was known as the “BrAtS camp”. There we met L. I. Mandelstamm,⁸⁵ I. E. Tamm, A. N. Frumkin,⁸⁶ and other friends from Moscow. We hiked to the Dombay meadows,⁸⁷ climbed the “square glacier” and even camped there overnight. We also visited the Murudju lakes.⁸⁸

Back at home Lev Vasilievich got involved in equestrian sports. He attended the Kharkiv riding school and earned a “Voroshylov’s rider” badge.⁸⁹ He participated in a horseback tour in Altai mountains with Yu. N. Riabinin and V. I. Khotkevych. Next year they did another tour in Altai: this time it was a rafting trip starting from Teletskoye lake⁹⁰ down the Bia river.⁹¹

In 1936 Lev Vasilievich with his younger brother Cyril and L. D. Landau made a boating trip along the Chusovaya river.⁹² L. D. Landau and Lev Vasilievich also trekked the Crimean mountains. L. D. Landau recalled that they scaled several local peaks, and Lev Vasilievich was very good at it, while he was only good in climbing up. The descents often ended in scrambling and sliding on the back of his pants.

The situation in the institute was becoming more and more tense, reflecting the developments around the whole country. The storm was coming.⁹³ Foreign physicists used to visit the institute for many years but now they were abruptly denied border entry. I already mentioned how E. Wiersma

⁸⁵https://en.wikipedia.org/wiki/Leonid_Mandelstam

⁸⁶https://en.wikipedia.org/wiki/Alexander_Frumkin

⁸⁷<https://depositphotos.com/101508204/stock-photo-mountain-belalakaya-or-striped-rock.html>

⁸⁸<https://northcaucasusland.wordpress.com/2014/02/08/dombay-karachay-cherkessia/murudju-lake-great-caucasus-mountains-north-caucasu-dombay-teberdinsky-reserve/>

⁸⁹“Voroshylov’s rider” and “Voroshylov’s sharpshooter” badges were issued to civilians participating in government-sponsored paramilitary training. The name comes from the Soviet military commander K. E. Voroshylov. The “Voroshylov’s rider” badge was first introduced in the summer of 1936. https://en.wikipedia.org/wiki/Voroshilov_Sharpshooter

⁹⁰https://en.wikipedia.org/wiki/Lake_Teletskoye

⁹¹https://en.wikipedia.org/wiki/Biya_River

⁹²https://en.wikipedia.org/wiki/Chusovaya_River

⁹³Understanding the condensed account of the last few pages of the memoirs can be difficult without some basic knowledge of the Great Purge, https://en.wikipedia.org/wiki/Great_Purge. The signs of what is coming appeared much earlier but too many people chose to ignore them. This was a mental defence mechanism against the fearful and unescapable developments. Soviet society was sufficiently divided to create a situation where every group thought it is better to look the other way when members of other groups were persecuted. Eventually the wave of terror was unleashed against its most privileged classes. Information on Great Purge in UFTI, presented in subsequent footnotes, mostly comes from the history research of Yu. M(N). Ranyuk, 1935 - 2017.

was not allowed to come when he decided to move to Kharkiv in 1936. The same year W. de Haas and F. Simon planned to visit, and their visa applications were rejected as well. The leadership of the institute was in flux. Instead of Sasha⁹⁴ Leipunski who was loved and respected by everyone,⁹⁵ a new director with the last name Davydóvych was appointed. When this happened, Lev Vasilievich started making fun of L. D. Landau by calling him “Lev Davydóvych”.⁹⁶ This new director was also displaced quite soon.⁹⁷

In the spring of 1937 we submitted applications for confirming our academic degrees: Doctor Nauk for Lev Vasilievich and Kandidat Nauk for me.⁹⁸ The procedure then was different from what we are used to nowadays. First, we obtained a permission from VAK,⁹⁹ and then a big package with paperwork for everybody from the institute was sent to the Academic Council of Kharkiv University. When the response came back, we found that neither Lev Vasilievich, nor me were confirmed. We were told that it was a clerical error: someone at the institute forgot to include our papers into the package sent to the University.

Our work in the Cryogenic Lab proceeded as usual but I was getting increasingly worried. I told Lev Vasilievich: “Let’s leave this place.” His response was: “How can I go? How can I abandon the lab?”

People were arrested left and right. Lev Vasilievich went for vacations in

The memoirs do not provide enough information for a nuanced understanding of Trapeznikova’s personal judgement of the events of the 1930-th. At the time of the interview (1987) the Soviet power was still in full force. While some mild criticism of Stalin was permitted, anything resembling a criticism of communist system or invoking the memory of the Great Ukrainian Famine of 1932-1933 would make the book unpublishable.

⁹⁴Diminutive for Aleksander

⁹⁵Leipunski was appointed a director in 1933 after the dismissal of Obreimov. In 1934 he went for a long visit to Cambridge, UK, where he worked with E. Rutherford. In 1935 he was called back to USSR to assume the director’s post again. He was later arrested on June 14, 1938 for two months. He happens to be one of the handful of people who were released from the secret police detention during the Great Purge

⁹⁶The difference in the stressed syllabus position in the patronimic name: correct Davýdovych vs. incorrect Davydóvych.

⁹⁷Davydóvych was an official director from December 1, 1934 to December 1, 1935.

⁹⁸*Kandidat Nauk* is roughly a Ph.D. degree, https://en.wikipedia.org/wiki/Candidate_of_Sciences. *Doctor Nauk* is the Habilitation degree, https://en.wikipedia.org/wiki/Doktor_nauk

⁹⁹Abbreviation for *Vyshshaya Attestacionnaya Komissia*, Higher Attestation Committee https://en.wikipedia.org/wiki/Higher_Attestation_Commission that was in charge of confirming all academic degrees in the country.

Crimea with L. D. Landau.¹⁰⁰ While he was away, I started receiving out of the blue telephone calls. Strangers were asking for Lev Vasilievich. When talking to one of the callers, I provided very detailed responses. Unexpectedly, he advised me to be careful in phone conversation with people I don't know.

In the morning of August 6, 1937 Lev Vasilievich came back from Crimea. At lunch time we got a phone call. He was summoned to the institute. I asked if he could finish the meal, but he said: "No, it's an urgent business." He left in a rush, and never came back...

At the end of the day Vera Rosenkevich told me that people saw a "chorny voron"¹⁰¹ near the institute entrance on Yumovskaya street. L. V. Rosenkevich and V. S. Gorsky were taken as well. That night the secret police came with a search. They found "compromising materials": tourist maps of Berlin and Leiden and 15 letters from Wiersma to Lev Vasilievich. I burnt my correspondence with E. Wiersma in advance, as I was afraid it could be used against Lev Vasilievich.

After the arrest of Lev Vasilievich I wrote petitions to Stalin, Beria,¹⁰² Bogomolets.¹⁰³ I wrote to many other high offices. When I was allowed to see Lev Vasilievich in prison, he asked to bring a few books, in particular Eucken's book on heat¹⁰⁴ and the *Handbüch der Physik*. Was he trying to work there? Next time, when I brought the books, an NKVD¹⁰⁵ officer helped me to carry the suitcase with them to the meeting cell. When we were inside, he said: "You know, there are no indispensable people." After that he started quoting from my letter to Stalin. I was very surprised: I

¹⁰⁰By that time Landau already moved to Moscow in January of 1937 to work in the institute of P. L. Kapitza.

¹⁰¹"Black Crow", a colloquial name for the secret police prisoner transport cars.

¹⁰²This is possibly a memory aberration. L. Beria became the NKVD chief in 1938. In 1937 the post of People's Commissar for Internal Affairs was occupied by N. Ezhov. But it could also be a reference to petitions written later.

¹⁰³Some research is needed to understand which Bogomolets is meant here. Possibly A. A. Bogomolets, the president of the Academy of Sciences of Ukrainian SSR in 1930-1946. https://en.wikipedia.org/wiki/Aleksandr_Bogomolets

¹⁰⁴Arnold Eucken, "Energie und Wärmeinhalt". This episode shows once again the farcical nature of accusations. Eucken was a member of the German Nazi party since 1933. Evidently, neither Shubnikov, nor the Kharkiv secret police knew about it, or else the book would become another piece of "condemning evidence".

¹⁰⁵NKVD is an abbreviation for *Narodni Komissariat Vnutrennikh Del*, Peoples Commissariat of Internal Affairs, the Soviet secret police.

didn't mail this letter yet, and they already knew what I wrote. We were not allowed to talk with Lev Vasilievich. After a short time they took him away, and he walked with his hands behind his back. We could not say goodbye or touch each other, or even get closer to each other. I could only look at him and he could look at me. This was the last time I saw him.

On August 31 I gave birth to our son. After returning from the hospital I had two phone conversations with Lev Vasilievich. He was allowed to call at night, the conversations were cut short after two minutes. All we could say was "don't worry about me", and "we have a baby boy, his name is Misha, don't worry about me." Soon after that the phone service in our apartment was disconnected.

On November 13 there was another search of the apartment where I was now living with Nina Gorsky. The institute administration moved her to our place after the arrest of Lev Vasilievich, V. S. Gorsky and L. V. Rosenkevich. The apartment of Vera Rosenkevich was searched as well. After the search the agents called for the prisoner transport. Nina Gorsky and Vera Rosenkevich were arrested. They bravely bid farewell to their children. I was saved by Misha, who was then 2.5 months old. There was nobody to leave him with, and I was left at home after signing a police restraint order barring me from leaving the city.

Next day I was summoned to the director's office of UFTI. There I refused to disown Lev Vasilievich, and they demanded that I voluntarily quit my job at the Institute.¹⁰⁶ So that's what I did. I was not allowed to stay in the institute-owned apartment any longer, and had to move to Kholodna Gora,¹⁰⁷ where Misha and I lived in a small shed. After a lot of effort I was able to receive a power of attorney signed by Lev Vasilievich to certify that he is Misha's father. This allowed me to register our son as Michael L'vovich Shubnikov.

On November 28 of 1937 Lev Vasilievich was convicted by NKVD troika,¹⁰⁸ and sentenced to ten years of imprisonment without the right for postal cor-

¹⁰⁶Persecutions of the "family members of the enemies of the people" became a commonplace. The institute administration was following suite. Family members of people convicted in the Great Purge were officially considered suspicious. Employers would not risk hiring them, and even if they did, the secret police intervened.

¹⁰⁷A district of the city, literally translates as "Cold Mountain". Kharkiv prison is located there.

¹⁰⁸A three-person group of NKVD officers sentencing people without a trial. https://en.wikipedia.org/wiki/NKVD_troika

respondence.¹⁰⁹ Today I still do not know why he was arrested, and what was he accused of. Afterwards, I never saw Lev Vasilievich, and received no information about him.

That was the end of our life together. We lived with Lev Vasilievich for just 12 years.

After the arrest, the name of Lev Vasilievich was proscribed and could not appear in any publications. Many results obtained under his direction and with his personal participation were published without mentioning him. His colleagues and students did not wish to do so but nobody could violate the prohibition.

For two years I was unable to find work.¹¹⁰ All that time I was getting help from my friends and parents. Misha and I moved to my parents place in Leningrad. We survived but my mother paid with her life for getting us through. I cannot express enough gratitude to the few good people who did not abandon me and helped during the most difficult times. These were Aleksandra Vasilievna Yakovleva, the first person to come to Kharkiv to help me; Daria Akimovna Akimova, my old nanny who lived in Kharkiv; staff members of the Cryogenic Lab: Georgiy Anatoliyevich Miliutin and Simon Solomonovich Shalyt. In Leningrad, first and foremost, this was Aleksandra Vasilievna Timoreva.

On June 11, 1957 Lev Vasilievich was exonerated posthumously. A little later I obtained his death certificate, stating that he passed away on November 8, 1945. The place of his death is unknown.¹¹¹

¹⁰⁹The formula “without the right to correspond” was used by the authorities to mask mass executions.

¹¹⁰See footnote 106.

¹¹¹Exonerations of the victims of Great Purge started several years after Stalin’s death. They were frequently accompanied by fake death certificates. It is known now from archival documents that L. V. Shubnikov was sentenced to death on October 28, 1937, and executed in Kharkiv on November 10, 1937.