

Akhiezer Institute for Theoretical Physics at the National Science Center ‘Kharkov Institute of Physics and Technology’, National Academy of Sciences of Ukraine: origins, events, facts, comments

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Abstract. The titled institute is the only historical example in Ukraine of a scientific school maintaining research continuity for over 80 years already. Today, it seems appropriate to remember the origins, to reflect on where this longevity came from, and to take a look at numerous behind-the-scenes legends and fiction stories that have grown around the institute.

1. First attempt in the USSR

*“The stones of the past
pave the way to the future.”*
Nikolay Roerich

The past does not pass without leaving a trace. A striking illustration is provided by the events of the early 1930s related to an attempt to organize the Institute for Theoretical Physics in the USSR Academy of Sciences (USSR AS). Let us recall the main details of this nearly forgotten historical fact [1, pp. 861, 862]: “...even in the early 30s, the question was raised about moving the Academy of Sciences from Leningrad to

Moscow, which was nearly void of physical institutes... it is safe to say that the destiny of the PMI [the Physical-Mathematical Institute of the USSR AS — *A V T*] was predetermined.

It is likely that in this situation Bronstein, Gamow, and Landau decided to endeavor to set up the Institute for Theoretical Physics on the base of the Physics Department of the PMI...¹ Gamow played a rather active role in the conceived rearrangement: he prepared the regulations for the institute and defined and substantiated the avenues of its future research.

¹ Judging by published materials, G A Gamow and L D Landau conceived the idea of setting up the Institute for Theoretical Physics as a consequence of undertaking study courses at foreign scientific centers, primarily with Niels Bohr, and not the possible transfer to Moscow, as supposed by the V Ya Frenkel [1]. According to published data, the issue of relocation of the USSR AS emerged in 1934 unexpectedly, was not substantiated in any way, and was voluntarily executed (similarly to the present-day ‘reform’ of the RAS), so that even the First Secretary of the Leningrad Regional Party Committee, S M Kirov, learned about it from the newspapers. The most comprehensive investigation of the circumstances of the relocation of the USSR AS to Moscow was performed by V D Esakov [40]. On the other hand, the PMI had indeed been divided back in 1932, i.e., prior to the relocation of the USSR AS, but this decision was blocked by the functionaries of the Central Executive Committee of the USSR. According to the *Chronicle of the Russian Academy of Sciences* [41, p. 764], the decision to divide the PMI into two independent institutes — Mathematical and Physical — was taken at the General Meeting of the USSR AS on 28 February 1932. At the same time, I M Vinogradov was appointed Director of the Mathematical Institute; on 29 March, the General Meeting took the decision to name the Mathematical Institute after V A Steklov [41, p. 768]. On 14 March 1932, A N Krylov was appointed Acting Director of the Physical Institute by the Presidium of the USSR AS [41, p. 766]. However, the decision to divide the PMI was not approved by the Presidium of the Central Executive Committee, and on 1 February 1933

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...The first concrete proposal for reorganizing the PMI was contained in a memorandum emphasizing the necessity of separating its mathematical... and physical parts. In this case, it was supposed that the physical part would be involved primarily in theoretical investigations, the basis of which consisted in the physics of the atomic nucleus, i.e., the area of research which Georgy Antonovich [Gamow—A.V.T.] had actively pursued for more than three years.

This suggestion was considered by Academy leaders, its so-called Groups—mathematical, astronomical, physical, and technical. The corresponding committees were also organized.

...Especially strong objections were raised by A F Ioffe and D S Rozhdestvensky. Also disapproved was the 'Conception of the Institute for Theoretical Physics of the USSR AS' formulated by Gamow alone. We outline the subjects specified in that conception:

(1) 'The theory of the atomic nucleus structure (radioactivity, nuclear energy). (2) The theory of the atomic and molecular structures (molecular beams, chemical reactions). (3) Solid-state theory (magnetism, electrical conduction, photoeffect). (4) Theoretical astrophysics (internal stellar structure, cosmological problems)'.

This plan was not significantly different from the more detailed work plan of the Physical Institute of the Academy of Sciences... also written by Gamow and presented to Academicians A F Ioffe and N N Semenov for review in mid-April 1932. Their opinion was highly negative; they stated that the plan was absolutely unacceptable and the idea of setting apart theoretical physics from powerful experimental research centers (i.e., from the PTI and the SOI²) was detrimental...

As would be expected, for business reasons which had little to do with the ambitions of older-generation physicists, the PMI structure was reconsidered by the autumn of 1932 in view of the organization in the near future of two independent institutes—the Mathematical Institute... which retained the name of V A Steklov, and the Physical one, which before long became the P N Lebedev Physical Institute of the USSR AS with location in Moscow. As is well known, its first Director was S I Vavilov—a disciple of P N Lebedev's scientific school. Both institutes persist to the present.³

Interestingly, accidentally or not, documentary source materials are rather scarce.³ Memoir information is also quite scarce.

The memoirs of Dmitrii Dmitrievich Ivanenko, a direct witness to those events, only partly elucidate them:

"Reminiscing about the years 1930–1931, we are briefly reminded of an episode related to the project of reorganizing

Soviet physics (at first, theoretical) proposed by Gamow and Landau, which is only indirectly known in the history of scientific literature. As an infrequent occasion for our Leningrad theoretical group, Johnny [Gamow—A.V.T.] and Dau [Landau—A.V.T.] happened to simultaneously be on a foreign mission in Great Britain in 1930... Gamow had already entered Big Science due to his alpha decay theory and Landau's early works had also been recognized, and they decided that all that would suffice to consider themselves the most important Soviet theorists, leaning upon the world opinion allegedly existing in this sense. Their corresponding statements made on returning to Leningrad (like Fock is not a theorist at all, he is a mathematical machine; many of Frenkel's works are raw; Tamm and Ivanenko did some minor work—known abroad are only the achievements of Gamow–Landau; Mandelstam is merely a radio-physicist, etc.; recall that those were the pre-nuclear years) gave rise, naturally, to laughter, but the following steps had to be treated seriously. Persistent agitation by Landau, who stated that Gamow would soon be elected to the Academy of Sciences, had reasonable grounds, and Gamow was elected a Corresponding Member in March 1932 (simultaneously with V A Fock, to become Ya I Frenkel's colleague, prior to I E Tamm's and Yu A Krutkov's entry into the Academy).

On the other hand, the project of setting up in Leningrad the central academic Institute for Theoretical Physics headed by Gamow and Landau without getting other leading theorists involved was justly regarded as a real step towards 'seizure of power' and provoked serious objections (the more so as Frenkel, together with me and other colleagues, had already written projects aimed at promoting a 'great leap' in theoretical physics). Numerous discussions with A F Ioffe, repeatedly with the obligatory secretary of the USSR AS Volgin, members of governing bodies (Central Committee of the Communist Party, Supreme Council of the National Economy, and other's), in particular during my dedicated trips to Moscow; attempts to persuade V A Fock to the consent to directorship of the new institute, with Gamow, Landau, Ivanenko, Ambartsumyan, etc. as heads of departments—none of these efforts led to consensus, and finally Ya I Frenkel and I persuaded A F Ioffe to address the decisive meeting of the Academy of Sciences and suggest that the organization of a separate large theoretical institute was inexpedient at that time. This suggestion was adopted by the Academy of Sciences, and this rather distressful epic came to an end after all. For Soviet physics, of course, the excessively high concentration of theorists in Leningrad was abnormal. In any case, these circumstances impelled Gamow to go abroad, despite his election to the Academy of Sciences.

After the attempt to seize power did not meet with success, Landau moved to Kharkov to take, after my return to Leningrad, the post of Head of the Theoretical Department of the PTI and the Chair of the Theoretical Physics Department at the Mechano-Machine-Building Institute. In Kharkov, beginning in 1933 through early 1937, Landau started to successfully bring up a whole school of theoretical physicists" [2, pp. 272–274].

Comment is superfluous here. It is no longer possible to find out how it was in reality. However, it is nevertheless possible to draw one conclusion: the first attempt to set up the Institute for Theoretical Physics in the USSR was undertaken back in the early 1930s in Leningrad.

These efforts were not in vain, for later they predetermined Ivan Vasil'evich Obreimov's idea to set up the USSR Center for Theoretical Physics on the basis of the newly established Ukrainian Physical-Technical Institute in Kharkov.

the General Meeting of the USSR AS had to pass a resolution that the Physical Institute was regarded as the Physics Department of the PMI, and the Mathematical Institute as the Mathematics Department of the PMI ([41, p. 794]). A year later, in 1934, in the relocation of the USSR AS to Moscow it has been possible to realize the resolution of the General Meeting of the USSR AS concerning the PMI division. (Editor's comment.)

² Physical-Technical Institute and State Optical Institute in Leningrad. (Editor's comment.)

³ However, some sources do exist. For instance, the history of attempts to set up the Institute for Theoretical Physics is analyzed in considerable detail in an article by G E Gorelik and G A Savina [42], which was based on archival materials. The 1932 attempt to establish the Institute for Theoretical Physics did not meet with success. A F Ioffe and D S Rozhdestvensky raised fundamental objections to administrative separation of theoretical and experimental physics. In August 1932, Landau moved to Kharkov, and Gamow started seeking a way to emigrate. (Editor's comment.)

2. “This took place nowhere else in the USSR”

The words that title this section belong to the organizer and first Director of the Ukrainian Physical-Technical Institute, Academician Ivan Vasil'evich Obreimov. This significant statement reflects the unique feature of the formation of one of the oldest Ukrainian research giants—the Ukrainian Physical-Technical Institute (UPTI).⁴ The official birthday of the institute falls on 30 October 1928. On that day, the Council of People's Commissars of the Ukrainian Soviet Socialist Republic (UkrSSR) passed the corresponding resolution about setting up the Physical-Technical Institute in Kharkov, the then (1919–1934) Ukrainian capital.

However, high-rank instructions on paper are not an institute yet. It was necessary not only to promptly fill the first research physical and technical institution with the corresponding qualified personnel, but also to lay the strategic directions for the institute.

“One of the most important aspects in the organization of physics is the organization of theoretical physics.” is how I V Obreimov defined the strategy of UPTI's development [3, p. 282]. Admittedly, it is precisely this that predetermined to a large extent the subsequent scientific success and longevity of the institute.

Even in the early 1930s, the Ukrainian physical and technical firstling became widely known in the world scientific community. The ‘UPTIans’ managed to come to the scientific forefront in a very short time, largely due to the strong orientation toward basic research.

The first UPTI director did not exaggerate when, speaking to the ceremonial meeting of the Scientific Council dedicated to the 40th anniversary of the creation of the institute many years later, he emphasized with special pride:

“If I have rendered a great service to my country which has borne and will bear fruits, it is that I cultivated theoretical physics in Kharkov and thereby in the USSR as soon as I had this opportunity, and this has left a mark on the country... We did it so that we continually played host to visiting scientists, so that a center of theoretical thought came about...”

Beginning in the spring of 1930, after we had moved to our new building, we received: 3 times (in a matter of 3 years) P A M Dirac from Cambridge; the theorist Podolsky from Princeton (USA) worked for a year; P S Ehrenfest from Leiden came twice (during winter holidays)...; Placzek came twice...; Weisskopf came twice...; Peierls came once.... All that turned Kharkov into the capital of theoretical physics....

An important point is that the theorists came not for several days as guests, but continuously worked for several weeks... In 1934, Niels Bohr came for three weeks and worked every day with theorists until lunch time. This took place nowhere else in the USSR” [4, pp. 23, 24].

And this was not bravado. Even more than half a century later, the significance of I V Obreimov's conception of the UPTI concerning ‘cultivation of theoretical physics in Kharkov and thereby in the USSR’ was specially noted in the pages of the *Herald of the Russian Academy of Sciences*:

“Inviting leading foreign scientists to Kharkov may be appreciated only when it is considered that such an invitation entered into competition, owing to the limitation of hard currency available, with the alternative of buying a new

spectrograph or some other instrument. The coming of Western scientists, in fact, influenced all Russian science at that time, because researchers from other cities in the Soviet Union also came to Kharkov in summertime. Physicists would undoubtedly note that Ivan Vasil'evich invited the most actively and fruitfully working experts of that time or, to state it in different terms, invited the ‘right ones’” [5, p. 239].

It is worth remembering that the visit of an eminent foreign scientist to the UPTI was by no means a trivial event at that time. In those days, foreign experts did not often pay visits to the young republic of workers and peasants, because foreign mass media reported that interminable chaos and economic dislocation reigned in the world's first socialist State. Furthermore, in response to an application to issue a visa for entry into the USSR, many Western diplomatic corps replied that they were unaware of this country.

In addition, only little more than ten years had passed after the revolutionary replacement of the old social system by the new one. That is why almost all newly organized scientific institutions of the young Soviet Union were in great need of skilled staff members.

This is the reason why setting up the institute at that crucial historical period was an intricate task. The first UPTI director described the realities of the theoretical physics of those days:

“Everybody... believed that theoretical physicists were calculators rather than thinkers. A F Ioffe would typically say ‘this calls for a calculation.’ Strictly speaking, this exhausted the theoretical analysis of the problem. Abram Fedorovich treated theoretical physicists condescendingly, even the most prominent ones. Of course, Ioffe was a physics thinker himself and realized that a true naturalist must be a thinker, but he somehow did not admit that theoretical physicist is a profession, and a highly necessary one” [6, p. 45].

Also important is the following fact: Ivan Vasil'evich Obreimov, who had been Deputy Director of the Leningrad Physical-Technical Institute prior to the organization of the UPTI, had already visited the world's leading physical centers and learned much straight from the horse's mouth. That is why his attitude toward the principle of serious ‘cultivation of theoretical physics in Kharkov and thereby in the USSR’ stands out.

In I V Obreimov's words, *“After my final leaving for Kharkov on 2 April 1930, my contacts with A F Ioffe became much less frequent. They became less frequent partly because Abram Fedorovich did not approve in every respect the line of investigations of the Kharkov institute. On the one hand, ‘theoretical physics was hypertrophied’ in Kharkov.*

It goes back to June 1929, when the 1st and single USSR conference on theoretical physics was organized at the UPTI, which gathered without exception all the theoretical physicists working in the USSR: from Grommer and Gamow to Frenkel and Tamm.

More recently, many theoretical physicists have come for rather long periods. P A M Dirac visited the Institute three times, Podolsky came from the USA to work at the Institute for a whole year, Placzek came twice, Weisskopf came twice, in 1932 G A Gamow lived in Kharkov, in 1934 Bohr came for three weeks. In 1932, L D Landau finally moved to Kharkov” [6, p. 53].

Nor should the foresight of the personnel policy of the first UPTI Director be underestimated. The following extracts from his personal and official correspondence make it possible to more specifically reconstruct Ivan Vasil'evich Obreimov's UPTI undertakings.

⁴ In 1939, the UPTI was renamed the Kharkov Physical-Technical Institute, and since 1993 it has borne the name National Science Center ‘Kharkov Institute of Physics and Technology’ of the National Academy of Sciences of Ukraine.

From I V Obreimov to P L Kapitza [7, p. 702]

"Leiden, 12 June 1928

...Two suggestions were simultaneously forwarded to our SPTI (State Physical-Technical Institute in Leningrad — *Translator's comment*) to organize 2 physical institutes, one in Tomsk and the other in Kharkov.

The Tomsk task has been done.... The Kharkov task has not been done, nor has it been even approached. Your most humble servant has been doomed to Kharkov....

I must confess that I have no inclination for super-dreadnought type institutes, so I have in mind a very modest institute. When I think of you, I believe that your presence in the institute would be a shot in the arm for our physics and for physics in general.

Think of what can be done in such an institute. And for the homeland: this institute will rival the Piter (i.e., the SPTI) in significance and will pull it up...."

From I V Obreimov to P L Kapitza [7, p. 703]

"...Dirac is now here in Leiden. I like him enormously (although I saw him only twice and we talked only a bit). He is not a talkative person.⁵ I like him for his intelligent look and the correctness of his remarks (quite infrequent). Probably a mischievous person. You will most likely laugh loudly and think than I am crazy, but when I think about Kharkov an idea runs through my head that it would be great to invite Dirac to Kharkov, at least for a short period.⁶ I just like his company...."

From I V Obreimov to P L Kapitza [7, p. 710]

"Cambridge, 17 November 1929

Dear Petr Leonidovich. We were all greatly pleased by your consent to be a consultant at our Institute, and I hope that this is just the first step towards your leaving for the USSR for permanent scientific work. You know quite well that scientific work is advancing rapidly in our country and that great importance is attached to it.

I assure you that everything required to facilitate your moving will be undertaken and has already been undertaken on our part.

(1) Considering your moral obligations to the Cavendish Laboratory, we have allotted a sum of 250 thousand roubles in hard currency for 1929/30 in the UPTI five-year plan in order to buy out your laboratory. This 5-year plan has been approved by the Presidium of the SCNE of the UkrSSR..." (Supreme Council of the National Economy of the Ukrainian Soviet Socialist Republic — *Translator's comment*).

(3) In the five-year plan for 1929/30 we have allotted a sum of 300 thousand roubles for constructing your Magnetic Laboratory on the site of our Institute.

(4) As for your position, we leave it to your discretion, i.e., either Director of the UPTI or an independent Senior Physicist, or you may have an absolutely independent laboratory....

⁵ An interesting fact: when Bohr was asked how Dirac was getting on in Copenhagen, he answered that he scarcely heard from Dirac. But J Thomson, who was present at the conversation, noted: "This reminds me of the story of a parrot who would not talk. The buyer complained to the salesman, who said: 'You wanted to obtain a chatterbox, and I have given you a thinker'" [8, p. 176]. (Comment from A.V.T.)

⁶ According to the memoirs of A I Akhiezer, one of the first staff members of the Theoretical Department at the UPTI, "Dirac was elected an honorary member of the Scientific Council of the UPTI, Kapitza and Gamow were scientific consultants to the Institute" [9, pp. 77, 78]. (Comment from A.V.T.)

Also extremely informative is the following letter [3, pp. 282, 283] addressed by A F Ioffe and I V Obreimov to the world-renowned theoretical physicist of the first third of the 20th century, P S Ehrenfest.⁷ There is good reason to cite this document unabridged, for it correctly reflects the state of theoretical physics in the USSR early in the 20th century.

"March 1929

Esteemed and Dear Pavel Sigizmundovich!

The large Physical-Technical Institute in Kharkov, which we have talked about several times, is supposedly close to realization. We have been charged with organizing it. One of the first ideas that occurred to us was to get you involved in the establishment of the institute. The role you have played in the development of physics in Russia, your invariable benevolent interest in it, and the constant assistance you render are widely known. That is why we ask you to accept the position of consultant at the Ukrainian Physical-Technical Institute. We ask you to visit us this year for a couple of months or so. To reimburse your travel expenses, we have allotted 2000 roubles. We simultaneously send you some materials concerning the organization of the institute.

One of the most important and simultaneously a challenging task in the organization of physical studies is the organization of theoretical physics work, because the number of theorists in our country is small and young theorists are afraid to leave Leningrad and Moscow so as not to remain without supervision. We believe that, should you agree to place yourself at the head of the Kharkov theoretical physics and transfer your school there, this will be a major factor for the progress of physics not only in our Union, but also for global physics. And the matter is not only that our Union would acquire in your person a first-rank physicist, but also that you possess an exceptional skill in gathering both theorists and experimentalists around you and providing help and advice on science organization. We believe that as regards scientific work, everyday life, and climate you would live in conditions no worse than those you now live in; as regards the benefit of physics, here it would be far greater.

We hope that you will permit raising and discussing at length the issue of your complete moving to Kharkov after your arrival to us; your visit will allow you to personally see the conditions of scientific work and the atmosphere.

Yours, A Ioffe,⁸ I Obreimov"

⁷ Ehrenfest, Paul (1880–1933) — theoretical physicist. He published works on the general problems of statistical mechanics, quantum theory, and the theory of relativity. Borne in Vienna. In 1899, he entered the Supreme School of Technology in Vienna. Graduated from University of Vienna (1904). In 1907–1912, he worked in St. Petersburg. From 1912 through 1933 he chaired the Theoretical Physics Department at the University of Leiden, which had earlier been supervised by H A Lorentz. From 1929 to 1933 he was a scientific consultant at the UPTI. A foreign Corresponding Member of the RAS (1924). Was married to a Russian subject, T A Afanas'eva.

⁸ From the memoirs of Academician A F Ioffe: "When D S Rozhdestvensky, A N Krylov, and I went abroad early in 1921 on behalf of Lenin to restore scientific relations, of critical importance was the valuable assistance rendered by Ehrenfest, who had numerous relations with foreign scientists. He even impelled them to collect for Soviet physicists the physics books and journals published during the blockade.... Ehrenfest highly appreciated and invariably promoted the work of Soviet scientists and helped them in every possible way until his death in 1933" [10, p. 271]. (Comment from A.V.T.)

It must be emphasized that the choice of P Ehrenfest's candidacy was not fortuitous. During the first three decades of the 20th century, this scientist enjoyed immense prestige among theorists throughout the world.

Among his closest friends were such titans of theoretical physics of the 20th century as Albert Einstein and Niels Bohr. In particular, Einstein confessed to Ehrenfest: *"I don't often meet people with whom I feel at ease. I need your friendship even more than you need mine"* [11, p. 105].

It should also be remembered that P S Ehrenfest was one of the first, if not the very first, to manage to convince the world's leading scientists that there was good reason to resume scientific contacts with the USSR (to state it in modern terms, he lobbied for Soviet physics in the world).

There is no escape from mentioning that the then optimism about the construction of the world's first State of workers and peasants was conducive to the establishment of broad international cooperation.

This is demonstratively evidenced by one of Ehrenfest's letters (1933), in which he describes his unforgettable impressions of Kharkov:

"I was in Russia from 14 December through 14 January and spent all the time in Kharkov among my friends at the Ukrainian Physical-Technical Institute. Life now is full of hardships there.

It is likely that foreign professionals experience lesser hardships — as regards acquiring food and other items. Despite these problems, all my friends feel quite happy and work with remarkable enthusiasm. They get very, very tired, in particular because everything is developing extremely rapidly here, with a lot of the related confusion and a waste of up to 80% of energy (the Kharkov population mushroomed from 200 thousand to a million in several years and is continuing to grow).

Surprisingly, every man and every woman engaged in learning feel they are a prime necessity to society, and you can imagine what this feeling signifies! In just the same way, I myself felt young and full of initiative....

All my friends insist that I should move to Russia forever and help them" [12, pp. 115, 116].

Undoubtedly, the cooperation of UPTians with foreign scientists was largely conducive to their familiarization with the latest achievements of West European science, because they learned about the news of physical science first hand.

This is how, for instance, Victor Weisskopf, one of UPTI's foreign staff members (head of CERN in the post-war years), described the reasons why he cast his lot with Ukraine:

"I could obtain a position neither in England nor in France. In 1933, for almost a year I moved to Russia, to Kharkov, where I could get a job providing means of subsistence" [13, p. 28]. It is well to bear in mind that at that time many foreign scientists had to leave their homeland because fascists had come to power. The complex situation in the international labor market after the Great Depression had also played its part.

Academician A I Akhiezer, one of the first staff members of the Theoretical Department at the UPTI, reminisced: *"The young Hungarian theoretical physicist L Tisza liked the situation at the UPTI so much that he decided to stay in Kharkov....*

By the way, his personal qualities are characterized by the following fact: as a foreign staff member he was awarded a higher salary than ours. But Tisza considered this to be unfair and asked to receive the same salary as the other theorists" [9, pp. 75, 76].

It is not out of place to recall such notions, presently forgotten, as patriotism and enthusiasm (these eternal engines

of progress) in the context of the USSR's first splitting of atomic nuclei at the UPTI laboratory.

UPTians were precisely the first in the USSR (and second in the world) to split the atomic nucleus. The famous Cambridge experiment (April 1932) was repeated at the UPTI (October 1932) only half a year later.

This was an extraordinary event: using the modest experimental base of the young Ukrainian institute, it was possible to reproduce the fundamental experiment of one of the best and oldest physics laboratories in the world—the Cavendish Laboratory, which was set up in 1871 at the University of Cambridge, one of the oldest European universities (established in 1209).

That is why the UPTI officials immediately reported about the basic experiment to the government. Reproduced below is this historical telegram, which was published on the first page of the central Soviet newspaper *Pravda* on 22 October 1932.

The nucleus of a lithium atom has been split
Major accomplishment of Soviet scientists

Moscow, to Cdes. STALIN, MOLOTOV,
ORDZHONIKIDZE, and to *PRAVDA*

As a result of dynamic work in the run-up to the 15th anniversary of October Revolution, the Ukrainian Physical-Technical Institute has had the first success in splitting the atomic nucleus.

On 10 October, our high-voltage team disintegrated the nucleus of lithium; the work is being continued.

UPTI Director *Obreimov*. Party Committee secretary *Shepelev*.

Local trade-union committee — *Fedoritenko*

Цена номера 5 коп.

Всесоюзная Коммунистическая Партия (больш.).

ПРАВДА

ОКТЯБРЬ
22
 1932 г.
 СУББОТА
 № 293 (5458).

Орган Центр. Ком. и Моск. Ком. ВКП (б)

Разрушено ядро атома лития.

Крупнейшее достижение советских ученых.

МОСКВА, ТТ. СТАЛИНУ, МОЛОТОВУ, ОРДЖОНИКИДЗЕ, «ПРАВДЕ».

Украинский физико-технический институт в Харькове в результате ударной работы к XV годовщине Октября добился первых успехов в разрушении ядра атома.

10 октября высоковольтная бригада разрушила ядро лития; работы продолжаются.

Директор УФТИ Обреимов. Секретарь парткома Шепелев.
Местком — Федоритенко.

Исследование атомного ядра является одним из центральных задач современной физики. Десятки передовых лабораторий всего мира ведут ожесточенную борьбу за открытие ядра, соревнуясь в изыскании наиболее мощных действительных методов его исследования.

В апреле этого года в печати появилось сообщение о том, что в лаборатории Резерфорда (Намбридж), являющейся в течение тридцати лет ведущей лабораторией в изучении строения атомного ядра, двум английским ученым, Ноксфолду и Волтону, удалось разрушить ядро нескольких элементов, подвергая их интенсивной бомбардировке водородными ионами, ускоренной в специальной разрядной трубке.

Украинский физико-технический институт (Харьков) работу по разрушению атомного ядра начал лишь в прошлом году. Однако коллективный метод работы и продолжение ударных темпов исследований позволили в течение этого короткого срока добиться решающего успеха.

10 октября научным сотрудниками УФТИ гг. Н. Д. СИНЕЛЬНИКОВУ, А. И. ЛЕПЛУНСКОМУ, А. И. ВАЛЬТЕРУ и Г. Д. ЛАТЫШЕВУ первым в СССР в истории в мире удалось осуществить разрушение ядра лития путем бомбардировки ядрами водорода, ускоренной в разрядной трубке.

Достижения института открывают громадные возможности в исследовании строения атомных ядер. УФТИ ведет дальнейшие количественные опыты по исследованию ядра лития и строит более мощную установку для разрушения ядер других элементов.

Директор УФТИ И. ОБРЕИМОВ.

UPTI's telegram (To Cdes. STALIN, MOLOTOV, ORDZHONIKIDZE, and to *PRAVDA*) in *Pravda* newspaper of 22 October 1932.

The Soviet leaders were so strongly impressed by the UPTI's disintegration of the atomic nucleus that rather large resources were allocated to the institute for constructing even higher-power nuclear-physics facilities. Since that time, nuclear research has been one of the main scientific lines of the institute.

The scientific advances of the institute of those days were so significant⁹ that even the first out-of-town session of the Physical Group of the USSR AS was held at precisely the UPTI base (Kharkov, 23–24 January 1937). The following fact was mentioned with a separate line in the resolution adopted by this session: “*In the six years of its existence, the UPTI has turned into one of the leading physical institutes of the Soviet Union*” [14, p. 885].

The scientific prestige of the UPTI was also enhanced by the unique fact that the Nobel Prize Laureate P A M Dirac was an honorary member of the Scientific Council of those days. And such legends of 20th century physics as P S Ehrenfest, P L Kapitza, and G A Gamow agreed to be scientific consultants at the institute.



P L Kapitza at the UPTI (Kharkov, 1933). Left to right: L D Landau, A I Leypunsky, Yu N Ryabinin, O N Trapeznikova, P L Kapitza, L F Vereshchagin, L V Shubnikov, B Ya Finkel'shtein, B Ruemann.

⁹ From I V Obreimov's memoirs: “UPTI pioneered the ‘atomic nucleus’ research in the USSR. In other centers they were not involved in this question and did not intend to take it up, believing, in part, that this problem might bear on the national economy in the distant future.... It should be remembered that, prior to Petr Kapitza's appearance, we were the first and only laboratory in the USSR and the fourth one in the world to have liquid hydrogen and, after 1933, liquid helium. I remember my meeting with W F Meissner at the Physikalisch-Technische Reichsanstalt in Berlin (similar to our Institute for Metrology) in 1928. He told me: ‘You want to have a liquid hydrogen machine? The question is whether you will have a sufficiently civilized maintenance man. I myself cannot obtain such a maintenance man and maintain this facility myself. Others work on it, and I maintain it. German maintenance men, of course, are more civilized than Russian ones. Your destiny is as follows: you will be the maintenance man of the machine, while others will work with liquid hydrogen. However, I will gladly help you.’ And he did help a lot, but not with hydrogen (in this case, help was provided by Leiden University, personally by Professor C A Crommelin, and master mechanic Flim), but with helium. Nonetheless, Meissner's prophecy did not come true. In the hands of mechanic Ivan Petrovich Korolev and, more recently, Vladimir Ivanovich Bogatov and their pupils, two liquid hydrogen facilities and subsequently a liquid helium facility, which was obtained with Meissner's help, have worked well; they are still operational now.”

We also properly estimated the scale and a wide style of the experimental work — the style of high-reliability measurements. We did not aim to ‘overtake and surpass’ other teams but simply carried out as superior and exhaustively as possible those studies that in our opinion were on the agenda of contemporary physics” [15, p. 13].

Of fundamental significance is the following little-known historical fact: for the first time in the USSR a start was made on the publication (in 1932–1937) of the physical journal *Physikalische Zeitschrift der Sowjet Union* in foreign languages on the basis of precisely the UPTI. Also often overlooked is the historical fact that the first conferences on theoretical physics in the USSR (1929, 1931, 1934) were held precisely on the initiative of the UPTI in Kharkov.

3. Theoretical Physics Department of the Ukrainian Physical-Technical Institute. L D Landau

“In 1932 I am moving to Kharkov as Head of the Theoretical Department at the Ukrainian Physical-Technical Institute.”
From L D Landau's autobiography

Especially crucial for the UPTI was the invitation¹⁰ to Lev Davidovich Landau for the position of Head of the Theoretical Physics Department, for it was he who managed to lay the cornerstone in the foundation of the Kharkov school of theoretical physics.

Although Landau was barely 24 years old when he moved to Kharkov, he already had serious work under his belt.

In this connection, of significance is the opinion on L D Landau's scientific work, which was expressed by the famous theoretical physicist V A Fock: “L D Landau's works are well known both here in the Union and abroad. For instance, in volume XXIV (Part 1), which is dedicated to quantum mechanics, of the famous German encyclopedia of physics, *Handbuch der Physik*, Landau's name is cited 11 times. It is pertinent to note that this volume was published in 1933, while the majority of Landau's works date after 1933” [17, p. 415].

In this case, there is good reason to cite the highly informative “Report about foreign academic mission to Denmark, Switzerland and Germany in 1929–1931,” written by Landau:

“From October 1929 to April 1930 I was on a mission abroad¹¹ at the expense of the PCE,¹² and then up to March 1931 on a Rockefeller stipend.

During this period, I had the opportunity to work with the most outstanding modern theorists, of whom N Bohr (Copenhagen), W Pauli (Zürich), and W Heisenberg (Leipzig) had the greatest impact on my work” [19, p. 233].

It is worth recalling that Niels Bohr visited Kharkov in 1934. At that time, the visit of a Nobel Prize laureate—a

¹⁰ The reason L D Landau moved from Leningrad to Kharkov, which escaped publicity during the Soviet times, was that “his relations with Ioffe worsened to the extent that Lev Davidovich had to leave the institute. And since his testimonial was quite unfavorable, by the time Obreimov invited Landau to Kharkov, he had been jobless in Leningrad for about a year” [5, p. 238].

¹¹ From L D Landau's memoirs: “...I was abroad for a year and a half. I was in Germany, Switzerland, Denmark, and England, and visited Belgium and Holland. I visited Denmark three times. This trip was of great importance to me, I met all the great physicists. I did not see, and will never be able to see, only E Fermi.

All of those I met were nice to talk with. None of them were conceited, nor did they put on airs. I knew W Pauli and W Heisenberg well. I met P Dirac....

I view the Danish physicist Niels Bohr as my teacher” [18, p. 313].

¹² PCE — People's Commissariat of Education. (Editor's comment.)

legend of 20th century theoretical physics! — to the UPTI¹³ did honor both to his favorite pupil and to the newly organized Ukrainian institute.

Highly significant in this respect is Bohr's opinion about the UPTI [21, p. 161]:

"I am glad to have the opportunity of expressing my admiration and delight with which I observed the beautiful new Physical-Technical Institute in Kharkov, where excellent conditions for experimental work in all areas of modern physics are taken advantage of with great enthusiasm and there is success under the outstanding supervision and in close cooperation with a brilliant theoretical physicist."

22-5-1934

Niels Bohr".

And it should be admitted that the Nobel Prize laureate did not digress from the truth: it was precisely Lev Davidovich Landau who laid the cornerstone of the foundation of the Kharkov school of theoretical physics. Many years later, Academician Aleksandr Il'ich Akhiezer, one of the first Kharkov pupils of L D Landau, reminisced, not without pride:

"In August 1932, L D Landau moved to the UPTI. At that time he was only 24, but he was already recognized throughout the world as an outstanding theoretical physicist. This was promoted by the fact that in 1929–1931 he was on an academic mission abroad and participated in workshops of the famous physicists M Born, W Heisenberg, W Pauli, P Dirac, and, lastly, Niels Bohr himself. His communication with these prominent scientists was quite active, and it was not long before they recognized his extraordinary talent. He conversed even with the great Einstein and tried to convert him to the 'quantum-mechanical religion,' but failed. Landau was most highly appreciated by Niels Bohr, who, beginning from that time and up to Landau's last days, ranked him as one of his best

¹³ From the brief review published by M P Bronstein in *Usp. Fiz. Nauk* [20] in 1934: "An All-Union conference on theoretical physics convened by the Ukrainian Physical-Technical Institute was held in Kharkov on 1–22 May. The conference was attended by theorists from Moscow, Leningrad, Kharkov, and other cities; furthermore, there were many foreign scientists, of whom Prof. Niels Bohr (Denmark) should be mentioned first."

From A I Akhiezer's memoirs: "The well-known theoretical physicist G Placzek, who came from Copenhagen, worked in the UPTI for a relatively long time. He performed, together with Landau, important work on light scattering by the molecules of a liquid or gas. It was published in the journal *Physikalische Zeitschrift der Sowjet Union*....

...In May 1934, an All-Union conference on theoretical physics was held in Kharkov. The conference was attended by outstanding theoretical physicists, including Niels Bohr, V A Fock, Ya I Frenkel, I E Tamm, and other scientists participated in the conference. The conference was held in Kharkov in order to emphasize the significance of the recently organized Physical-Technical Institute and the worldwide-recognized role of Landau in theoretical physics.

L D Landau used to commune with Niels Bohr, his teacher, who showed great interest in Landau's works throughout his life.

The conference was attended by the young Hungarian theoretical physicist L Tisza, who so much liked the atmosphere at the UPTI that he decided to stay in Kharkov. He was affiliated with Landau's Theoretical Department, so that there became eight of us: E M Lifshitz, A S Kompaneets, A I Akhiezer, I Ya Pomeranchuk, L M Pyatigorsky, M A Korets, L Tisza, and V M Konovalov, B Podolsky's post-graduate student....

...As for Placzek, subsequently, when working in the USA, he published a highly important paper on neutron scattering, in which he highly praised my work on neutron scattering in crystals written together with Pomeranchuk....

Tisza also left the USSR in 1937 and subsequently worked in the USA" [9, pp. 75, 76].

pupils, and Landau regarded Bohr as his teacher. Many years later, in a talk with me, Ivan Vasil'evich Obreimov said that Landau had been underestimated at the Leningrad Physical-Technical Institute and that only he, Obreimov, knowing how talented Landau was, offered him the position of the Head of the Theoretical Department at the UPTI and complete discretion as regards research areas and education of young theorists.

After Landau's move to Kharkov, UPTI became one of the best world centers of physical science" [18, p. 46].

Meanwhile, the Kharkov period of L D Landau's life lasted for only five years—from 1932 through 1937. These were precisely the years which saw the formation of the Kharkov school of theoretical physics, which subsequently became one of the most famous Ukrainian scientific schools.

A I Akhiezer's memoirs can give an idea about the level of UPTI theoretical research performed under L D Landau's supervision:

"In 1937, a conference on nuclear physics was held in Moscow, which was attended by Pauli. Landau presented me and Pomeranchuk to him, and Pauli familiarized himself with our papers on light scattering by light and coherent gamma-ray scattering by nuclei. He approved of the results. And this was all the evident success of Landau and his pupils, for it demonstrated that the Landau school was occupied with the most topical problems of theoretical physics" [22, p. 43].

However, the Head of the Theoretical Department of the UPTI was concerned not only with the problems of 'pure' science. Lev Davidovich Landau always sought to give specific help in solving the many problems of UPTI experimentalists. From the memoirs of Nikolay Evgen'evich Alekseevskii (then a scientific associate of the Cryogenic Laboratory of the UPTI):

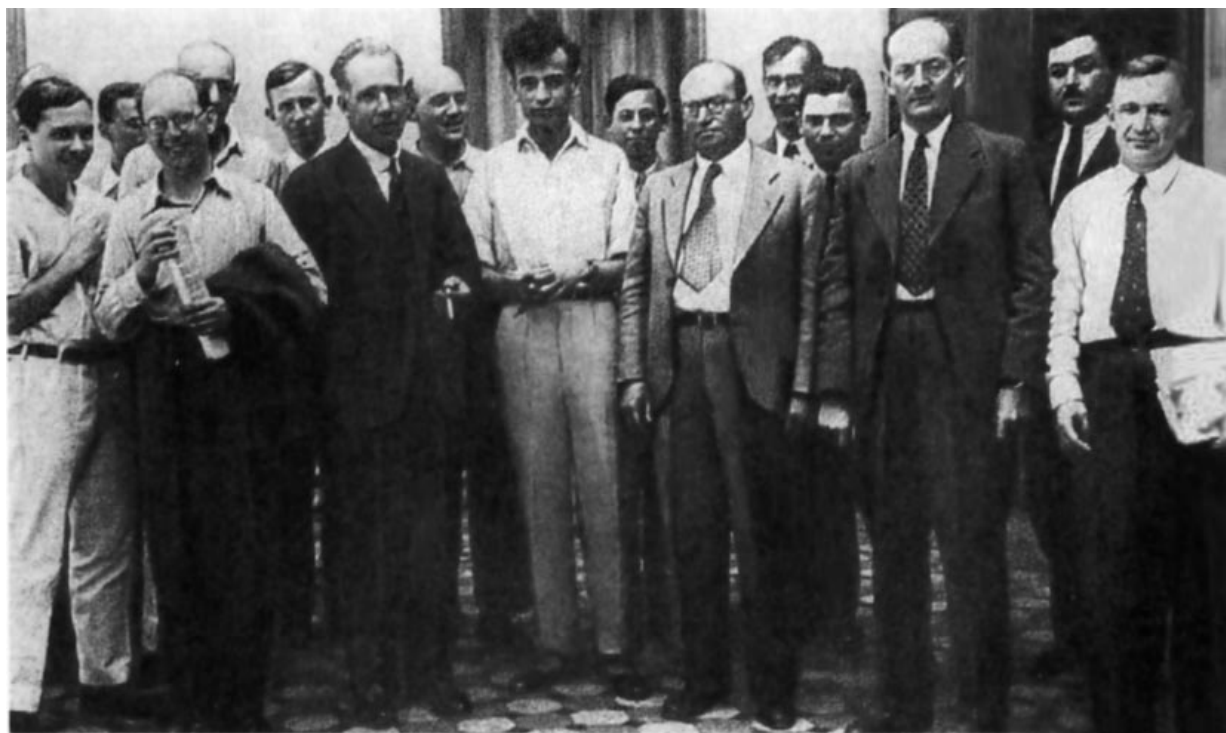
"By the breadth of his knowledge and the speed of his wit he immediately became the center of attention. At that time, he already was the recognized leader of the Kharkov school of theoretical physics. At the UPTI he introduced a 'Theoretical minimum' examination not only for theorists, but also for experimentalists: he believed that many experimentalists had a poor knowledge of physics and therefore performed experiments incorrectly. (He would repeat in this connection: 'God forgive them, for they surely do it ignorantly or heedlessly')" [18, p. 40].

P S Ehrenfest, who repeatedly came to Kharkov, also emphasized this L D Landau phenomenon in his confidential correspondence with A F Ioffe [3, pp. 259–263]:

"Dear, Dear Ioffe!

21 December 1932, Kharkov

...As for Landau, I have recently come to think highly of him as an extraordinarily bright person, in the first place for the clarity and critical keenness of his thinking. I greatly enjoyed disputing different matters with him. And, irrespective of whether I was wrong (mostly in fundamental questions) or right (as a rule, in minor details), each time I learned very much and could appreciate how clearly he 'saw' and how large the stock of his well thought-out knowledge was (so far I cannot judge Landau's capabilities as an associate professor or his talent for organization). In any case, I attach no great importance to some of his irritating bad habits: his carelessly unintelligible and hasty speech, as well as similar insignificant things, because he might readily get out of them...."



All-Union Conference on Theoretical Physics at the UPTI (Kharkov, 1934). From left to right in the foreground: **D D Ivanenko**; **L Rosenfeld**, in the background behind Rosenfeld: on his left — **M P Bronstein** (hardly seen), on his right — a tall man — **Yu B Rumer**; **Niels Bohr**, in the background behind Bohr: on his left — **Milton S Plesset**, on his right — **L V Shubnikov**; **L D Landau**; **Ya I Frenkel**, in the background behind Frenkel: on his left — **R Peierls** (?), on his right — **Ivar Waller**; **R Williams**, in the background behind Williams: on his left — **V A Ambartsumyan**, on his right — **V A Fock**; **I E Tamm**.

“My dear friend!

6 January 1933, Kharkov

...To me it seems unquestionable that such a person as Landau... is an absolutely indispensable type of theoretical physicist to the same extent for any country. It is valid to say that typical Talmudic features are inherent in the nature of his thinking (as in mine and in Einstein's). In any case, they are much, much more conspicuous in his (Landau's) talks than in his thinking!!

As a result, I have characterized him quite one-sidedly. After I had a heated debate with him a couple of times about some of his unjustifiably paradoxical statements, I received evidence that he thought not only clearly, but also quite illustratively — especially so in the realm of classical physics. And in this short period I learned surprisingly much new from him — almost each time after the debate phase during which I was firmly convinced that he was wrong!!

I like his way of thinking nearly as much as Pauli's.

And I understand quite well why every individual group of experimentalists seeks very willingly Landau's advice (and not Rozenkevich's or Podolsky's), for he takes keen interest in everything and is interesting himself. His boyish pranks have the result that everything he says is, not infrequently, initially unintelligible; however, if next you argue persistently with him, you always feel enriched... ”

4. “The Course of Theoretical Physics was conceived in Kharkov in 1935”

“Landau was a great patriot and believed that one of his most important tasks was to do all he could to improve physical education in our country.”

A I Akhiezer

A catastrophic deficit of professional scientific brainpower was one of the most serious scientific organizational problems of the UPTI in those days.

The first-ever socialist State pursued a course of industrialization and set itself the grandiose task of overtaking and surpassing the leading capitalist countries. A propaganda campaign aimed at education of highly skilled domestic professionals was also started on a wide scale.

In this connection, credit should be given to **L D Landau**, Head of the Theoretical Department at the UPTI, for his enthusiasm. On his own initiative, for the first time at the UPTI he started up a ‘conveyor’ for educating professionals in the area of modern physics by developing “‘*Theoretical minimum*’ programs — the basic knowledge in theoretical physics required for experimentalists and separately for those who wanted to devote themselves to professional research in theoretical physics” [18, p. 11].

And it was not a mere chance that **P L Kapitza** and **E M Lifshitz** emphasized precisely this fact in their paper [23] about **L D Landau**:

“... the work by Landau and his pupils made Kharkov of those years the center of theoretical physics in the USSR.

...Seeking to impart his knowledge to others, particularly to his students, even back in Kharkov Landau conceived the idea of constructing a course of theoretical physics, which has now come to be the widely-known many-volumed work of Landau and Lifshitz. Landau alone could not write this course; although Landau was an excellent speaker, he did not manage to state scientific work in writing well. In those years, among the young physicists in Kharkov there were two brothers — **Evgenii Mikhailovich Lifshitz** and **Il'ya Mikhailovich Lifshits**. Both are highly gifted beginner scientists with a wide coverage of theoretical physics. The elder, **Evgenii Mikhailovich**, in addi-



Participants in the first out-of-town session of the USSR AS at the UPTI (Kharkov, 1937). From left to right: A I Leypunsky, S I Vavilov, A F Ioffe, L D Landau, L V Shubnikov.

tion possesses an exceptional capability for the literary exposition of scientific mathematics. The course of events showed that Lifshitz and Landau perfectly complemented each other in the construction of the course of theoretical physics.... The course of theoretical physics originated in Kharkov in 1935 and was a textbook for passing examinations in theoretical physics, which were initially passed using the summaries of lectures which Landau read to scientific associates of the Kharkov Physical-Technical Institute” (back translation from Russian [17, pp. 419–421]).¹⁴

5. “Envy and resentment towards Landau were accumulating...”

“In 1937 I am moving to Moscow to become Head of the Theoretical Physics Department at the Institute for Physical Problems.”

From L D Landau’s autobiography

In 1937, Landau had to leave Kharkov.¹⁵ “Envy and resentment towards Landau were accumulating and awaited

¹⁴ It is noteworthy that the creation of the famous *Course of Theoretical Physics* was preceded by Landau’s lectures on general physics for 1st and 2nd year students at Kharkov State University (KhSU), which were written together with L M Pyatigorsky and E M Lifshitz and published in the UPTI in 1935 [43]. Also written in Kharkov was *Mechanics* by Landau and Pyatigorsky (published in 1940) and a problem book by Landau, Lifshitz, and Rosenkevich (1935). The history of the emergence of the course was reflected in Ref. [44]. Subsequently, Pyatigorsky did not participate in the construction of the course. The tragedy of the mutual relations between Landau and Pyatigorsky was described in Ref. [43] (see also Refs [45–47]). During Landau’s stay in Kharkov, the examination in the theoretical minimum was passed by A S Kompaneets (1933), E M Lifshitz (1934), A I Akhiezer (1935), I Ya Pomeranchuk (1935), L M Pyatigorsky (1935 ?; he passed the examination, but was not indicated in the list written by Landau), L Tisza (1935), and V G Levich (1937) (a photocopy of the list is shown in B L Ioffe’s book [48]). Subsequently Landau’s pupils became authors of their own theoretical courses: A I Akhiezer, V B Berestetskii (*Quantum Electrodynamics*), V G Levich (*Course of Theoretical Physics*), etc. (Editor’s comment.)

¹⁵ L D Landau’s departure from Kharkov to Moscow followed immediately after the Chancellor dismissed him from the position of Head of the department at Kharkov State University (KhSU) and attempted to fire him (it turned out that this decision was not formally confirmed in Kiev) in December 1936. In connection with the attempt to discharge L D Landau from KhSU, L V Shubnikov, as well as A I Akhiezer, I Ya Pomeranchuk, E M Lifshitz, A K Kikoin, and V S Gorskii, submitted applications of the

an outcome” [22, p. 22]—this is how A I Akhiezer characterized the unfavorable atmosphere formed around Landau by that time. The circumstances which impelled Landau to move to Moscow are appropriately illustrated by an official primary source—the memorandum of the then UPTI Director, Academician A I Leypunsky of 5 February 1938 [24, p. 51]:¹⁶

“To Vice Chairman of the USSR Council of People’s Commissars Cde. Mezhlauk
Classified. Copy No. 1

Dear Valery Ivanovich!

As far as I know, you still take an interest in Kapitza and his institute. That is why I permit myself to address you on the following matter. Working in our institute is a young and highly talented theoretical physicist, L D Landau, who now is negotiating his transfer to Kapitza’s institute. He is undoubtedly one of the leading scientists in this area. This scientist is larger than Kapitza in scale. Unfortunately, his political face cannot be termed entirely Soviet. He treats the Soviet community with internal (sometimes outward) defiance. We try to bring him up, for this man is not hopeless. The education procedure is sometimes rather painful for him. Recently, we subjected him to some educative blows. This did him good, which he himself was forced to admit. However, he would not mind freeing himself from this permanent pressure which he is under and moving to a position in which he and Kapitza would become recognized leaders of a certain group of scientists....

With his evident antisocial attitude of mind, great intellect, energy, and a taste for organizational activity, Landau, in combination with Kapitza, will undoubtedly become the center of a reactionary group of our scientists, who, unfortunately, are still quite numerous.

That is why I decided to address you with this letter in the hope that you will take steps to prevent the joining of these two people....”

6. Repressions. The year 1937

“There is a limit to a man of genius,
but human baseness is devoid of limits.”
Eugeny Evtushenko

The end of 1930s was one of the most gloomy and tragic periods in the history of the UPTI, which must not be forgotten. To understand what really happened at the UPTI at that time, it would suffice to turn to unbiased memoirs of the then foreign member of the UPTI staff, A Weissberg, a direct witness of those events:

“Our institute¹⁷ is one of the most significant in Europe. It may well be that there is no institute in Europe equally well

same type for voluntary termination of their employment, considering inexpedient their work in KhSU without Landau. At the Scientific Council of KhSU this was termed an ‘anti-Soviet strike’. Materials about this strike were published by V V Vorob’ev [49] (see also Ref. [21]). (Editor’s comment.)

¹⁶ The letter from Leypunsky to Mezhlauk was first published in a book by V D Esakov and P E Rubinin [50]. (Editor’s comment.)

¹⁷ From the resolution of the inspection committee of the Physical and Mathematical Sciences Division of the USSR AS of 12–18 May, 1939: “The main UPTI characteristics, which are its indisputable merits, are its diversified facilities and vast technical experience. As regards its technical equipment, the KhPTI ranks highest among the physical institutes in the USSR” (Archive of the RAS (Fond 2, Opis 1a, Delo 34, List 25) [19, p. 70]. (Comment from A.V.T.)

equipped and having as many different laboratories as ours. The government has spared no expense. The leading scientists were partly educated abroad. They were sent for a long time to continue their education with the world's most famous scientists at the expense of the government.

There are 8 departments in our institute, which were headed by 8 scientific supervisors.

What does it look like now?

Laboratory of Crystals... Supervisor Obreimov — arrested.

1st Cryogenic Laboratory... Supervisor Shubnikov — arrested.

2nd Cryogenic Laboratory... Supervisor Ruemann — expelled from the country.

Nuclear Laboratory... Supervisor Leypunsky — arrested.

X-Ray Department... Supervisor Gorskii — arrested.

Department of Theoretical Physics... Supervisor Landau — arrested.

Experimental Station for Deep Cooling... Supervisor Weissberg — arrested.

Ultrashort Wave Laboratory... Supervisor Slutskin — is so far still in the office" [16, p. 277].

The repressions of those days had a huge international resonance.

Even Albert Einstein addressed Joseph V Stalin [21, p. 309]¹⁸, because he was sincerely convinced that these persecuted scientists were loyal to the Soviet state.

"To Mr. Joseph Stalin, Moscow, USSR
Pasadena, 16 May 1938

Dear Mr. Stalin!

Recently, I have come to know about numerous cases where prominent scientists in Russia are accused of grave crimes as people who retain full confidence in their human relations with foreign colleagues. I understand, and you know about this, that suspicion happens to fall on innocent and reputable people in times of crisis and disturbance. But I am also convinced that, both from the universal human point of view and in the interest of progress of the Russian constructive endeavor, it is very important that the treatment of highly creative and exceptionally capable people be extremely cautious.

In this connection, I would like to ask you to take note of the case of Alexander Weissberg, Kharkov. Mr. Weissberg, an Austrian citizen and engineer-physicist, was working in the Ukrainian Physical-Technical Institute in Kharkov. I would particularly ask you to take into consideration the opinion about Dr. Weissberg's activity, which Prof. Martin Ruemann (Supervisor of the Experimental Station for Deep Cooling) sent to the People's Commissariat for Heavy Industry in the spring of 1937.

Respectfully yours, Prof. Albert Einstein"

The weight of international resonance may be judged by the following petition signed by three Nobel Prize laureates [21, pp. 309, 310]:

"To Mr. Prosecutor General of the USSR
Paris, 15 June 1938

Dear Mr. Prosecutor General!

We, the undersigned, friends of the Soviet Union, consider it to be our duty to inform you of the following.

The arrest of two outstanding foreign physicists, Dr. Friedrich Houtermans, who was arrested in Moscow on 1 December 1937, and Mr. Alexander Weissberg, who was arrested in Kharkov on 1 March in this year, has given rise to bewilderment in the scientific circles of Europe and the USA.

Since Mr. Houtermans and Mr. Weissberg carry great weight within these circles, there are grounds to fear that their long-term custody will be one more impetus in the campaign which is presently damaging the prestige of the socialist country and the USSR's cooperation with Western countries.

This is additionally complicated by the fact that scientists who consider themselves friends of the USSR and its advocates against the attacks of its opponents have received no information from Soviet authorities about the conditions of Houtermans and Weissberg, despite their custody for a long period of time, and their attitude to what is going on is bewilderment.

Houtermans and Weissberg have numerous friends among world-renowned scientists, for instance, Prof. Einstein in Pasadena, Prof. Blackett in Manchester, and Prof. Niels Bohr in Copenhagen, who sympathize with them and will follow the fate of both scientists.

Mr. Weissberg, who is one of the founders and editors of the journal *Physikalische Zeitschrift der Sowjet Union* in the USSR, has been invited by Prof. Einstein to the Caltech university in Pasadena. Because of his arrest, he is devoid of the opportunity to take advantage of this invitation.

For the same reason, Dr. Houtermans, who had been invited to an institute in London to carry out research, could not avail himself of this invitation: at the time of his arrest, he was already in the customs area of the Moscow railroad station...

Persons in charge in the USSR recently made several official statements that in the course of the sweeps, which were required due to the threat of internal and external enemies to the country, executive powers committed errors inevitable at this critical time; the persons in charge strongly emphasized the necessity of eliminating such errors and abuse of power.

We, the undersigned and all friends of both accused, are convinced that this case is precisely such a misunderstanding.

That is why they appeal to the Prosecutor General of the USSR to take note of the Houtermans and Weissberg cases and ask him, in order to maintain the prestige of the USSR in foreign scientific circles, to urgently take measures for the immediate discharge of both of them.

The utmost political significance of this circumstance entitles us to send a copy of this letter to Mr. Stalin via the USSR embassy in Paris....

Irene Joliot-Curie, Nobel Prize laureate
Jean Perrin, Nobel Prize laureate
Frederic Joliot-Curie, Nobel Prize laureate"

Cited next is an official letter signed by the Nobel Prize laureate Niels Bohr.

From N Bohr to J Stalin [25, pp. 149, 150]

"Institute for Theoretical Physics
at the University of Copenhagen
23 September 1938

To J Stalin —

Secretary of the Communist Party of the Soviet Union

The feeling of deep gratitude for the active and fruitful cooperation with the scientists of the Soviet Union, which I had

¹⁸ Einstein's letters in defense of Weissberg and Houtermans were first published by V Ya Frenkel [51]. (*Editor's comment.*)

the fortune to participate in for many years, and the deep impression gained in repeated visits to the USSR, which was produced by the enthusiasm and success of research work pursued and encouraged there, impel me to draw your attention to the case of one of the most prominent young-generation physicists, namely the case of Prof. L D Landau of the Institute for Physical Problems at the Soviet Academy of Sciences.

Professor Landau has received the recognition of the scientific world not only due to several highly significant contributions to atomic physics. Owing to his fruitful effect on young scientists, he has also made a decisive contribution to the foundation of the school of theoretical physics in the USSR, which has turned out indispensable researchers for grandiose scientific-experimental investigations now executed in magnificently equipped new laboratories in all parts of the USSR.

For many years, I had the great pleasure to maintain close relations and be in correspondence with Prof. Landau on scientific problems which were of profound interest to both of us. However, to my deep regret, I have not received a reply to my latest letters and, so far as I know, none of the other numerous foreign physicists who follow his work with special interest have received news from him, either. I also tried to establish communication with Prof. Landau by making an inquiry via the Soviet Academy of Sciences, which I have the honor to be a member of; however, a recent reply received from the Academy of Sciences President does not bear any information about Prof. Landau's whereabouts or fate.

I am deeply distressed by this, especially in connection with the fact that I heard a rumor about Prof. Landau's arrest. I still hope that this rumor is unfounded; if Prof. Landau is indeed under arrest, I am convinced that the case is a regrettable misunderstanding, for I cannot imagine that Prof. Landau, who has devoted himself entirely to scientific research and whose sincerity is highly appraised from my part, might have done something to justify his arrest.

In view of the great importance of this circumstance both for science in the USSR and for international cooperation, I make an urgent request to hold an inquiry into Prof. Landau's fate, so that, in case this is indeed a misunderstanding, this extremely gifted and fruitfully working scientist would be able to participate in scientific research, which is of great importance to mankind.

Niels Bohr,
Professor, University of Copenhagen"

The soviet scientific community did not stand aloof from these events, either. It was precisely P L Kapitza who scored success in discharging I V Obreimov and L D Landau. This was a courageous deed, because he risked his life.

From P L Kapitza to V M Molotov [7, pp. 726, 727]
"7 July 1940

Comrade Molotov!

I have been shown the letters written to you about the arrestee Prof. I V Obreimov (former Corresponding Member of the Academy of Sciences). This case certainly deserves great attention, but in these letters I did not find the most important thing. So, if you decide to turn your attention to Obreimov's fate, my letter may be helpful to you.

I have known Obreimov for about 20 years; I know him well, as well as one can know people of this kind. If Lombroso were alive, he would be able to describe him better, because Obreimov is a typical subject for his theory.

Obreimov has remarkable achievements in physics, and they are amazingly original. Many of his viewpoints and theories have not been understood, but if they turn out to be correct, they will be brilliant.

The most difficult thing is to understand Obreimov's ideas, for they are quite paradoxical. He himself would say: 'I do not like people with lucid ideas; they do not invent anything new.' Were it not for several valuable and concrete results, which no one can deny, Obreimov would have been treated as a great crank, if not a crazy person.

For instance, he contrived, realized, and introduced a method for determining the optical properties of glass, while it is still melt in a bowl. This problem is of critical importance in optical technology and, on the face of it, is insolvable. Obreimov found a brilliantly simple solution, and, owing to the so-called Obreimov technology, our optical industry is able to produce glasses better than anybody else.

Concerning the Obreimov case, I have the following viewpoint.

(1) It is unlikely that Obreimov is a political criminal. Most likely, his never-ending paradoxes brought the investigator and NKVD officers to the state of complete perplexity, and they simply jailed him to be on the safe side. So if there were a necessity to put him under arrest, it would be more properly to keep him in houses of People's Commissariat of Public Health rather than in NKVD houses.

(2) After the arrest, Obreimov worked as a scientist, and now, it is said, they have made him into a stevedore in Kotlas.

If this is true, it should be promptly corrected; otherwise, we all will be ashamed of it.

(3) If the NKVD assessment is not a subject to reconsideration, he should nevertheless be given the opportunity to work as a scientist on what he wants and bring his work to publication, which is in the interest of all the science.

Yours, P Kapitza"

From P L Kapitza to J V Stalin [25, p. 136]

"28 April 1938

Comrade Stalin,

This morning, a scientist from our institute, L D Landau, was arrested. Despite his 29 years of age, he and Fock are the most prominent theoretical physicists in our country. His work on magnetism and quantum theory are often cited both in our and in the foreign literature. In the past year alone, he has published a remarkable paper in which he first pointed out a new energy source of stellar radiation. This work gives a possible solution of why 'solar and stellar energy does not appreciably lower with time and has not been depleted so far.' Bohr and other leading scientists acknowledge the great future significance of these ideas of Landau's.

There can be no doubt that the loss of Landau as a scientist, for our institute as well as for Soviet and world science, will not pass unnoticed and will be strongly felt. Of course, scientific scholarship and talent, no matter how brilliant they may be, do not give a person the right to violate the laws of his country, and if Landau is guilty, he must answer for his actions. But I appeal to you, in view of his exceptional giftedness, to give instructions to consider his case very attentively.

Also, I believe, it is necessary to take into account Landau's temper, which is, bluntly speaking, bad. He is a tease and a bully, he likes to seek mistakes in the work of others, and when he finds them, especially the mistakes of important elders, like our academicians, he disrespectfully teases them. He has thus made many enemies.

In our institute, we were having a difficult time with him, although he would yield to persuasion and become better. I forgave him his pranks in view of his exceptional giftedness. However, for all the drawbacks of his temper, it is hard to believe that Landau was capable of acting dishonestly.

Landau is young, he still has much to do in science. No one, except another scientist, can tell you about all this, and so I am writing to you.

P Kapitza"

From P L Kapitza to L P Beria [25, p. 154]

"26 April 1939

I ask you to release from custody the arrested professor of physics, Lev Davidovich Landau, and I stand as guarantor for him.

I guarantee to the NKVD that Landau will not carry on any counterrevolutionary activities against Soviet authority at my institute, and I will do all that is in my power to ensure that he does not carry on any counterrevolutionary activities outside the institute, either.

In the event that I notice that any of Landau's statements is harmful to Soviet authority, I will immediately inform the NKVD.

P Kapitza"

Truly inscrutable are the ways of humans. But the true nature of a person reveals itself in precisely hard times. The facts outlined above are not attributable to ill luck, no matter how the descendants may interpret the political events of the late 1930s.

7. The Soviet Atomic Project. Laboratory No. 1

*"Not merely an applied research area,
but an applied research area via science."*

Academician K D Sinel'nikov

Lack of knowledge generates legends. Now when part of the classified documents on the Atomic Project of the USSR has been published, it has become possible to familiarize oneself with the information on Laboratory No. 1.¹⁹ Additionally, the recent publication of the reminiscences of UPTI-KhPTI staff members not only supplements this information, but it also gives a clear idea of the real events occurred in those years.

For instance, it was not for nothing that N A Khizhnyak ventured to touch upon a 'closed' theme: *"In accordance with the rules of those years, secret laboratories were set up in the institutes involved in the work on the Atomic project. It is commonly known that the I V Kurchatov Institute of Atomic Energy was Laboratory No. 2, the 'deuce', as referred to in the narrow circles of researchers. The Institute for Theoretical and Experimental Physics (A I Alikhanov's institute) in Moscow contained Laboratory No. 3, etc.*

But few persons knew that Laboratory No. 1 was in the KhPTI and was supervised by K D Sinel'nikov" [26, p. 164].

By addressing the recently promulgated documents, it is possible to precisely define the role of Laboratory No. 1 in the Soviet Atomic Project:

¹⁹ For more details about the participation of Laboratory No. 1 in the Atomic project, see the book by Yu M Ranyuk [52]. (Editor's comment.)



Academician I V Kurchatov at the KhPTI (late 1950s). At the right is Academician K D Sinel'nikov, Director of the KhPTI.

"Extract from the protocol No. 9 of the meeting
of the Technical Council of the Special Committee
under the USSR Council
of People's Commissars [27, p. 40–45]

9 November 1945

*Top secret
(Special dossier)*

⟨...⟩ VI. On the research plan
of the Ukrainian Physical-Technical Institute in nuclear physics
(speaker: Cde. K D Sinel'nikov)

(1) Consider it necessary to reorganize the Nuclear Physics Department of the UPTI into a special laboratory and switch it over to the uranium problem.

(2) Approve the following work program for the special laboratory of the Ukrainian Physical-Technical Institute:

a) investigation of 1–1.5 MeV neutron scattering by different materials with the aim of selecting the most advantageous material for the reflector and determining the optimal reflector layer thickness;

b) measurements of fast-neutron absorption cross sections in elements 233, 235, and 239;

c) search for methods of obtaining powerful sources of the ions of uranium and its compounds.

Chairman of the Technical Council B Vannikov
Scientific Secretary of the Technical Council A Alikhanov"

Today, it is also possible to reconstruct details concerning the epoch of Laboratory No. 1 from the reminiscences of Academician V F Zelenskii, Director of the KhPTI from 1981–1997:

“I V Kurchatov assigned the production of fuel for heavy-water nuclear reactors (‘boilers’) producing materials for the charges of atomic bombs as the most important and urgent task for the institute in the uranium project.

The institute has begun to work on the problem of fuel for a heavy-water gas reactor—the generator of weapon U-233 and plutonium” [26, pp. 31, 32].

8. “The world’s first textbook on applied and basic nuclear physics”

A highly significant fact was also stated by Academician B E Paton, President of the National Academy of Sciences of Ukraine:

“On I V Kurchatov’s instructions, he [A I Akhiezer—A.V.T.] and I Ya Pomeranchuk wrote the first ever textbook on applied and basic nuclear physics. This book played a major role in the education of personnel for the Soviet nuclear project” [22, p. 226].

The official correspondence on the issue of the publication of this unique monograph was made public relatively recently [27, 28]. We cite the most informative of these documents.

A I Alikhanov’s letter to L P Beria
concerning the publication of the book by A I Akhiezer
and I Ya Pomeranchuk²⁰
on the theory of boilers [28, pp. 800, 801]

“10 April 1948
Top secret
(Special dossier)

To Vice Chairman of the USSR Council of Ministers
comrade L P Beria

The progress of work in the field of *atomic energy* production even now urgently calls for the creation of several textbooks devoted to different aspects of the theory, calculation, and design of *atomic facilities*.

Such textbooks are required for both scientists and technical and engineering employees of our laboratories, as well as for the students of special departments who will subsequently work in laboratories and industrial plants.

Unfortunately, however, no attention is being given to the writing of such textbooks in our country.

The existing disparate reports concerned with various problems of the *theory of boilers* are kept in laboratory safes and can hardly be employed for education. Even laboratory

scientists may not be able to make heads or tails of these separate reports, and so the situation is essentially such that the *theory of boilers* is stored in the heads of several theoretical physicists.

Elucidating some question requires a personal conversation with the author of the corresponding project report.

This situation seriously hinders the education and development of our employees and, therefore, in my view, impedes the progress of work.

The only attempt to summarize the available material has been made by Prof. A Akhiezer and Prof. I Pomeranchuk, who have written a book on the main problems of the *theory of boilers*. This book is the first attempt to systematically outline the issues of neutron transport through substances, the determination of the main physical parameters of the *boilers*, and several other issues. It is extremely valuable and helpful, but the manuscript is stored in the archive of the Technical Council and no steps have so far been taken to publish it for internal administrative (restricted) use. This circumstance precludes the use of this book by either scientists or students.

It should be noted that the nonconfidential review concerned with *moderation of neutrons* has been published recently in America in the journal *Reviews of Modern Physics*. The material contained in this review almost completely repeats the text of the Chapter 1 in the monograph written by A Akhiezer and I Pomeranchuk.

This situation compels me to address you and formulate the problem of publishing—in confidential form—several textbooks on different issues of *atomic energy* production; first and foremost, I ask you to authorize the printing of the book by A Akhiezer and I Pomeranchuk for internal administrative (restricted) use.

Director of USSR AS Laboratory No. 3
Academician A Alikhanov”

F F Kuznetsov’s letter to N S Sazykin
on the issue of printing the book

Foundations of the Theory of Atomic Boilers [27, p. 549]

“1 November 1948
Top secret
(Special dossier)

To comrade N S Sazykin

With this cover letter I send you back the review “Foundations of the theory of atomic boilers,” written by Professors I Pomeranchuk and A Akhiezer.

The general structure of the theory of atomic boilers in the review is different from the general structural pattern of the theory outlined in each of the materials of the IC,²¹ but the exposition of separate problems, the sequence of expounding concrete problems of the theory of boilers and their formulation and solution coincide with the materials of the IC. The notation of physical quantities in the same formulas of the review and the IC materials are, as a rule, different, although there is an undesirable coincidence of the numbers of several formulas in the review with the numbers of identical formulas in the IC materials (for instance, formula No. (7.1) on page 43 in the review is identical to formula No. (7.1) on page 21 in material No. 251s).

²⁰ Isaak Yakovlevich Pomeranchuk (20.05.1913–14.12.1966)—a theoretical physicist, Academician of the USSR AS (beginning 1964). Born in Warsaw. In 1923, the family moved to Donbass. Graduated from the Leningrad Polytechnic Institute (1936) and then the postgraduate course in the Ukrainian Physical-Technical Institute (1936–1937). Worked in the Physical Institute of the USSR AS (1940–1943), in 1943–1946 headed a sector in the USSR AS Laboratory No. 2, and beginning from 14.12.1946 he headed the theoretical sector of the USSR AS Laboratory No. 3. From A I Akhiezer’s memoirs: “I got acquainted with Isaak Yakovlevich early in the autumn of 1935, when he came to Kharkov.... Landau immediately appreciated Pomeranchuk, or—as he would call him—Chuk. There was no escape from appreciating him, for he passed Landau’s famous ‘Theoretical minimum’ in several months (a record which has never been broken!)... We were separated by the war. At the end of the war I was in Moscow and worked in the MPEI (Moscow Power Engineering Institute). Chuk connected me with I V Kurchatov and asked him to engage me in his task; after a (rather long) clearance, I was taken on the staff as a coworker in Pomeranchuk’s sector.... After Chuk’s transfer from Kurchatov to Alikhanov, I—remaining a coworker for Kurchatov—returned to Kharkov.... Kurchatov himself asked me to do this” [22, pp. 69–77].

²¹ “The case in point is the Information Committee (IC) under the USSR Council of Ministers (CM), set up by the decree of the USSR CM of 30 May 1947...” [27, p. 551].

A comprehensive analysis of the review suggests that, when writing it, its authors extensively used the IC materials, although they did not copy them word for word. This is especially conspicuous in Chapters I and II of the review.

Considering the aforesaid, we believe that the publication of the book should be entrusted not to the USSR Academy of Sciences, but to the First Main Directorate of the USSR Council of Ministers, and that both parts of the book should be classified.

Annex: book in 228 pages, opinion letter on four sheets.

F Kuznetsov"

It was not until 2002 that the full text of this monograph was published without 'secret' restrictions. This is how A I Akhiezer subsequently described the events outlined above:

"The reasons for that were considerations of secrecy, although, strictly speaking, it contained no secrets..."

Due to family circumstances, Pomeranchuk moved from Moscow to Leningrad for some time. All book issues fell to me in Moscow, and one day I was summoned to see a general in charge of classified work. He takes a notebook out of his pocket and says: 'In your manuscript there is the formula $\Delta n = dn/dt$; where did you get it?' I explain that this is the conventional diffusion equation well known to all physicists, which is written in the form whereby the diffusion coefficient is assumed to be unity. The general asks: 'But why do you use the same notation as in my materials?' I answer: 'Even if you so desired, it would be impossible to think of another notation for this equation.' We said goodbye to each other, but I could see that the general was not satisfied with my explanation. He probably feared that the publication of our book would disclose some secret methods of obtaining special information.

*However, Igor' Vasil'evich Kurchatov permitted publishing several well-known manuscript parts of a general physical nature. These were the problems relating to the general theory of the nucleus. The question arose of how to title the publication. We could not name the book *The Theory of the Nucleus*, because the manuscript did not cover the entire nuclear theory. And we turned for advice to my brother Naum Il'ich. 'What should we name the book?' He jokingly advised not to rack our brains and follow Stalin's example, who named his book *Some Issues of Leninism*, and to entitle ours *Some Problems of the Nuclear Theory*. We agreed on that. The manuscript reviewers were Igor' Evgen'evich Tamm and Vladimir Aleksandrovich Fock. They wrote highly favorable reviews, and thus our first monograph, *Some Problems of Nuclear Theory*, appeared in 1948. This book played an important role in the education of nuclear physics theorists.*

*Our work in the area of slow-neutron scattering was in fact the starting point for subsequent investigations, during which it became clear that the phonon spectrum of crystals may be reconstructed from neutron scattering data. On the nomination by Lev Davidovich Landau and Mikhail Aleksandrovich Leontovich, the book *Some Problems of Nuclear Theory* was awarded an L I Mandelstam Prize of the USSR AS" [22, pp. 75, 76].*

Years have passed... "The unbreakable union of free republics" disintegrated...

Even after a lapse of more than half a century, Lev Borisovich Okun', an Academician of the Russian Academy of Sciences, emphasized that *"when similar documents of the Manhattan Project were declassified it turned out that many calculations done by Akhiezer and Pomeranchuk excelled similar calculations by Bethe and Wigner, who received*

assistance from Einstein: unlike the latter, they were performed analytically, and not only numerically" [22, p. 223].

It was not for nothing that the President of the National Academy of Sciences (NAS) of Ukraine, B E Paton, pointed out the following: *"On I V Kurchatov's request, in 1945 Aleksandr Il'ich returned from Moscow to the KhPTI again. Here he continued to work till the last days of his life. In the mid-60s, when the Institute of Theoretical Physics was being set up, Nikolay Nikolaevich Bogoliubov and I wanted take Aleksandr Il'ich with us to Kiev. But he would not move from Kharkov. He loved and highly appreciated his Kharkov"* [22, p. 226].

9. Post-war renaissance

*"Thanks to the activities of
A I Akhiezer and I M Lifshits,
a potent school of modern theoretical physics
was established in Kharkov."*

Academician B E Paton, President of the NAS of Ukraine

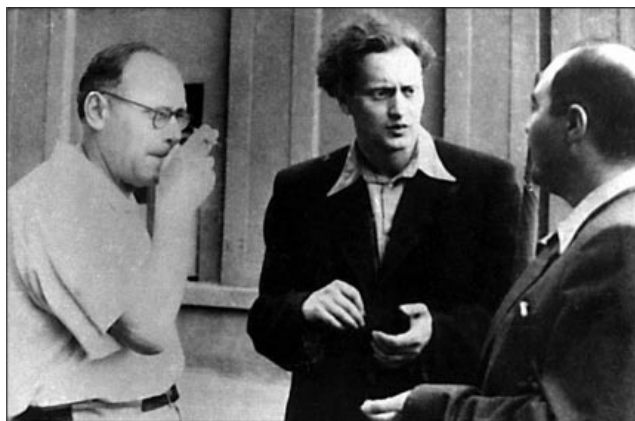
9.1 Aleksandr Il'ich Akhiezer

The formation and development of theoretical research at the Kharkov Physical-Technical Institute is associated with the name of Academician A I Akhiezer. Aleksandr Il'ich Akhiezer was the permanent Head of the Department of Theoretical Physics of the KhPTI for half a century — from 1938 till 1988.

As a supervisor, Aleksandr Il'ich was distinguished for his outstanding organizational capabilities: not only could he focus on a new scientific problem, but he could also fully realize an idea by rallying a team of enthusiastic scientists for the purpose.

Let us turn to the recently published reminiscences of Academician Viktor Grigor'evich Bar'yakhtar, one of the first pupils of A I Akhiezer, so as not to be inexact concerning the member composition of the theoretical departments of the KhPTI of those days:

"A very nice group gathered in A I Akhiezer's theoretical department (with the selection made by him, of course): apart from me, it comprised S V Peletninskii, P I Fomin (we all graduated in the same academic year, and now once again were in the same 'company' — members of the NAS of Ukraine), K N Stepanov, D V Volkov, and V F Aleksin (they graduated a year earlier).



During a break between the meetings of the out-of-town session of the UkrSSR AS at the KhPTI (Kharkov, 1956). Left to right: A I Akhiezer, Ya B Fainberg, I M Lifshits.



Participants of the out-of-town session of the UkrSSR AS in Kharkov (1956). Left to right: L N Rozentsveig, I M Lifshits, Ya B Fainberg, M I Kaganov, V L German.



International Conference on Nonlinear Phenomena (Kiev, 1984). Left to right: N N Bogoliubov, A I Akhiezer, Ya B Zel'dovich, V G Bar'yakhtar.

D V Volkov (who became an Academician of the NAS of Ukraine and, without any exaggeration, an outstanding theorist in the field of elementary particle physics) and V F Aleksin, regrettably, have gone to the best of all possible worlds, and K N Stepanov is a Corresponding Member of the NAS of Ukraine.

In the neighboring department headed by I M Lifshits (known to everyone as Il'mekh), graduates of the Nuclear Department — V I Gerasimenko, V V Andreev, E V Inopin, V V Slezov (the last moved there from the Leningrad Polytechnic Institute) — also worked” [29, p. 12].

Today, considering the secrecy nuances²² of that time, it is possible to only briefly outline the scientific heritage of A I Akhiezer and his scientific school.

In particular, the expert opinion concerning A I Akhiezer's running for Corresponding Member of the UkrSSR AS, which was signed by Academician Bogoliubov, goes as follows:

“Professor A I Akhiezer is an eminent Soviet theoretical physicist, who has made an outstanding contribution to the development of science. He is among the most active Soviet scientists working in the field of theoretical physics.

²² According to the reminiscences of Academician V F Zelenskii, Director of the KhPTI in 1981–1997, “...beginning in the mid 60s, the institute would make an increasing contribution to defense branches: nuclear, rocket, space, etc. The nature of defense research also changed qualitatively. While the institute was earlier involved only in the work aimed at the solution of Kurchatov's Program, now it has begun to work on the development, production and testing of new defense technologies in close contact with chief designers and manufacturers. As a result, the level of secrecy of the work rose sharply, as did the level of security requirements in their execution” [30, p. 501].

The nuances of the epoch according to N A Khiznyak's memoirs:

“After 1970, a start was made at the KhPTI on the development of space-based weapons in the framework of ‘Star Wars,’ and I was appointed supervisor of one of the lines of inquiry. It all began with a visit of high-ranking KGB (Committee of State Security) representatives who dotted their i's and crossed their t's.

I was told: (1) N A, in order to avoid any misunderstanding in the future, we ask you to rule out any attempts to go abroad, be it a business trip or a holiday. Such are the rules for all who are involved in classified research, and (2) we ask you to be highly cautious in the selection of friends and buddies...

There was no need to repeat these instructions. We worked in concord with KGB representatives as regards keeping secrets. We met and worked together as much as required in the interest of business” [26, pp. 174, 175].

He has performed about a hundred studies concerned with different problems of nuclear physics, quantum electrodynamics, and the theory of charged particle accelerators. Several arduous and witty investigations, which yielded fundamental results, made a significant contribution to the development of these problems and made his name well-known and authoritative to Soviet and foreign scientists.

Professor A I Akhiezer is one of the best Soviet theoretical physicists working in the area of the physics of the atomic nucleus and quantum electrodynamics. He is the author of first-class studies on the scattering of gamma-ray photons by nuclei and the diffraction scattering of nuclear particles. He has determined the feasibility of a new effect — diffraction splitting of a deuteron by nuclei.

A I Akhiezer is the author of pioneering works on neutron scattering in crystals, which gained special importance in connection with the problem of neutron moderation. Of major significance was his first work aimed at determining the critical reactor dimension with the inclusion of neutron moderation.

Special mention should be made of the work of Prof. A I Akhiezer and his disciples on the theory of linear charged particle accelerators and plasma theory...

A I Akhiezer is one of the USSR's leading plasma scientists, who obtained highly important results concerning the behavior of fast-particle beams in plasma and their stability, as well as



International Conference on Nonlinear Phenomena (Kiev, 1984). Left to right: A I Akhiezer, V G Bar'yakhtar, E M Lifshitz.

nonlinear plasma waves. Akhiezer's investigations on neutron diffusion and scattering and on diffraction scattering of particles were completed with the publication of the well-known monograph on nuclear theory, which was awarded an L I Mandelstam Prize of the USSR AS.

A I Akhiezer was one of the first USSR scientists to take up the problem of quantum electrodynamics; in particular, he is the author of the first studies on nonlinear electrodynamics.

His monograph on quantum electrodynamics is recognized as the best one in the world literature on this critically important area of theoretical physics. Of major importance is A I Akhiezer's investigation into quantum theory of ferromagnetism and the theory of kinetic processes in metals and dielectrics.

A I Akhiezer's research activities are closely related to the experimental²³ investigations performed at the PTI of the UkrSSR AS and other scientific institutions. This all shows the breadth of the scope of A I Akhiezer's work, which is characterized by topicality and a deep penetration into the physical nature of processes... [31, pp. 37, 38].

One cannot help admiring also the fortitude of Aleksandr Il'ich Akhiezer, which he displayed on receiving the irreparable blow of fate – complete loss of vision in 1995. Aleksandr Il'ich once said on this occasion: “Nikolay Nikolaevich Bogoliubov taught me that one may not complain of God or fate” [22, p. 268].

Also noteworthy is the fact that Aleksandr Il'ich was not only worried about science: he was sincerely worried about the fate of the country and his beloved Institute. Still remembered are his words said at the end of 1994: “*The Institute to which I devoted sixty years of my life has actually fallen to pieces. My heart aches for the Institute, but there's nothing you can do! Thank God, there still are several enthusiasts whom you can work with; otherwise, you ought to put an end to your life*” [22, p. 101].

And, nevertheless, Aleksandr Il'ich did not lose courage, did not give in to despair. Optimism in combination with a moral basis were inherent in his scientific school, as well.

9.2 Il'ya Mikhailovich Lifshits

In 1941, I M Lifshits became leader of the Second Theoretical Department at the KhPTI, and in 1968 P L Kapitza, Director of the Institute for Physical Problems of the USSR AS, made him an offer of honor to place himself at the position of Head of the Department of Theoretical Physics, which had previously been supervised by the Nobel Prize laureate L D Landau. It is possible to throw light upon the prehistory of this appointment using available documents.

²³ From Academician I V Kurchatov's article “Development of atomic physics in Ukraine” in the newspaper *Pravda* of 7 February 1960:

“In January of this year, as in the good old days, I spent several days at the KhPTI, which made me very happy...”

Due to the work of the Physical-Technical Institute of the UkrSSR Academy of Sciences in Kharkov and of the Physical Institute of the UkrSSR AS in Kiev in the field of research into nuclear reactions at colliding particle energies ranging from one up to a hundred million electron-volts, Ukraine presently ranks highest among the fraternal republics of our great homeland....

In the Kharkov Physical-Technical Institute, a start has been made on research into the main problem of modern science—the problem of controlling thermonuclear reactions. A successful solution to this problem will open up unprecedented prospects.

Controlled thermonuclear research at the Kharkov Physical-Technical Institute was commenced under the general scientific supervision of K D Sinel'nikov only one and a half–two years ago. During this short period, nevertheless, important theoretical and experimental investigations have been made into the properties of ionized plasma.”



Academician A I Akhiezer with his pupils, Academicians of the NAS of Ukraine. Left to right: Ya B Fainberg, A I Akhiezer, V G Bar'yakhtar, S V Peletminskii (Kharkov, the late 1990s).

From B E Paton to I M Lifshits [7, p. 732]

“July 1968, Kiev

Dear Il'ya Mikhailovich!

Today, after the meeting of the Presidium, Aleksandr Yakovlevich Usikov told me about your forthcoming move to Moscow. This will be an irretrievable loss for physical science in Ukraine. Your absence will also have an adverse effect on the state of the Kharkov Physical-Technical Institute. That is why I ask you to comprehensively ponder the situation. We would like to facilitate in every possible way the retention of your activities in Kharkov and to establish the most favorable conditions for your work. Please, let me know your opinion. If you happen to be in Kiev, it would be highly desirable to meet and openly discuss all these matters.

I look forward to hearing from you.

Sincerely yours,
B Paton”

From I M Lifshits to B E Paton [7, p. 733]

“July 1968, Kiev

Dear Boris Evgen'evich:

At the end of May I received an offer from Academician P L Kapitza to become supervisor of the Department of Theoretical Physics in the Institute for Physical Problems—the post which had been occupied by the late L D Landau. I replied to this offer in the affirmative, in principle, and enclose for you the copies of the letters which we exchanged.

I am closely related to the Physical-Technical Institute, where all my scientific life has been spent (since 1937), and to other Kharkov institutes, in which many of my pupils are working. I have never intended to break these ties, considering it necessary to jointly work out the optimal solution to the question of my transfer, and planned to meet you prior to undertaking practical steps.

On receiving your letter, I decided to set forth my viewpoint aside from a personal conversation with you, which I hope to have in the nearest future. I will not speak about the emotional aspect of the matter—I believe that the offer to take L D Landau's post at the Institute for Physical Problems is most honorable one for a theoretical physicist in the Soviet Union, and for me—his pupil—this is, naturally, not the least of the factors.

However, we are dealing with purely business considerations. For the last several years, in all my research work I have been actively and closely related to Moscow institutes and, first and foremost, to the Institute for Physical Problems. This relationship does not involve episodic contacts; it consists of my having spent almost half of my time in Moscow, working in the Institute for Physical Problems together with Moscow physicists, mathematicians, and, recently, biophysicists, as well. It is also pertinent to note that the major part of experimental investigations related to my work on the electron physics of metals was done in precisely the Institute for Physical Problems. Therefore, from the standpoint of the efficiency of my work, this transfer is undoubtedly absolutely natural and expedient.

The main question which arises in this case is related to the continuation of the work of my department in Kharkov. Needless to say, bringing up talented pupils and forming actively working teams are some of the most important aspects of the work of a scientist. Of the more than fifteen of my pupils who have defended or completed their doctoral theses, ten of them are now working in Kharkov academic institutes (six of them in the Physical-Technical Institute), to say nothing of a significantly higher number of Candidates of science. This alone firmly ties me to Kharkov and especially to the UPTI, where I have worked and lived all my life.

So, I believe that the main thing in the present situation is to work out the most acceptable and efficient form of continuation for my work in Kharkov, with the understanding that the permanent residence will move to Moscow. I am not able and do not want to solve these problems by myself — they should be solved together with you and the directorate of our Institute.

I am glad that I could discuss these matters precisely with you, and I do not doubt that we will be able to arrive at the most reasonable solution.

Respectfully, yours
I M Lifshits”

From I M Lifshits to P L Kapitza [7, p. 733]

“Dear Petr Leonidovich!

I received a letter from B E Paton, wrote an answer, and yesterday went to Kiev for the final conversation with him. The copies of our letters are enclosed; the results of our talks are as follows. Boris Evgen'evich agreed that the decision about our moving was justified, and he would not object to it. However, he insists that I remain the supervisor of my Kharkov Department for some time, with the commitment to come to Kharkov rather often, and that this fact should be fixed by a special resolution of the Presidium of the USSR AS.

B E believes that this is required not only for business, but also for justifying my decision to the leaders of Ukraine. He asked me to coordinate the preliminary text of this resolution with you, on the one hand, and the directorate of our Institute, on the other, and pass it him, so that he would have the resolution approved also by the... [Presidium of the AS of Ukraine — *Translator's comment.*]

He is upset by the present situation, and yet he understands the motives for my decision. I believe that there is plenty of time to coordinate different details and therefore I ask that this letter be considered a confirmation of my consent to get down to the practical realization of all steps to organize the forthcoming transfer.

Respectfully yours,
I M Lifshits”

From P L Kapitza to B E Paton [7, p. 733]

“20 August 1968

Dear Boris Evgen'evich!

In accordance with your request, I am sending you the draft of directions of the Presidium of the USSR AS concerning I M Lifshits's transfer to Moscow. This project has been coordinated with Il'ya Mikhailovich and meets your desire that he continue his work in Kharkov. We may jointly submit this project to the Presidium. By arrangement with Il'ya Mikhailovich, his work at the PTI of the UkrSSR AS will be effected by way of regular visits to Kharkov and the continuation of required collaboration.

Respectfully,
P L Kapitza”

Enclosed with the letter was the draft of directions of the Presidium of the USSR AS, which is appropriate to cite here:

“(1) *The Corresponding Member of the USSR AS I M Lifshits is appointed Head of the Department of Theoretical Physics at the Institute for Physical Problems of the USSR AS by way of transfer from the Physical-Technical Institute of the UkrSSR AS.*

(2) *By agreement with the USSR AS, the Corresponding Member of the USSR AS I M Lifshits is allowed to concurrently supervise the Theoretical Department of the PTI of the UkrSSR AS”* [7, p. 733].

Comment is superfluous here, for the archival documents are sufficiently informative by themselves.

10. Akhiezer Institute for Theoretical Physics at the NSC KHIPT of the NAS of Ukraine

“*To be or not to be.*”
Hamlet. William Shakespeare

In his reminiscences, Academician A I Akhiezer impartially covered — comprehensively and discreetly briefly — the central events of the prehistory of the Institute for Theoretical Physics at the NSC KHIPT of the NAS of Ukraine:

“*After Landau left Kharkov, the Theoretical Department was supervised by the author of these lines; after the war, another department was set up on its own, which was supervised by I M Lifshits.*

Now the former Landau's Theoretical Department is supervised by Academician S V Peletminskii, and in the National Science Center 'Kharkov Institute of Physics and Technology', the present-day name of the former UPTI, there are several theoretical departments, which are all integrated into a single Institute for Theoretical Physics” [32, p. 1025].

The establishment of the Institute for Theoretical Physics took place during the period of global social cataclysms: the disintegration of the USSR, hyperinflation, opaque privatization, growing unemployment, and dispirited financing of science...

Today, it is worth recalling some features of that Time of Trouble.

How did they get on at that time? Those years were very, very difficult. Some left science entirely in despair. Others, finding themselves in dire straits, had to emigrate in search of a better life. In those times, the emigration of first-rate scientists had a detrimental effect on domestic science centers.



Academicians of the NAS of Ukraine and the Nobel Prize Laureate Zh I Alferov (Kiev, The House of Scientists of the NAS of Ukraine, 2004). Left to right: First Vice President of the NAS of Ukraine A O Shpak, President of the NAS of Ukraine B E Paton, Academician Zh I Alferov, Vice President of the NAS of Ukraine A G Naumovets, adviser of the NAS of Ukraine V G Bar'yakhtar.

We cannot remain silent about the fact that many found themselves struggling for physical survival. Many could not do without maintaining a vegetable garden, because buying almost any food was a real problem. Scientists also had to plant on the areas of land allotted to vegetable gardens close to the institute. In particular, according to the reminiscences of Academician A I Akhiezer's daughter, "everyone—from laboratory assistants to doctors of science—planted potatoes. Everybody was trying to earn a little money somewhere. My father took it very hard. He worried about his collaborators and his beloved institute...."

AI felt very bitter: it was painful for him to think about the disintegration of the Soviet Union, the beggarly state of science, and the degradation of society" [22, p. 266].

However, the Institute withstood and managed to retain its unique scientific potential. For there remained optimists—those who were actually carried away by science. Justice should be done to their inexhaustible enthusiasm, enviable patience, and devotion to science.

And these are not all the pages of the chronicle of the Institute.²⁴ "But let us be modest," as Academician A I Akhiezer, whose name was given to the Institute for Theoretical Physics of the NSC KhIPT of the NAS of Ukraine in 2003, liked to repeat.

This article was written using materials from a doctoral thesis in history (scientific supervisor: Academician of the NAS of Ukraine V G Bar'yakhtar), which was prepared for defense, and monographs [23, 33–39].

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²⁴ For the accomplishments of UPTI physicists, see the recently published book Ref. [53]. (Editor's comment.)

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