Materialist Perestroika of Quantum Dynamics and Soviet Ideology: Yakov Petrovich Terletskii (1912–1993)

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Abstract

Yakov Petrovich Terletskii (1912–1993), a professor in theoretical physics at Moscow State University wrote extensively on the "philosophical" issues of modern physics, particularly in the first half of the 1950s. Outside Russia, his name is rarely mentioned. Nevertheless, it is likely that he has been regarded as a "cat's-paw" of the ideological apparatus of the Marxist state. May we share such a view even now, in spite of the major changes in the historiography of Soviet science we have already seen in the last few decades? Thanks to the progress of the study based on formerly classified documents in various Russian archives, we see that the totalitarian model that had been applied to the understanding of Soviet society for a long time rapidly lost its popularity and was replaced with a more pluralistic view. This study reexamines and reevaluates the thoughts and activities of Yakov Terletskii from the viewpoint of today's understanding of the historiography of Soviet science. It provides a new analysis, connecting the global quest of physicists for a new approach to quantum dynamics to the local context particular to the Soviet Union.

Keywords: Yakov Terletskii, Modern Physics, Quantum Dynamics, the Copenhagen Interpretation, the Soviet Union, Ideology, Dialectical Materialism.

> Robespierrists! Anti-Robespierrists! For pity's sake, simply tell us what Robespierre was. [Marc Bloch, *The Historian's Craft*. trans. by Peter Putnam (Manchester: Manchester University Press, 1954), p. 140.]

1. Introduction

Independently from Ethan Pollock,[1] the author of this paper has taken notice of the consequences of an ideologically charged campaign under the guise of a series of academic "discussions" initiated in various fields of science in Postwar Soviet Union, as

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[1] Ethan Pollock, *Stalin and the Soviet Science Wars* (Princeton: Princeton University Press, 2006).

one of the important opportunity for the cultivation of "the Cold War climate" among Soviet physicists that objectively drove them to Cold War scientific and technological projects such as nuclear weapon development.[2] Soon after this "discussion" began in the field of philosophy in 1947, and then subsequently in the field of physics, Vladimir Kessenikh (1903–1970), Vasilii Nozdryov (1913–1995), and several other professors and teachers at the Faculty of Physics (Fizicheskii fakul'tet; Fizfak) of the Moscow State University (MSU), who called themselves "patriotic and materialistic physicists," launched an attack on leading physicists such as Grigorii Landsberg (1890–1957), Pyotr Kapitsa (1894–1984, a Nobel Prize laureate in 1978), and Igor Tamm (1895–1971, a Nobel Prize laureate in 1958), condemning them for their "idealism" and "cosmopolitanism or worship of foreign science."[3] What is astonishing here for the historians of science, especially of modern physics, is the fact that the physicists themselves, neither the philosophers nor the Party ideologues, criticized quantum dynamics for its "idealist distortion" of physics. However, could there have been any genuine physicists who were indifferent to quantum dynamics and the principle of relativity by the second half of the 1940s? Indeed, some "patriotic and materialistic physicists" only outwardly condemned "idealism" in physics.[4] Nevertheless, their criticism against the "idealist" nature of quantum dynamics was so heated that the exchange of words between them and the modern physicists they were accusing presented itself as "a kangaroo court." Among such accusers, Yakov Petrovich Terletskii (1912–1993), a professor at MSU in charge of theoretical physics, who produced a number of "philosophical" papers on modern physics,[5] attracts our attention. Although he

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[2] Ichikawa, Hiroshi, *Reisen to Kagaku-Gijutsu: Sorenpô 1945–1955* (*The Cold War*, *Science and Technology: The Soviet Union*, *1945–1955*) (Kyoto: Minerva Shobô, 2007). See Chapter 2 in this book (99–153): Here, Ichikawa demonstrates that the social background of this dispute was rooted in the jealousy and antagonism of a group of physicists against another group of physicists, which accumulated due to distortion in the Soviet academic regime before and during the war. In spite of that, the initiators had no further intentions other than ideological restraint and unification in the occasion of the outbreak of the Cold War. A large-scale "academic discussion" campaign beginning in 1947 with "the philosophical dispute" explosively released these complaints in ideological terms from some groups of scientists in a warped form.

[3] V.P. Vizgin, "Yadernyi shchit v "tridtsatiletnei voine" fizikov s nevezhestvennoi kritikoi sovremennykh fizicheskikh teorii," *Uspekhi Fizicheskikh Nauk*, vol. 169 (1999): p. 1372.

[4] For example, Sergei Vasil'ev (1904–1999), a professor at MSU and supporter of the "patriotic and materialistic physicists" in postwar academic "discussions," was in turn rebuked by the dean of the Faculty of Chemistry of MSU for his "double-dealing" attitude towards "idealistic" physical theories. Even while he outwardly condemned "idealism" in physics, he taught students the "idealistic" theories of Niels Bohr (1885–1962), Ernest Rutherford (1871–1937), Linus Pauling (1901–1994), and Erwin Schrödinger (1887–1961) in his lectures. [Rossiiskii gosudarstvennyi arkhiv sotsal'no-politicheskoi istorii (RGASPI). Fond (F.). 17, Opis' (Op.). 125, Delo (D.) 618. 176]

[5] Except for works categorized as "commentary," from 1948 to 1956 he published six articles for the journal, *Voprosy Filosofii*; (1) Ya.P. Terletskiy, "Zamechanie v diskussii o prirode fizicheskogo znaniya: Obsuzhdeniye stat'i M.A. Markova (Remark in the Discussion on the Nature of the Knowledge of Physics: The Discussion on the Paper by M.A. Markov)," *Voprosy Filosofii*, no. 3 (1948), 228–231; (2) Ya.P. Terletskiy, "Problemy razvitiya kvantovoi teorii (Problems of the Development of Quantum Theory)," *Voprosy Filosofii*,

was an able physicist, it would be hard to argue that his name is well known. In any historiography of modern physics, we have difficulty in finding his name[6] except within the works written in Russian.[7] However, Max Jammer's well-received work on the history and philosophy of quantum dynamics is comprehensive enough to mention Terletskii. His name is cited when Jammer refers to the early responses to the idea of a young American physicist, David Bohm (1917–92), who proposed a new approach to quantum dynamics (which I will discuss below). Terletskii was one of the first physicists to express his approval of Bohm's idea. Jammer states, "It is therefore not surprising that first favorable criticism of Bohm's idea came from those sources who for one reason or another sympathized with such ideological consideration."[8] As seen here, the thoughts and activities of Terletskii were associated with Soviet ideology.

Is such an interpretation still correct? In this study, by rereading the work of Terletskii, examining newly declassified documents and reviewing other materials, the author reexamines the thought and activities of Terletskii, who is apt to be assigned the role of a villain in the Soviet history of physics.

2. Life and Activities of Yakov Terletskii

To commemorate his 60th birthday, an article reviewing his career and academic contributions was issued in a bulletin, *Istoriya i Metodologiya Estestvennykh Nauk* (*History*

no. 5 (1951), 51–61; (3) Ya.P. Terletskiy, "Ob odnoy iz knig akademika L.D. Landau i ego uchenikov (On One of the Books of Academician L.D. Landau and his Students)," ibid., 190–194; (4) Ya.P. Terletskiy, "O soderzhanii sovremennoi fizicheskoi teorii prostranstva i vremeni (On the Content of the Modern Physical Theory of Space and Time)," *Voprosy Filosofii*, no. 3 (1952), 191–197; (5) Ya.P. Terletskiy, "Ob izlozhenii osnov spetsial'noi teorii otnositel'nosti (On the Presentation of the Foundations of the Special Theory of Relativity)," *Voprosy Filosofii*, no. 4 (1953), 207–212; (6) Ya.P. Terletskiy, "O vzaimoprevrashchayemosti elementarnykh chastits (On the Interconversion of Elementary Particles)," *Voprosy Filosofii*, no. 2 (1956), 164–166.

[6] For example, even Alexei Kojevnikov, who published a political and social history of Soviet physics, refers to his name only in the connection of the so-called "Copenhagen Mission" case (which I mention below) in which in 1945 Terletskii was dispatched to Copenhagen to obtain information on nuclear weapon development. See Alexei Kojevnikov, *Stalin's Great Science: The Times and Adventures of Soviet Physicists* (London: Imperial College Press, 2004), pp. 149–150. Slava Gerovitch, who attracted a lot of interest because of his fresh approach to the history of Soviet science, refers to the name of Terletskii in connection with his dismissal from the editorial board of the journal, *Voprosy Filosofii* (*The Problems of Philosophy*). See Slava Gerovitch, *From Newspeak to Cyberspeak: A History of Soviet Cybernetics* (Cambridge, Mass.: The MIT Press, 2002), p. 165.

[7] The name of Terletskii is often referred in the following works by Russian historians: Vizgin, "Yadernyi shchit ⋯ op. cit.; A.S. Sonin, "*Fizicheskii Idealizm*": *Istoria Odnoi Ideologicheskoi Kampanii.* Moscow, Fiziko-Matmaticheskaya Literatura, 1994; A.V. Andreev, *Fiziki Ne Shutyat: Stranitsy Sotsial'noi Istorii Nauchno-issledovatel'skogo Instituta Fiziki pri MGU. 1922–1954* (Moscow: Progress-Traditsiya, 2000), and others. They are cited here in this paper.

[8] Max Jammer, *The Philosophy of Quantum Mechanics: The Interpretations of Quantum Mechanics in Historical Perspective* (New York: Wiley-Interscience, 1974), p. 290. He also regards Dmitrii Blokhntsev's (1907–79) attempt to give new statistical interpretation to quantum dynamics as rooted in ideological reasons, saying, "In Soviet Russia where, as intimated earlier, Bohr's complementarity ideas were interpreted as an endorsement of idealistic philosophy and hence as incompatible with dialectical materialism the statistical interpretation was more favourably accepted as an alternative to the Copenhagen view." (ibid., p. 444).



Fig. 1. Yakov Petrovich Terletskii
Source: A.S. Sonin, "*Fizicheskii Idealizm*": *Istoria Odnoi Ideologicheskoi Kampanii.* Moscow, Fiziko-Matmaticheskaya Literatura, 1994.

and Methodology of Natural Sciences.) Vol. 17 [Physics], which was edited by the Section on the History and Methodology of Natural Sciences affiliated to the Academic Council of MSU.[9] Furthermore, when Terletskii passed away in 1993, the well-received physics journal, *Uspekhi Fifizicheskikh Nauk* (*The Successes of Physical Sciences*), edited by the Soviet Academy of Sciences, issued an obituary.[10] In 2002, a memorial conference was held on the occasion of his 90th birthday at the Peoples' Friendship University (Russkii Universitet Druzhby Narodov, RUDN) where he had worked for a large part of his career, and a material review of his life and activities was edited for this conference.[11] Today, thanks to these and other materials, we know about the life and activities of Terletskii.

The son of Pyotr and Anna, both school teachers, Yakov Terletskii was born in St. Peterburg, July 30, 1912. His father, Pyotr, engaged himself in an ethnographical study of the northern ethnic groups of Russia and later worked at the Nikolai Miklukho–Maklai Institute of Ethnography of the Soviet Academy of Sciences.[12] At this time in the Soviet

[9] "Yakov Petrovich Terletskii." *Istoriya i Metodologiya Estestvennykh Nauk.* Vol. XVII [Fizika] Izdatel'stvo Moskovskogo universiteta (1975), pp. 112, 212–215.

[10] "Pamyat' Yakova Petrovicha Terletskogo," *Uspekhi Fifizicheskikh Nauk.* vol. 164, no. 2 (February 1994), pp. 235–237.

[11] *Trudy Mezhdunarodnoi Konferentsii*, "*Nauchnye Chteniya*, *Posvyashchyonnye 90-letiyu Yakova Petrovicha Terletskogo*," 1–3 iyulya 2002 g. (Moscow, 2002). 17ss.

[12] Pyotr wrote a monograph on the northern ethnic groups of Russia; P.E. Terletskii, *Naselenie Krainego Severa* (*Inhabitants of the Far North*) (Leningrad, 1932).

Union, as a general rule, applicants for universities had to demonstrate experience of a working career. After his graduation from the Moscow Middle School No. 36, Terletskii worked at the Moscow Electrical Lamp Factory as an operator and took the Special Course in Electrical Engineering named after Leonid Krasin. In 1931, he entered MSU and specialized in physics, which was then undergoing a revolutionary reconstruction. In 1936, he went on to graduate school and there continued his studies: at first under Igor' Tamm (1895–1971, a Nobel Laureate in Physics in 1958) and then under Mikhail Leontovich (1903–1981). His first scientific paper, titled "On Critical Conversion of Quantum Dynamics to Classical Dynamics," was written as early as 1936 and appeared in an authoritative journal, *Zhurnal Experimental'nykh i Teoreticheskikh Fizik* (*Journal of Experimental and Theoretical Physics*, *ZhETF*), the following year.[13] He obtained a degree, "Candidate for Doctor,"[14] in 1939 with his dissertation "Hydrodynamics Theory of Brownian Movement" and was appointed as a research assistant in the Theoretical Physics Department at MSU. He was then promoted to senior lecturer, and then to associate professor (dotsent) at MSU. At the beginning of his career, his contribution to the strengthening of the Bohr–van Leeuwen Theorem on the impossibility of the explanation of magnetism in classical dynamics attracted the attention of many physicists around the world. [15] This young, promising talent was soon involved in the storm of the war.

The most important institutional framework, or the most fundamental and original feature of the development of sciences in the Soviet Union, was the fact that the Soviet Academy of Sciences was retained as a powerful organization for a long time, even into modern history. In contrast, in Western European countries such as France, England, and others, after the end of absolutism, the various academies of science evolved into more honorary organizations consisting of achieved scientists without any serious practical power. The Soviet Academy of Sciences, however, having long been proud of its overwhelming influence on the overall scientific development in the Soviet Union because of the affiliation of many advanced scientific research institutes and organizations under its banner, was a unique organization.[16]

Immediately after the outbreak of war between Nazi Germany and the Soviet Union

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[13] Ya. P. Terletskii, "O predel'nom perekhode kvantovoi mekhaniki v klassicheckuyu." *Zhurnal Experimental'nykh i Teoreticheskikh Fizik*, vol. 7 (1937), 1290–1298.

[14] This degree is now regarded as almost equivalent to a Ph.D. degree in Anglo-American countries. However, as it was very hard to obtain a doctoral degree in the Soviet Union, many academic researchers and teaching staff worked with the degree, "Candidate for Doctor."

[15] *Trudy* … op. cit. (note 11), p. 12. Therefore, in the Soviet Union, this theorem was also called "Bohr–van Leeuwen-Terletskii Theorem. ("Pamyat' …" op. cit. in note 10, p. 235.)

[16] See Hiroshi Ichikawa, ed., *Kagaku no Sanbô-honbu: Rosia/Sorenpô Kagaku Akademî ni kansuru Kokusai Kyôdô Kenkyû* (*The General Staff of Science: An International Joint Study on Russian/Soviet Academy of Sciences*) (Sapporo: Hokkaido University Press, 2016). This voluminous collective work was an attempt to trace the path along which Soviet science was developed and comprehensively clarify the historical factors behind the particular institutional framework of scientific development in the Soviet Union.

on July 22, 1941 many of the scientific institutes that had been concentrated in Moscow and Leningrad were evacuated to Kazan, Sverdlovsk (now Ekaterinburg), and other cities. In total, 85 organizations of the Academy were moved, and the research staff were then engaged in military-related research in the new cities where they were living. On the other hand, universities had not been able to grow their research capabilities in the Soviet Union; they were specialized only in their educational function at least in formal relationship. Nevertheless, after the failure of the Udarnik-style reforms in universities in the early 1930s, the evolution of universities from the mere educational facilities to research universities was pursued. Some universities succeeded in building their research capabilities to a certain extent despite the difficulties brought about by the Great Terror and others factors. However, the wartime evacuation of universities was conducted on the principle of formal, or conventional distinction between education and scientific research; with only the educational aspect of universities considered, their research functions were denied. Consequently, the disparity of research facilities between the Academy's institutes and universities was so enlarged that it could no longer be overcome. In the summer of 1941, MSU began evacuation. 68 professors, 58 associate professors and 39 assistants moved to Ashgabat, Turkmenistan and began lecturing in a building of a normal school that was still under construction. They had no time to settle down in their work in Ashgabat, before they were moved to Sverdlovsk in July 1942 because of improvements in the tide of the war. However, when only a small portion of MSU staff moved there, MSU began to return many staff to Moscow when the war situation further improved. They succeeded in returning on July 10, 1943. During these repeated removals, the professors and teachers, who very often escaped from Moscow with nothing but the clothes on their backs, lived in vacant rooms in students' dormitories as the former residents were sent to the war front. They did not do anything apart from giving lectures, and their research activities were suspended.[17]

Terletskii, who from 1939 onwards was interested in the acceleration of electrons by induced electromotive force, was invited to move from Ashgabat to Kazan by the Institute of Physics of the Academy (perhaps, on the recommendation of Leontovich). There he was engaged in the research of military-related subjects, perhaps related to the development of a betatron, an accelerator of electrons. As early as the beginning of 1942, he returned to Moscow together with Leontovich and began to work on a radar project that was being carried out under the leadership of Professor Semyon Khaikin (1901–1968), a professor at Fizfak in the underground rooms of MSU. Even with the pressure brought about by the war, he conducted theoretical work on the law of causality in quantum dynamics and accomplished his doctoral dissertation titled "Dynamic and

[17] See Hiroshi Ichikawa, "Soviet Physicists during the War: Jealousy, Discord and the Ideological Dispute," *Historia Scientiarum*, vol. 22, no. 3 (March 2013): 215–226.

Statistical Laws of Physics."[18] On obtaining his doctoral degree, he was promoted to full professor. Immediately after his promotion, he encountered a "super star" of contemporary physics, Niels Bohr (1885–1962, a 1922 Nobel laureate in Physics), albeit ironically.

According to the sensational memoirs of Pavel Sudoplatov (1907–1996), a veteran of Soviet foreign intelligence activities, whose reliability is doubtful, Lavrentii Beriya (1898–1953), then the People's Commissar of Internal Affairs and the chief governmental officer in charge of nuclear weapon development, dispatched Terletskii, newly recruited to the Division 'S'(Otdel 'S') of the People's Commissariat, to Copenhagen. Terletskii visited Bohr with a letter from Kapitsa, and interviewed Bohr twice. Sudoplatov wrote that Terletskii obtained the valuable information concerning the designs of nuclear reactors from Bohr.[19] However, the truth in this story is completely non-existent. In the last days of his life, Terletskii recalled that he did not obtain any useful information from Bohr.[20]

In November 1944, Igor' Kurchatov (1903–1960), the leader of the early Soviet nuclear development project, was ordered by the government to serve concurrently as a professor of MSU and lead the Department of Nuclear and Radiation Physics in MSU. More specialists of nuclear physics and nuclear technology were necessary for the development of nuclear weapons. Moreover, the government ordered MSU to establish a new institute for nuclear research. In the Soviet Union, universities were officially positioned as educational facilities and not allowed to conduct advanced research activities. The professors and teachers of universities were often afforded some opportunities for their research activities only by registering with a research institute. In 1922, on the basis of a predecessor established in 1904, the professors and teachers of the Fizfak established their research institute, the Scientific Research Institute for Physics (Nauchno-issledovatel'skii Institut Fiziki; NIIF) affiliated to the Faculty of Physics, to guarantee their approach to research. The institute for nuclear physics established in 1946 by a governmental proclamation was named the Second Scientific Research Institute for Physics (Vtoroi Nauchno-issledovatel'skii Institut Fiziki; NIIF-2) affiliated to the Faculty of Physics. While this second institute was full of young talent, NIIF (renamed NIIF-1) was dominated by several full-time professors and lecturers including Nikolai Akulov (1900–1976), Fyodor Korolyov (1909–1979), Makar Karasyov (1916–1979), Nozdryov and others. In opposition to the newly established institute, NIIF-2, they demonstrated their enthusiasm and ability for nuclear research by establishing a new laboratory for

[18] *Trudy* ⋯ op. cit. (note 11), p. 3.

[19] Andrei Sudoplatov, *Tainaya Zhizn' Generala Sudplatova: Pravda i Vymysly o Svoem Ottse* (Moscow: Olma-Press, 1998), pp. 124–125.

[20] Ya.P. Terletskii, "Operatsiya 'Doplos Nil'sa Bora,'" *Voprosy Istorii Estestvoznaniya i Tekhniki*, no. 2 (1994), pp. 37–39.

nuclear physics with Terletskii as the chair. However, the government set up an ad-hoc commission to inspect the qualifications and scientific performance of all MSU professors and teachers with Vyacheslav Malyshev (1902–1957), a minister in charge of the nuclear industry, as the chair. This commission, often called the Malyshev Commission, emerged after MSU students spontaneously protesting against the dominance of a number of incompetent professors and teachers at MSU. This "rebellion" occurred in a unique atmosphere of relief from fear and terror immediately after the death of the dictator, Iosif Stalin, and the arrest of Beriya, the former chief of the secret police. Consequently, at the conclusion of the Malyshev Commission, the government took the measure of exchanging some teachers of MSU with others and directed the close of NIIF-1 due to its outdated research equipment and research methods.[21]

Despite these adversities and difficulties on Fizfak, his own basis, Terletskii actively devoted himself to various theoretical subjects of physics. He foresaw the existence of the ionic composition of cosmic rays, using a model of particle acceleration induced by interstellar forces. He was also engaged in the solution to the new phenomenon of "magnetic accumulation," and he led the development of a method to obtain a super strong magnetic force by rapid (explosive) combustion of some metals in a magnetic field.[22]

All the biographies of Terletskii include that he worked for a theoretical section of an institute newly established in Dubna (then Novo-Ivan'kovo), a northern suburb of Moscow in the first half of the 1950s, concurrently with his jobs at MSU. At the time, there were two institutes in Novo-Ivan'kovo using large particle accelerators for nuclear research; The Hydro-engineering Laboratory (Gidrotekhnicheskaya Laboratoriya) and The Electro-Physics Institute (Electrofizicheskii Institut) of the Academy of Sciences. Terletskii was hired for the former.[23] Perhaps his knowledge concerning the methods of obtaining super strong magnetic field was needed.

Terletskii's study on some of the fundamental issues of quantum dynamics attracted the interest from another great figure of 20th century's physics, de Broglie (Louis–Victor

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[21] Ichikawa, ed., *Kagaku no Sanbô-honbu*, op.cit. (note 16), pp. 103, 130, and 135–136.

[22] "Pamyat' Yakova Petrovicha Terletskogo," op.cit. (note 10), p. 236.

[23] The first, the Gidrotekhnicheskaya Laboratoriya, which was renamed in 1953, Institut Yadernykh Problem (Institute of Nuclear Problems), and functioned as a subsidiary of Laboratoriya No. 2 (Laboratory No. 2), the core research institute for nuclear development, had a 500–700 Mega-electron-volt-class cyclotron operating in December 1949. The second, the Electrofizicheskii Institut, the construction of which began in 1951 and was completed in 1956, had a 10 Giga-electron-volt-class cynclo-fazotron (*fazotron* is a particular name used in the Soviet Union and Russia, standing for a cyclotron with high accelerating power). These two institutes were combined into a large-scale international research institution, Ob"edinyonnyi Institut Yadernykh Issledovanii (Joint Institute for Nuclear Research, OIYaI or, JINR), on March 26, 1956, and it was the counterpart to the European Organization for Nuclear Research (CERN, from its French initials), a joint institution for "Western Bloc" European countries. [V.G. Kadyshevskii et al., eds., *Dubna: Ostrov Stabil'nosti* (Moscow: IKTs-Akademkniga, 2006), p. 13]

Pierre Raymond, 7e duc de Broglie. 1892–1987, a Nobel laureate in physics in 1929). Terletskii was invited to the Institut Henri Poincaré on the recommendation of de Broglie and stayed for a year as a research fellow. Later, in 1971, he was afforded a full membership of the Swedish Royal Society of Science, Uppsala.[24]

Soon after his return to the Soviet Union from Paris, he made a decision that astonished those around him. After leaving a lecture[25] where he revealed the paradoxes of the principle of relativity as a parting gift, he left MSU where he had studied and worked for more than thirty years and moved to the Peoples' Friendship University (then, with the prefix "named after Patrice Lumumba"). This was a newly established university specifically for international students, mainly from Western countries and developing countries in Asia and Africa, educated in their various major subjects while concurrently learning the Russian language. Terletskii led the Theoretical Physics Department in the Faculty of Mathematics and Natural Sciences of that university. There, he led a relatively calm life, devoting himself to the training of younger physicists, like Vladimir Mirantsev (1934–), Yurii Rybakov (1939–), and others.[26] Before he passed away in 1993, he was interviewed by young historians such as Andrei Andreev on his checkered experiences such as the "Copenhagen Operation."[27]

There is no clear knowledge of when Terletskii became a member of the Communist Party. However, when the Party organization of the physics faculty was separated and became independent from the university as a whole on July 14, 1943, he was already a full member of the Party. Moreover, he was elected as a member of the Bureau, a leadership section of the basic Party organization[28] and so he could be called an "Old Bolshevik." According to his son, Aleksandr, who also taught at the Peoples' Friendship University, he had maintained his Party membership until the day of the dissolution of the Communists Party of the Soviet Union.[29]

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[24] "Pamyat' Yakova Petrovicha Terletskogo," op. cit. (note 10), p. 237.

[25] The contents of this lecture were later published as a monograph; A.P. Terletskii, *Paradoksy Teorii Otnositel'nosti* (Moscow: Nauka, 1965). This book was translated and published in English as *The Paradoxes in the Theory of Relativity* (New York: Plenum Press, 1968), and also translated by Masaki Hayashi into Japanese and published as *Sôtaisei Riron no Paradokkusu* (Tokyo: Tokyo Tosho, 1966).

[26] "Yakov Petrovich Terletskii," *Istoriya*⋯ op.cit. (note 9), p. 214. While he worked at Moscow State University, he taught Andrei Sakhrov (1922–1989) who was a Nobel Peace Prize laureate in 1975, Gersh Budker (1918–1977) who later became the first Director of the Institute of Nuclear Physics, the Siberian Branch of the Soviet Academy of Sciences, and others.

[27] Andreev, *Fiziki Ne Shutyat.* op.cit. (note 7), pp. 100, 106, 123, 133, 138, 162–163, 198, and 299.

[28] Tsentral'nyi arkhiv obshchectvenno-politicheckoi istorii Moskvy (hereafter cited as TsAOPIM), Fond (F.) 478, Opis' (Op.) 1, Delo (D.) 57. 4.

[29] Interview to Aleksandr Yakovlevich Terletskii, September 15, 2009.

3. Terletskii's Debut in the Philosophical Arena: Discord with Khaikin's *Mekhanika*

The textbook *Mekhanika* (*Mechanics*) written by Semyon Khaikin, a professor at MSU, was adopted by the Commission on Higher Education, affiliated to the Council of People's Commissars of the USSR, as a textbook for university students in physics faculties and for normal school students in physics and mathematics faculties. It was issued in 1940, with the official seals of the Commission on Higher Education attached. However, with the intensification of the war, it became difficult to continue publishing this textbook. When the situation improved and after the return of universities and other higher education facilities to Moscow and other cities in Europe, the State Technological Publisher proposed republication of this textbook in 1944. Khaikin prepared a second version of his textbook for the republication. Some of his colleagues at the Department of General Physics (in charge of the education of students in lower grades) where Khaikin himself worked reviewed the new draft. Party members like Professors Vladimir Karchagin (1887–1948), Samson Gvozdover (1907–69), and Efraim Reikhrudel' (1899–1992) took part in this review, together with Terletskii from the Department of Theoretical Physics. The first person to actively and openly denounce the draft and then lead the discussion was Terletskii. The Department of General Physics adopted the conclusion of their discussion. Furthermore, following a proposal of some Party members, the draft was sent to the Party organization of the faculty to be examined. After that moment, like a rolling snowball, the situation rapidly became more serious.[30] Although the discussion on Khaikin's draft was scheduled to be held at a Bureau meeting on January 19, 1945, it was postponed due to a delay in the preparation of a paper by Karchagin. On March 13, 1945, in addition to Karchagin, Terletskii and Vasilii Mikryukov (1904–1962) were also ordered to prepare a draft for the resolution of the Party assembly of the Faculty of Physics. On October 4, 1945, the Party assembly heard Khaikin's explanation of the matter, and a vote on the adoption or rejection of Khaikin's *Mekhanika* was held at the Party assembly on October 24, 1945. Twenty-six members supported the rejection of Khaikin's *Mekhanika* against nine oppositions and seven abstentions.[31]

Simultaneously, on that day another vote took place on the propriety of the

[30] A.S. Ilyushin, *Sud'ba knigi i cheloveka* (unpublished draft), pp. 45–47. The author cites from this draft with the permission of Professor Ilyushin. However, the commentary titled "Introduction" to Khaikin's letter dated May 25, 1945 to the Party's Central Committee reprinted in the periodical of the Vavilov Institute for the History of Natural Science and Technology of Russian Academy of Sciences includes similar content that can be seen in this draft by Professor Ilyushin. See *Issledovaniya*, *po Istorii Fiziki i Tekhniki* (2009–2010) (Moscow, 2011), pp. 214–224.

[31] TsAOPIM, F. 478, Op.1, D.92. 4, 6, 8b, 50b, 51b; Ilyushin, op.cit. (note 30), pp. 45–47.

elimination of Khaikin from the Party. However, only ten members supported this, while twenty two members opposed the proposal and nine members abstained from voting.[32] Why did the elimination of Khaikin become an issue to the Party organization concurrently with the criticism of his textbook? The criticism against Khaikin's *Mekhanika* was entangled with the problem of his application to join the Party. Nikolai Krementsov, a historian of science, suggests that the recruitment campaign of the Party, which was carried out on a large scale during the war, brought about a serious change in the composition of Party members and created a crack in the ideological uniformity of the Party because of the sudden increase in the number of new Party members.[33]

In July of 1943, while the wartime recruitment campaign of the Party was actively conducted, there were only thirteen full members and four candidates (applicants for full membership on probation) in the Faculty of Physics, MSU.[34] In January 1946, the numbers increased to 143 and 47, respectively.[35] Khaikin applied for Party membership in response to the Party's call while he was dispatched to a factory for technical assistance. On October 22, 1945, his promotion to full membership was examined at the Bureau of the Party of his faculty. However, meanwhile, he had been harassed in various ways by some old Party members. Khaikin was unable to contain himself and sent the Central Committee of the Party a letter on May 25, 1945 for fair deal.[36] Some old Party members who had been selected as Party members through a strict screening thought that the wartime recruitment campaign brought about a "popularization" of the Party and newly recruited members might often have low qualifications in ideological training and, eventually, might be somewhat contemptible. Furthermore, Khaikin was an "idealist" whose "worship to Machism" was pointed out.

Khaikin's petition for a fair deal was eventually effective, despite the Central Committee needing a long consideration. The memorandum to a Politbureau member, Georgii Malenkov (1901–88), dated January 8, 1946, jointly signed by the Chief of Propaganda and Agitation Section, Georgii Aleksandreov (1908–61), and the Chief of the Scientific Section, Sergei Suvorov (1902–94), concludes: "(The Commission, consisting of those who) never and nowhere had any occasion to learn philosophical issues and have never been referred to as major experts in the field of physics, with reckless valor to

[32] TsAOPIM, F. 478, Op.1, D.92. 53.
[33] N. Krementsov, *Stalinist Science* (Princeton: Princeton University Press, 1997), pp. 96–99.
[34] TsAOPIM, F. 478, Op.1, D.57. 1.
[35] TsAOPIM, F. 478, Op.1, D.114. 123.
[36] Professor MGU, kandidat VKP(b) s 1943 goda, Sekretaryu TsK VKP(b), tovarishchu G.M. Malen'kovu: kopiya Predsedatelyu VKVSh, tovarushchu S.V. Kftanovu.(Akhiv Muzei istorii fizicheskogo fakuliteta MGU. Delo S.E. Khaikina): For example, a party member, Professor Sergei Mraveiskii, told Khaikin that they would need to "prepare for a prayer to mourn" if Khaikin did not change his "idealistic" thought. Nozdryov, Secretary of the Party Committee in MSU, blamed Khaikin, saying that he made use of a factory where he was dispatched to as "a bypath," with his "idealism" unchanged.

speak on behalf of dialectical materialism, embarks on the standpoint so harmful to the principles of today's physics, defending their too simplified views on the process of scientific recognition. The error of the Party Committee also consists in that they trusted the complex theoretical problem concerning the evaluation of the book to the vote of the party assembly, most of which are incompetent members, including students and technical staff. The incorrect direction of the leadership of the party organization of MSU is not seen only in the case of Professor Khaikin. In recent years, there has been cultivated among young scientists, students and postgraduates of MSU a mood of arrogant and disparaging attitude toward important scientific centers of the country such as the Academy of Sciences of the USSR, to the scientific activities of old scientists and foreign scientists."[37] The secretary of the MSU Party Committee, Nozdryov, was dismissed from the post of member of the Moscow City Committee due to his mismanagement in this affair. The resolution on Khaikin's *Mekhanika* by the MSU Party Committee was withdrawn by the upper Party organization, and Khaikin returned to a normal Party life. The MSU Party Committee, which persisted in their position for a while, demonstrated their wish for a settlement. At a Party assembly on December 12, 1946, the Vice-secretary of the MSU Party Committee, Sergeev (his name and patronymic and other biographical details are unknown), reported: "The Party organization of the Faculty of Physics examined Khaikin's textbook, and Comrade Khaikin revised his draft and presented it to the Party Committee."[38]

What did our hero, Terletskii do during this time? Undoubtedly, it was Terletskii who had discovered the subordinate attitude of the physical "idealism" in the draft of the second version of *Mekhanika* by Khaikin, raised the issue to his colleagues, and gave the first impetus for mass criticism against Khaikin. The author looked through all the minutes and stenographic records of the meetings of the Party organization of the Faculty

[37] Rossiiskii gosudarstvennyi arkhiv sotsal'no-politicheskoi istorii (RGASPI). F. 17, Op. 125, D. 363, pp. 72–74.

[38] TsAOPIM, F. 478, Op.1, D.114. p. 163: Nevertheless, the beginning of the "Discussions" campaign, for the first time in the field of philosophy in 1947, reactivated a number of physicists at Fizfak. In this context, the *Mekhanika* of Khaikin again fell into the subject of discussion. Associate Professor of the Faculty of Physics, Fyodor Korolev, who had a poor background, moved to the university after his work in the railway service and the spinning mill, joined the Party in the campaign to recruit new Party members during the war in 1944. He wrote an article titled "On Methodological Errors in the Book of Prof. S.E. Khaikin, *Mekhanika*." This article published in *Uspekhi Fizicheskikh Nauk* (March 1949), is a stretch, finding fault with several poly-semantic words in the book of Khaikin which have "subjective" meanings along with objective ones, like "experience," "approval," etc. [F. A. Korolyov, "O metodorogicheskikh oshibkakh v knige prof. S. E. Khaikina *Mekhanika*," *Uspekhi Fizicheskikh Nauk* vol. 37 no. 3 (March 1949), pp. 388–394] This paper straightforwardly demonstrated that "patriotic and materialistic physicists" were not qualified to conduct philosophical debates. However, after the "Triumph" of the Lysenkoites at the August session of the All-Union Academy of Agricultural Sciences named after V.I .Lenin, no one could alter the situation, except for the self-criticism of Khaikin. Khaikin sent his own self-criticism, "O metodologicheskikh nedostatkakh moego uchebnika *Mekhnika* (On the Methodological Shortcomings of My Textbook *Mekhanika*)" to the editorial board of the journal *Uspekhi Fizicheskikh Nauk*. It was published in *Uspekhi Fizicheskikh Nauk*, 3 (1950), pp. 483–490.

of Physics of MSU from 1944 to 1951.[39] (Unfortunately, the documents issued from February 12 to October 7, 1948 were not available for technical reasons.) During this time, Terletskii was consistently a member of the Bureau (the leading organ of the lower Party organizations), except for the period from October 8, 1944 to October 24 1945, while he left the post of Bureau member because of "illness." Here we need to bear in mind that he was engaged in other activities, including his business trip to Copenhagen in November 1945. However, it is astonishing that until October 1945, for a long time, while the dispute on Khaikin's *Mekhanika* became serious, he remained silent on this issue. There is no reasonable explanation for this silence. He only broke his silence in the second half of 1948, on the occasion of the initiation of the discussion on the philosophical paper, "O prirode fizicheskogo znaniya (On the Nature of Physical Knowledge)"[40] by Moisei Markov (1908–94), a young member of the Institute of Physics of the Academy of Sciences (Fizicheskii Institut Akademii nauk im. P.N. Lebedeva).

4. Terletskii's Philosophical Quest: the Struggle with the "Copenhagen Interpretation"

Markov's paper, written on the persistent recommendation or, more precisely, the obstinate instigation of the outstanding Soviet physicist and authoritative scientific administrator, Sergei Vavilov (1891–1951), and published in the newly launched philosophical journal *Voprosy Filosofii* (*The Problems of Philosophy*), was welcomed by many physicists as a monumental work that reconciled quantum dynamics with Marxism. While in the 1930s, Boris Gessen (1893–1936) and others tried to provide a Marxist reinterpretation or justification of quantum dynamics,[41] their efforts were suspended by the Great Terror which involved Gessen himself. Also in an early day after the war (November 25, 1946), at an assembly dedicated to ideological problems in MSU, Rector, Il'ya Galkin (1898–1990), referred to "the danger of losing the advantageous position of materialist dialectics" for physicists and, at the same time, "the danger of underestimating quantum dynamics, a new and powerful mean to understand nature" for philosophers and appealed to his colleagues to take appropriate steps.[42] Dmitrii Shepilov (1905–1995), the Deputy Chief of the Propaganda and Agitation Section of the Party's Central Committee, realized the necessity to hold "the Physics Conference," when he read the paper written

[39] TsAOPIM, F. 478, Op.1, DD.75–226.

[40] M.A. Markov, "O prirode fizicheskogo znaniya," *Voprosy Filosofii*, no. 2 (1947), pp. 140–176. Later, this paper was reprinted in M.A. Markov, *Izbrannye Trudy* (*Selected Works*) (Moscow: Nauka, 2000), vol. 1, pp. 365–407.

[41] For example, see Boris Gessen, "K voprosu o problem prichinnosti v kvantvoi mekhanike (To the Question on the Problem of Causality in Quantum Dynamics)," in A. Gaaz, ed., *Volny Materii i Kvantovaya Mekhanika* (*Wave Motion of Matters and Quantum Dynamics*) (Moscow and Leningrasd, 1930), pp. 5–32.

[42] Tsenral'nyi munitsipal'nyi arkhiv Moskvy (TsMAM), F. 1609, Op. 2, D.189. 33.

by Markov.[43] As the initiator of the "Discussion" campaign, Shepilov assumed the more deepened understanding of physicists on the dialectic-materialist interpretation of modern physics, which could be obtained by reading Markov's paper, was the final target of "Discussion" in the field of physics.

Immediately after the publication of Markov's paper, however, a conservative philosopher, Aleksandr Maksimov (1891–1976), objected to it in a newspaper, *Literaturnaya Gazeta* (*Literary Newspaper*), regarding quantum dynamics as an "idealist distortion," arguing over so-called "measurement problem"(later, I mention)."[44] However, quite differently to before the war, quantum dynamics was already accepted by a wide range of physicists, and so he could not gain the approval of any physicists, apart from Terletskii.[45]

In quantum dynamics, the subject is the microcosm, and it is impossible to search for the momentum and the coordinates of matter simultaneously; the measuring device changes the impulse of the particle indefinitely while the manipulation device controlling the momentum of the matter and measuring it, changes the coordinates of the matter itself. This so-called "measurement problem" is the main focus of Markov's paper: "... and the old, classical and complementary concepts of 'momentum' and 'coordinates' of a particle can characterize the objects of the microcosm for us, but [they can do so… *Ichikawa*] only in connection with one of the apparatuses of two, this and that particular classes mutually exclusive one from the other."[46] "It is invariably found out that if the experiment could be set up in the best and most precise way, then, the experiment can afford only what the quantum theory predicts, taking into account the quantum nature of the interaction."[47] Thus, by affirming the objectivity and the lawfulness of each observed result unobtainable simultaneously, Markov warns his readers not to leap to "subjective terminology": "It is impossible to recognize simultaneously," "It is impossible to measure in principle," "For us, it is inaccessible," and so on. Nevertheless, he does not involve himself in the "Copenhagen Interpretation"; rather, he assumes it to be a premise.

Which point of his paper dissatisfied Terletskii? In his "discussion paper,"[48] where he first wrote about philosophical problems, he describes quantum dynamics thus: "(1). In quantum dynamics, classical (i.e., macroscopic) terms are widely used: such as 'coordinate,' 'pulse,' 'energy,' 'moment of momentum.' However, these concepts are

[43] V.D. Esakov, "K istorii filosovskoi diskussii 1947 goda," *Voprosy Filospfii*, no. 2 (1993), pp. 85–86.

[44] Maksimov published his article "Ob odnom filosofskom Kentavre (On One Philosophical Centaur)" in *Literaturnaya Gazeta* of April 10, 1948. In this paper, Maksimov uses formalist logic to assert that the microscopic world itself cannot be recognized objectively, because the physical conditions of particles are influenced by macroscopic equipment.

[45] Sonin, "*Fizicheskii Idealism.*" op.cit. (note 7), pp. 90–93

[46] Markov, *Izbrannye Trudy.* vol. 1, op.cit. (note 40), vol. 1, p. 377.

[47] Ibid., p. 396.

[48] Terletskii, "Zamechanie v diskussii o prirode fizicheskogo znaniya," op.cit. (note 5), pp. 228–231.

associated with other figures in quantum dynamics than in classical⋯ However, they also have direct reflections in experiments. (2). Quantum dynamics is a statistical theory, and there appears causality only in a form of probability. From a practical point of view, in the overwhelming majority of cases, we can be satisfied with the statistical results given by quantum dynamics⋯" Despite such a positive understanding of quantum dynamics, "the idealistic essence of the Complementarity Principle" was unbearable to Terletskii. According to Terletskii, any quantum dynamic calculation can be afforded its solution without the "Copenhagen Interpretation," which instead must be regarded as "a philosophical interpretation of the fundamentally new consequences in Machist spirit." Therefore, he had to object to Markov's paper, which "completely appreciated the role and purpose of the Complementarity Principle, which, following the bourgeois scientists, he [Markov⋯*Ichikawa*] laid on the basis for quantum-dynamic concepts."[49]

The Complementarity Principle is at the core of the Copenhagen Interpretation. Based on the Uncertainty Principle posed by Werner Karl Heisenberg (1901–1976, a Nobel Prize laureate in Physics in 1932), with this principle it is considered possible to search and describe every quantum dynamic objective by mutually complementing paired physical quantities, 'momentum' and 'coordinates' of a particle, 'time' and 'energy,' 'particles' and 'undulations,' which cannot be measured simultaneously. Important physicists of the twentieth century such as Albert Einstein (1879–1955, a Nobel laureate in Physics in 1921), Erwin Schrödinger (1887–1961, a Nobel Prize laureate in Physics in 1933), de Broglie and others had expressed their objections, doubts, or alternatives to the Complementarity Principle. They claimed that it seems to have cast "causality" out of natural science; however, despite this, they could not succeed in their trials of overcoming the Complementarity Principle.[50]

It is believed that the most important philosophical work of Terletskii is a paper titled "Problemy razvitiya kvantovoi teorii (The Problems of the Development of Quantum Theory)," published in the journal *Voprosy Filosofii*, No. 5, 1951 (51–61). This paper was republished in the collection of papers edited by Maksimov, Terletskii and others, under the title *Filosofskie Voprosy Sovremennoi Fiziki* (*Philosophical Problems of Contemporary Physics*).[51] Here, he concentrates on criticizing the Complementarity Principle[52]: "Unfortunately, the materialist perestroika and the further creative development of quantum theory are largely inhibited by the position taken by some of our

[49] Ibid., p. 229.

[50] See Jammer, op.cit. (note 8), especially pp. 20–251.

[51] A.A. Maksimov, Ya.P. Terletskii, i N.F. Ovchinnikov (Ed.), *Filosofskie Voprosy Sovremennoi Fiziki* (*Philosophical Problems of Contemporary Physics*). Moscow: Izd-vo AN SSSR, 1952.

[52] In other papers of him, he also argues about the philosophical problems concerning the theory of "space" and "time," the special theory of relativity and others. However, so as to concentrate the consideration to the Copenhagen Interpretation as the core problem, I omit these problems here.

leading theoretical physicists [Here he refers to a prominent Soviet physicist, Vladimir Fok (1898–1974).—*Ichikawa*], who are trying to revive the Complementarity Principle thrown out by Soviet science."[53] At the same time, he expresses his sympathy for the proposal of the possibility of a new interpretation of quantum dynamics based on the theory of statistical ensembles posed by Dmitry Blokhintsev (1907–79). He wrote, "The interpretation of quantum dynamics as the theory of statistical ensembles is in harmony with dialectical materialism."[54] According to Max Jammer, a statistical ensemble interpretation, or briefly a statistical interpretation on quantum theory can be defined as "an interpretation according to which the state vector provides a description not of the individual system but of an ensemble of identically (or similarly) prepared systems."[55] Blokhintsev "defined ensembles as (ideally) infinite sequences of identical microsystems each of which is found in the same macrosetting *M* (set of macroscopic bodies such as collimating slits, magnetic analyzers); the macroenvironment somehow determines the state of motion, or simply the "state," of the microsystem."[56] It is certain that Terletskii found it possible to secure "objectivity" in quantum dynamics by means of such an approach.

The alternative proposal by de Broglie to the Copenhagen Interpretation was sharply criticized in the Solvay Conference on Physics in 1927 and after that de Broglie himself accepted this interpretation. However, almost a quarter of a century later, in 1951, the young American physicist, David Bohm proposed a new approach to quantum dynamics, somewhat similar to de Broglie's approach. His approach which was based on a new concept of the "quantum potential" retained several classical characteristics.[57] His proposal initiated a discussion on the Copenhagen Interpretation among leading physicists around the world. Later, in 1958, Terletskii expressed his sympathy and anticipation for the new approach of David Bohm in his long commentaries, which he contributed to a large-scale conference on philosophical matters, the All-Union Conference, "Filosofskie Voprosy Sovremennogo Estestvoznaniya (Philosophical Problems of Contemporary Natural Science)," held in 1958[58].

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[53] Terletskiy, "Problemy razvitiya kvantovoy teorii," op.cit. (note 5), p. 52.

[54] Ibid., p. 52: Such a reinterpretation of quantum dynamics based on the theory of statistical ensembles, however, could not replace the Complementarity Principle eventually [Jammer, op.cit. (note 8), pp. 439–469].

[55] Ibid., p. 440.

[56] Ibid., p. 446.

[57] Helge Kragh, *Quantum Generations: A History of Physics in the Twentieth Century* (Princeton: Princeton University Press, 1999), p. 207.

[58] Ya.P. Terletskii, [obsuzhdenie dokladov (Discussion on the Presentations)], in P.N. Fedoseev et al., eds., *Filosofskie Voprosy Sovremennogo Estestvoznaniya* (*Philosophical Problems of Contemporary Natural Science*) (Moscow: Izd-vo AN SSSR, 1959), pp. 384–392. This Conference was a monumental event in the Soviet history of science. In the end of the conference, each presenter was requested to give his or her "presenter's remark at closing the conference." In his "remark" which would be often cited as a landmark statement, a prominent mathematician, Sergei Sobolev (1908–1989) declared on behalf of all the Soviet scientists, their

5. Conclusion

The name Yakov Petrovich Terletskii was notable among Japanese intellectuals in the early 1950s. According to the recollection of a Japanese prominent philosopher and historian of science, Professor Emeritus of St. Andrew University, Kunio Gotô (1930–),[59] immediately after the 1951 publication of David Bohm's paper, which attempted a new interpretation of quantum dynamics in accordance with causality, several physicists mainly around Nagoya University were very interested again in the interpretation problem of quantum dynamics. On that occasion, they also examined and argued the trend of thoughts and arguments coming from the Soviet Union. One such physicist, Takashi Sugawara (1920–?), then an assistant professor at Nagoya University, who knew the Russian language well, translated some papers included in a voluminous collective work on the philosophy of science, *Filosofskie Voprosy Sovremennogo Estestvoznaniya*, and presented them to his colleagues. Although a paper on provability written by Aleksandr Khinchin (1894–1959)[60] attracted the most attention, the philosophical position of Terletskii[61] in the discussion of contemporary physics in the Soviet Union also attracted the interest of the physicists involved in the discussion.

Terletskii, as a zealous Communist, probably felt sympathy for Ludwig Boltzmann (1844–1906) who defended his "materialistic" position in the dispute between the two viewpoints on matter, "*Energetik*" and "*Atomistik*," and David Bohm, who was once a member of the Young Communist League USA and was expelled from the United States during the anti-communist campaign of McCarthyism. However, he rarely quoted the works of Marx, Engels, and Lenin. In the "culture" particular to the Soviet Union in which even serious scientific quests appeared under the disguise of an ideological argument, he might have referred merely to "objectivity," "causality," and "lawfulness" by the terms and jargons of dialectical materialism. In essence, his quest for overcoming the Principle of Complementarity came from his serious real physical quest, despite his ideological shell. Many great physicists such as Einstein, de Broglie and others, also looked for other ways from the Complementarity Principle. Only after a time delay, did Terletskii share the same viewpoint as these great physicists. In this aspect, his quest was one of global trials and efforts. In this meaning, his argument or opposition on the

refusal of any interference from the side of philosophers, saying, "We cannot divide physics into materialistic and idealistic physics. We cannot say that this atomic bomb is materialistic, but that one is idealistic, that this accelerator of elementary particles is idealistic, and that one is materialistic." (ibid., p. 573)

[59] K. Gotô's electronic mail to the author dated on June 18, 2017.

[60] A.Ya. Khinchin, "Metod proizvol'nykh funktsii i bol'ba protiv idealisma v teorii veroyatnosti (Method of Random Functions and the Struggle against Idealism in the Theory of Provability)," in Fedoseev et al., eds., *Filosofskie Voprosy*, op.cit. (note 58), pp. 522–538.

[61] Ya.P. Terletskiy, "Problemy razvitiya kvantovoi teorii (Problems of the Development of Quantum Theory)," in ibid., pp. 432–444.

Copenhagen Interpretation of quantum dynamics is not so worth newly reexamining.

From such a position, he was dissatisfied with Khaikin's textbook and Markov's paper and put straight-forward questions to his colleagues. Even any archival document keeps silence about Terletskii's real sentiments. It can be said objectively that he didn't participate so actively in the emotional offensive by Fizfak professors against the leading physicists and kept a distance from anti-cosmopolitanism campaign. It seems to me that he immediately felt disgusted when he learned that his questions had been used as an outlet for the frustration and dissatisfaction of his colleagues, most of whom were unworthy of historical memory.

In subsequent publications, Terletskii no longer mentioned so actively on his opposition against the Copenhagen Interpretation. It must be taken into consideration that an atmosphere of a certain relief from the political pressures in the "thaw" after the death of the dictator Iosif Stalin made the ideological arguments fall off considerably. In addition to this, he was dismissed from the editorial board of the journal, *Voprosy Filosofii*. His publications in the post-Stalinist era became more of 'commentaries' for the readers of the journal, *Voprosy Filosofii*, and other amateurs rather than philosophical essays.[62]

Yakov Petrovich lived honestly to himself in the Soviet era, which ended earlier than his life, contrary to his expectations.

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[62] For example, two of his papers cited in note 5, and numbered (5), (6) assume a character as a commentary. However, in one of his last philosophical writings published in 1963, Terletskii tried a philosophical problem of contemporary physics, treating positively with the new theory on the structure of an atomic nucleus which was pioneered by the pioneering study on electron scattering in atomic nuclei lead by Robert Hofstadter (1915–1990, a Nobel Prize laureate in Physics in 1961). [Ya. P. Terletskii, "K voprosu o prostranstvennoi structure elementarnykh chastits (To the Problem on Spatial Structure of Elementary Particles)," in I.V. Kuznetsov and M.E. Omel'yanov, eds., *Filosofskie Problemy Fiziki Eletarnykh Chastits* (*Philosophical Problems of Elementary Particles*) (Moscow, 1963), pp. 100–108] As for the study of Hofstadter, see, Kragh, op.cit. (note 57), pp. 282–283.