

To the centenary of the birthday of Academician I.M. Lifshits

*To the 20-th anniversary of the foundation of A.I. Akhiezer
Institute for Theoretical Physics*

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“THEORETICAL PHYSICISTS – THIS IS A PROFESSION AND A VERY REQUIRED ONE”¹

On January 31, 1996, the Institute for Theoretical Physics of the National Science Center “Khar’kov Institute of Physics and Technology” (NSC KhIPT) of the NAS of Ukraine was founded (according to the Presidential Decree of 23 June 1993). Nowadays, the A.I. Akhiezer Institute for Theoretical Physics of the NSC KhIPT of the NAS of Ukraine is the only domestic historical bearer of a unique continuity in scientific schools and traditions of the more than 80-year “endurance”.

“Thanks to L.D. Landau and, after his departure for Moscow, due to A.I. Akhiezer’s and I.M. Lifshits’s activities, a powerful school of modern theoretical physics was created in Khar’kov.”

President of the National Academy
of Sciences of Ukraine Academician
B.E. PATON

Lev Davidovich Landau

Perhaps, on the eve of the centenary of the birthday of Academician Il’ya Lifshits, it is both fair and appropriate to emphasize that it was Lev Davidovich Landau who laid the cornerstone into the foundation of the Khar’kov scientific school of theoretical

physics. Aleksandr Il’ich Akhiezer, who was one of his first disciples in Khar’kov, reasonably put accents on the pages of the academic memorial anthology *Recollections of L.D. Landau*:

“In August 1932, L.D. Landau moved to the UPTI. He was 24 years old at that time, but he was already known throughout the world as a prominent theoretical physicist. This situation was favored by the fact that, in 1929–1931, he was sent to a scientific mission abroad and participated there in the workshops held by the famous physicists M. Born, W. Heisenberg, W. Pauli, P. Dirac, and, finally, none other than Niels Bohr. The intercourse with those top scientists was very active, and they soon got convinced of the power of Landau’s extraordinary talent. He even had a discussion with the great Einstein and tried to convert him into the ‘quantum-mechanical faith’, but he failed.

Landau was especially appreciated by Niels Bohr, who, from that time till Landau’s last days, classed him as one of his best disciples, whereas Landau regarded Bohr as his teacher².

Much later, Ivan Vasil’evich Obreimov told me that Landau was underestimated at the LPTI, and only he, Obreimov, knowing how talented Landau was, offered him the position of the Head of Theoretical Department at the UPTI, as well as a free hand in the training of young theorists and in the choice of scientific problems.

¹ From the own lips of I.V. Obreimov, the Director and founder of the UPTI: “Everybody ... believed that theoretical physicists are calculators, rather than thinkers. The expression ‘This should be calculated’ was typical of A.F. Ioffe. In essence, the theoretical analysis of a problem was reduced to that. Theoretical physicists, even the most leading ones, were treated indulgently by Abram Fedorovich. Of course, Ioffe himself was a thinker in physics. He realized that a true naturalist must be a thinker. However, he did not recognize that theoretical physicists – this is a profession, and a very required one” [2, p. 45].

² NB (the grateful Landau’s memory): “It’s sad to me when I think that I will never see his eyes, will not feel a pungent smell of tobacco smoke from his invariant pipe, and will not hear ‘Landau! Don’t swear, but criticize!’” (Komsomolskaya Pravda, 6 October 1965).

After Landau had moved to Khar’kov, the UPTI became one of the best world centers of physical science” [1, p. 46].

However, the Khar’kov period of Landau’s life lasted only five years, from 1932 to 1937. What and WHO forced Landau to leave Khar’kov became possible to be clarified owing to relatively recently released shorthand records of evidences given by the UPTI employees. Let us quote the most eloquent of them, keeping the style and the orthography of those years:

“Landau Lev Davidovich. By his political credo, he is a Trotskyist. With his Trotskyism ideas, which extol the people’s enemy Trotsky and slanderously characterize comrade Stalin, who ‘took Trotsky’s merits for his own’, Landau made a public speech at the House of scientists in Khar’kov in 1933. In scientific issues, Landau has an eclectic viewpoint, which is a mixture of idealism and mechanicalism, and he propagated those theories among the Soviet students at the KhSU and KhETI.

When Landau was denounced by the students as an idealist, and the administration of the State University demanded explanations from him, Landau organized a strike, participated by Shubnikov, Gorskii, Lifshits, Akhiezer, Brilliantov, and other scientific researchers of the UPTI, who concurrently lectured at the State University.

A similar strike was organized by Landau in 1933–1934 at the Khar’kov Mechanical and Machine-Building Institute. The strike was participated by Landau, Obreimov, Sinel’nikov, and others, whom I don’t remember...

Landau is an anti-Soviet person. He has been linking, since Leningrad and as a close friend, with Iwanenko, a counter-revolutionary, who has been deported from Leningrad by the NKVD after the Kirov assassination (Iwanenko is a son of the Editor of ‘Kievlyanin’), and with Gamow, a physicist, who denied to return back to the USSR from abroad.

Landau is one of the authors of a provocative fictitious order, which was put out in the UPTI in 1934 as a mockery of Slutskin’s laboratory. Landau was expelled from the professional union for his political hooliganism and, in Khar’kov in 1937, for a strike at the State University.

Hiding behind pompous phrases about ‘pure’ science and demonstrating contempt for all applicative, Landau spoke with those ideas at scientific confer-



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ences, public meetings, and, hence, he fulfilled a large piece of saboteur work...

Obreimov Ivan Vasil’evich is nobleman’s son. He has a brother abroad, who emigrated along with the Whites. A member of Landau’s counter-revolutionary group, ... Obreimov is an author of the notorious counter-revolutionary theory of ‘walk-through door’, according to which Soviet young specialists should not work at the UPTI for more than 1–2 years, but have to free their places to others. Only ‘super-elite’, high-skilled natural physicists have to work at the Institute...” [3, p. 264-265].

Aleksandr Il’ich Akhiezer

“A few members of our Academy – and not only ours – can be proud of such a large number of talented disciples.”

B.E. PATON

The name of Academician A.I. Akhiezer is associated with the further development of theoretic at the KhIPT. Alexander Ilyich Akhiezer was a longstanding head of the Theoretical Physics Department at the KhIPT for half a century, from 1938 to 1988.

Let us quote the recently published memoir notes of Academician V.G. Bar’yakhtar, who was one of the first Akhiezer’s disciples, in order to prevent inaccuracy in the personnel of theoretical departments of the KhIPT at that time:

“A very good team, besides me, was gathered in the theoretical department headed by Akhiezer (of course, according to his selection): S.V. Peletminskii



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and P.I. Fomin (we were all from the same course, and now we are in the same ‘company’ again: the members of the National Academy of Sciences of Ukraine), K.N. Stepanov, D.V. Volkov, and V.F. Aleksin (they were from the course a year earlier than ours).

Unfortunately, D.V. Volkov (who became an Academician of the National Academy of Sciences of Ukraine and, without any exaggeration, an outstanding theorist in the field of elementary particle physics) and V.F. Aleksin have gone to the best of the worlds, whereas K.N. Stepanov is a member of the National Academy of Sciences of Ukraine.

The other department headed by Lifshits (who was known to all as Ilmekh) also included graduates from the nuclear faculty: V.I. Gerasimenko, V.V. Andreev, E.V. Inopin, and V.V. Slezov (although the latter was transferred there from the Leningrad Polytechnic Institute)” [4, p. 12].

As a supervisor, Aleksandr Il’ich possessed unordinary managerial capabilities. He could not only get his collaborators interested in a scientific problem, but also maximally implement the idea by rallying a team of like-minded persons for this purpose.

Let us briefly outline the contours of the scientific heritage of Akhiezer’s school in the context of memoirs of Academician V.F. Zelenskii, who was the director of the KhIPT in 1981–1997:

“... Since the mid-1960s, Institute’s contribution to the defense industry domains – nuclear, mis-

sile, space, and others – has started to grow drastically. The character of defense works also changed qualitatively.

Earlier, the Institute was engaged only in the solution of the problems aimed at supplying the Kurchatov Program. Now it begins to work in a close contact with Chief designers and manufacturers on the development, manufacture, and testing of new models of military equipment.

As a result, the confidentiality level of works was drastically elevated, as well as the level of security requirements at their fulfilment” [5, p. 101].

One cannot help admiring the courage of Aleksandr Il’ich Akhiezer with which he met an irreparable blow of fate, the complete loss of vision in 1995. On this occasion, Aleksandr Il’ich one day said: “Nikolai Nikolaevich Bogolyubov taught me that one must not complain about God and destiny”.

Aleksandr Il’ich Akhiezer was a man of great spiritual power. His daughter, who was with him till the last minutes of his life, described those years as follows: “His mind remained young. Nobody could imagine my father as an infirm old man. His students and collaborators attended him several times a week. But that was not enough for him. He generated new thoughts and ideas faster than implemented the older ones. In such cases, my dad asked me to write down the main points. He performed complicated mathematical calculations in his mind...” [6, p. 268–270]. In this connection, one cannot help recalling the words said by A.I. Akhiezer, “I am ready to lose all my sense organs for only to recover the vision, at least in one eye”.

Of particular attention is the fact that Aleksandr Il’ich did not confine his interests only to science. He sincerely worried about the life of his state and his favorite institute. I still remember his words that he said in the late 1994, “The Institute, to which I gave sixty years of my life, virtually collapsed. My heart aches, but what to do! Thanks God that there are still a few enthusiasts, with whom something can be done...” [6, p. 101].

Yet, Aleksandr Il’ich did not lose heart and did not despair. His optimism together with his moral principles comprised a characteristic feature of his scientific school.

To all appearances, it was not in vain that the milestones of Akhiezer’s scientific school were marked by the President of the National Academy

of Sciences of Ukraine B.E. Paton, by using the names of symbolic persons: "Thanks to L.D. Landau and, after his departure for Moscow, due to A.I. Akhiezer's and I.M. Lifshits's activities, a powerful school of modern theoretical physics was created in Khar'kov. Among the disciples of Aleksandr Il'ich Akhiezer, there are Academicians V.G. Bar'yakhtar, D.V. Volkov, S.V. Peletminskii, A.G. Sitenko, Y.B. Fainberg, the Corresponding members of our Academy K.N. Stepanov and P.I. Fomin. A few members of our Academy – and not only ours – can be proud of such a large number of talented disciples."³ [6, p. 225].

Il'ya Mikhailovich Lifshits

"The works of Lifshits's group on the electron theory of metals are the most important in the world literature."

L.D. LANDAU, the Nobel laureate

In 1941, I.M. Lifshits became the Head of the second theoretical department of the KhIPT. In 1968, he received a proposal from Academician P.L. Kapitsa, the director of the Institute for Physical Problems, to head the Department of Theoretical Physics, which was earlier headed by the Nobel laureate L.D. Landau. The archival documents quoted below serve an illustration of the prehistory of this proposal.

From B.E. Paton to I.M. Lifshits (July 1968, Kiev):

"Dear Il'ya Mikhailovich,

Today, after the Presidium meeting, Aleksandr Yakovlevich Usikov told me about your future leaving



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for Moscow. This will be an irretrievable loss for the physical science in Ukraine. Your absence will have a very hard effect on the state of the Khar'kov Fiztekh as well. So I ask you very much to consider the current situation in detail. We are ready to promote the protection of your activity in Khar'kov as much as possible and the creation of the most favorable conditions for your work. I ask you very much to inform me your opinion. If you are in Kiev, it would be highly desirable that we meet and openly discuss all issues with you.

I am waiting for your reply.

Sincerely,

B. Paton" [8, p. 732]

From I.M. Lifshits to B.E. Paton (July 1968, Khar'kov):

"Dear Boris Yevgenievich,

In the late May, I received a proposal from Academician P.L. Kapitsa to take a position of the Head of the Department of Theoretical Physics at the Institute for Physical Problems, a position held by the late L.D. Landau. I replied to this proposal by my agreement in principle, and I enclose the copies of the letters that we had exchanged.

I am very tightly linked to the Physico-Technical Institute, at which all my scientific life had been running (since 1937), as well as with other institutions of Khar'kov, where a lot of my students work. I never intended to break those links. I consider the mutual generation of the optimal solution concerning the issue about the form of my transfer to be absolutely

³ Historical parallels involuntarily arise from the lips of L.D. Landau:

"I would like to talk about the development of theoretical physics...

Theoretical physics in our country had a special status. Before the revolution, our experimental physics in our country was rather good. Take Lebedev for instance. But theoretical physics was absent altogether...

This, modern, picture cannot be compared with that. During 30 years – and I was their contemporary – our theoretical physics was developed very much, and now it occupies one of the first places in the world. Not only qualitatively, but also quantitatively, it can compete with the US theoretical physics. Now theorists are available at all physical institutions...

The matter is much better in Khar'kov, where there exists a developed theoretical physics, with a lot of people working well. The groups of A.I Akhiezer and I.M. Lifshits can be mentioned..." [7, p. 1330–1331].

necessary, and I intended to meet with you before undertaking practical steps.

After receiving your message, I would like to inform you about my viewpoint, irrespective of our private conversation that I hope to have soon. I will not talk about the emotional side of this affair: I consider a proposal to take the position of L.D. Landau at the Institute for Physical Problems to be the most honorable proposal for a theoretical physicist in the Soviet Union. For me, his disciple, this is an important circumstance, of course.

However, the matter concerns purely business considerations. Over the past few years, my whole activity has been very actively and closely linked with Moscow institutions and, first of all, with the Institute for Physical Problems. This link is not reduced to occasional contacts, but, in practice, I am forced to spend almost half of my time in Moscow, working at the Institute for Physical Problems in cooperation with Moscow physicists, mathematicians, and, recently, with biophysicists. I would also like to note that the majority of experimental researches related to my works on the electron physics of metals, have been carried out at the Institute for Physical Problems. Therefore, from the viewpoint of the efficiency of my work, this transfer is undoubtedly quite natural and expedient.

The main issue that arises at that is associated with the continuation of the work of my department in Khar'kov. It is needless to say that I consider the training of talented students and the creation of active working teams as one of the most important aspects of the work of a scientist. Of more than fifteen of my disciples, who have already defended their doctoral theses or finished their preparation, ten people are now working at the Khar'kov academic institutions (six of them at the Institute of Physics and Technology), not to say about a much larger number of Ph.Ds. This fact alone strongly links me to Khar'kov and, in particular, the UPTI, where I lived and worked all my life.

Therefore, I considered that the main point in this situation was to work out the most appropriate and efficient form for the continuation of my work in Khar'kov, provided that Moscow would become the main base of my stay. I am not able and did not expect to solve those issues myself alone. They must be solved together with you and with the administration of our Institute.

I am glad that I could discuss those issues exactly with you, and no doubt that we will find the most reasonable solution.

With deep respect, yours

I.M. Lifshits" [8, p. 733].

A.I. Akhiezer Institute for Theoretical Physics

The next stages in the development of the Khar'kov school of theoretical physics were reflected very compactly in the mirror of memoirs of K.N. Stepanov, the Corresponding Member of the National Academy of Sciences of Ukraine:

"In the years to follow, the staff of theoretical departments at the IPT of the AS of the UkrSSR grew strongly. There appeared laboratories at the departments. In 1988, A.I. was appointed an advisor at the KhIPT directorate, ceased to be the administrative manager of the department, but remained the chairman of the Scientific and Technical Council. S.V. Peletminskii became the head of the department. At present, on the basis of two theoretical departments and in the framework of the NSC KhIPT, the Institute for Theoretical Physics has been created. The institute is headed by A.I.'s disciple N.F. Shulga, who fruitfully worked with A.I. for a long time" [6, p. 293].

The formation of the Institute for Theoretical Physics coincided in time with the critical period in the history of our country. V.F. Zelenskii, the director of KhIPT in those years, described the situation in that period as follows:

"When the USSR had collapsed, the KhIPT turned out in an extremely hard situation. The scope of its scientific problems was always connected with the Ministry of Medium Machine-Building Industry. The KhIPT administration was faced with two interrelated, extremely important, and urgent tasks. One of them consisted in that to stop the collapse of the Institute and preserve it as a large center of physical science, it was urgently necessary to find a place (a 'niche') for it in science and in the national economic complex of Ukraine...

During 1992–1996, four Presidential Decrees were issued, and two Resolutions and three Decrees of the Cabinet of Ministers of Ukraine were adopted concerning the Khar'kov Institute of Physics and Technology. The Presidential Decree about the special

support of six institutions, including the KhIPT, that were of scientific value for Ukraine was the first.

On July 23, 1993, L.M. Kravchuk signed the Presidential Decree about the transformation of the KhIPT into the National Science Center ‘Khar’kov Institute of Physics and Technology’. In accordance with this decree, the following institutions were formed on the basis of scientific branches:

- Institute for theoretical physics;
- Institute for solid state physics, materials science, and technology;
- Institute for plasma physics;
- Institute for high-energy physics and nuclear physics;
- Institute for plasma electronics and new acceleration methods;
- Scientific and research complex “Accelerator”;
- Scientific and technological complex “Nuclear Fuel Cycle”.

The NSC KhIPT is funded separately from the state budget of Ukraine.

The assignment of the status of the National Scientific Center – the status of the first and the only “National laboratory” in Ukraine – to the Khar’kov Institute of Physics and Technology is a recognition of the outstanding value of this large center of physical science for the present and the future of Ukraine” [5, p. 498–499].

The KhIPT theorists had a lot to go through and overcome. Not having withstood evident difficulties, the pessimists quitted work. There remained only optimists: those who really had an infatuation for science. We must pay tribute to their inexhaustible enthusiasm and enviable patience. Because science is a truly noble occupation, which is free of any pragmatic interests.

Illustrative and universal lessons can be learned from the memoirs of N.F. Shul’ga, the Director and founder of the Institute for Theoretical Physics of the NSC KhIPT, who underwent the action of all “first strikes”:

“After the collapse of the USSR, there emerged a very complicated situation at the NSC KhIPT. It was caused by the insufficient financing of scientific works. Researches on large physical installations – e.g., on the world-known 2000-MeV electron accelerator – were practically stopped.

The Institute library almost did not receive scientific literature, especially foreign journals. In winter-



The first theoretical conference



Theoreticians of KhIPT. From left to right: V.G. Bar’yakhtar, A.I. Akhiezer, S.V. Peletminskii, K.N. Stepanov, 1960s

time, it was impossible for the employees even to stay in the workrooms in their overclothes, to say nothing of working there. The activity of scientific seminars reduced significantly.

Moreover, the salary was very low. Sometimes it was less than five dollars a month. A lot of researchers were forced to take an unpaid leave. The employment of young specialists was ceased. The situation was especially difficult for theorists, because they had no opportunity to earn additionally.

Computer facilities only started to appear in the KhIPT. At the theoretical departments, there was one computer per approximately 10 scientists. As a result, some research workers left the Institute, whereas some others ultimately emigrated from Ukraine. However, the worst of all was that the relations between people became more strained.

Emergency measures had to be applied in order to preserve the high-skilled scientific personnel. To resolve the corresponding issues, the following actions were proposed. First, an opportunity had to be provided for the theorists of the NSC KhIPT to freely

transfer with their salaries into any department of the Institute for Theoretical Physics. Second, the existing theoretical laboratories of the NSC KhIPT had to be reorganized into scientific departments of the Institute for Theoretical Physics, provided that the requirements of the National Academy of Sciences of Ukraine were satisfied. Namely, the scientific problematics of theoretical laboratory could be retained, if a new department would include not less than ten employees, five of which had to be Ph.D or Dr.Sci. Those ideas were supported by a lot of leading researchers of the NSC KhIPT. Academician D.V. Volkov, who distinguished elements of currently emerging democracy in those unordinary proposals, was particularly active.

As a result of relevant measures, nine theoretical laboratories of the NSC KhIPT were reorganized into six research departments of the Institute for Theoretical Physics. The strain in the relations between the employees almost immediately disappeared, because everybody took a decision only for him/herself".

Nowadays, the development strategy for the newly created Institute for Theoretical Physics (hereafter, ITP) has already passed the test of time. The Institute managed to retain the challenging research directions and the continuity of the leading scientific schools of the UPTI-KhIPT.

The present day of the ITP, this is the development of challenging and advanced frontiers in modern physics, whereas its scientific ideology includes the continuity of the scientific traditions of the UPTI-KhIPT. These are some of them:

- the respectful attitude to the experiment;
- the participation in challenging scientific and engineering projects in Ukraine and abroad;
- the holding of the Institute and city scientific workshops;
- the training of young scientific staff;
- the pedagogical activity.

But the most important is that many young people became the employees of the Institute in recent years. Today, the teams of all scientific departments

of the ITP include highly talented and initiative young scientists, despite that the bygone years did not favor the inflow of youth into science. The fact that the relations between the employees are humanly kind and democratic helps very much.

The ITP is also open to a rational cooperation with world's scientific community. Here is a typical example. Yu.P. Stepanovskii, the leading researcher of the ITP, tells, "One day, my coursemate, who came from Dubna, had a report at the seminar. He was asked a lot of tricky, in my opinion, questions. After the seminar, I wanted to apologize to him, because the too inquisitive participants had worn him out a little. But I was late. 'You know, I'm so jealous of you. Never have I experienced such a benevolence with respect to me!' my coursemate said" [6, p. 301]. This is a very exact and pathos-free observation.

However, these are not all the pages from Institute's chronicle. "But let us be modest," as Aleksandr Il'ich Akhiezer liked to emphasize. In 2003, the Institute for Theoretical Physics of the NSC KhIPT of the National Academy of Sciences of Ukraine was named after him.

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