Physics – Uspekhi **66** (2) 213 – 214 (2023)

PERSONALIA

PACS number: **01.60.+q**

In memory of Lev Petrovich Pitaevskii

DOI: https://doi.org/10.3367/UFNe.2022.12.039307

A remarkable scientist, a full member of the USSR Academy of Sciences (later the Russian Academy of Sciences, RAS), an honorary member of the Italian National Academy of Sciences, one of the worthiest representatives of the Landau school, Lev Petrovich Pitaevskii, has passed away. The tradition of universalism, characteristic of Landau, was interrupted with his departure, where one person possessed an incredible combination of encyclopedic knowledge and vast memory that enabled him to embrace all branches of physics and its applications in a comprehensive viewpoint. This universal approach formed a foundation of the world-renowned course in theoretical physics by Landau and Lifshitz. The work on this course was tragically interrupted in 1962 by a car accident which put an end to Landau's scientific activity. V M Berestetskii, E M Lifshits, and L P Pitaevskii resumed and completed this noble work. Pitaevskii was the only remaining disciple of Landau's, who inherited his teacher's universal approach.

Lev Petrovich Pitaevskii (LPP) was born on January 18, 1933. He was educated at Saratov State University, where his father Petr Ivanovich was a professor in and later Dean of the Industrial Department. As a student, LPP passed the complete set of tests in the Landau Theoretical Minimum, and Landau was so impressed that he immediately invited LPP to join his group as a graduate student. The postgraduate study lasted from 1955 to 1958. During this time, LPP obtained several important results in the theory of quantum liquids. Among them was the classical study of the properties of the superfluid ^{4}He spectrum near its end point. The inevitability of the transition of the liquid isotope ^{3}He into the superfluid state was asserted and the possible temperature of such a transition was assessed.

In 1956, Lev Petrovich married his fellow student at Saratov University, Lyubov Lazarevna Lukashinskaya. Soon, their son Vladimir was born. Their marriage was lasting and happy. Lyuba, as all their friends called her, managed to create a warm, hospitable atmosphere at home, where Lev felt comfortable and supported in his work.

From 1958 to 1960, LPP continued his scientific carrier at IZMIRAN (now Pushkov Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation RAS) in the city of Troitsk, Moscow region. Here, he seriously took up plasma physics for the first time. He could not get a position as a researcher at the Institute for Physical Problems (IPP, now named after P L Kapitza) because he did not have a Moscow residence permit, i.e., official permission for permanent residence in Moscow. The obstacle was overcome by P L Kapitza. During a meeting of state leaders with scientists in 1960, he told Nikita Khrushchev that now Lomonosov would not be able to move to Moscow because of a residence permit. Khrushchev promised to solve the problem, provided that he saw the new Lomonosov. So, LPP was placed at IPP, as Lomonosov from Saratov, and climbed the ladder from a junior to a chief researcher, and from 1988 to 1992 was the head of the Theoretical Department of the Institute.

Lev Petrovich Pitaevskii
(18.01.1933–23.08.2022)

In 1976, LPP was elected a corresponding member and in 1990 a full member of the USSR Academy of Sciences.

In 1998, LPP was invited by the University of Trento (Italy) to collaborate with the group of Professor Sandro Stringary. Here, he lived the rest of his life, visiting Russia regularly mostly during sessions of the Russian Academy of Sciences as long as his health permitted. During one of these visits, a tragic car accident occurred, killing his wife Lyuba.

LPP's scientific heritage is great and diversified. In the scientific world, the Gross–Pitaevskii equation is known, which regulates the motion of the superfluid component (condensate) of a weakly interacting Bose–Einstein gas.

Uspekhi Fizicheskikh Nauk **193** (2) 227 – 228 (2023)
Translated by A N Tsaplin

Other widely known work by LPP carried out in collaboration with E M Lifshitz and I E Dzyaloshinskii is the theory of Van der Waals forces in dispersive media (see *Usp. Fiz. Nauk* **73** 381 (1961); *Sov. Phys. Usp.* **4** 153 (1961)). In this work, the forces acting on the surface of a limited sample of a dispersive medium as a result of electromagnetic field fluctuations are expressed as functionals of the dielectric permittivity function $\varepsilon(\omega)$ depending on the frequency ω.

The third series of LPP's studies deal with plasma physics. Many of these studies were performed together with Ya L Alpert and A V Gurevich, which were dictated by the advent of artificial Earth satellites. It had to be clarified how their orbits and stability changed under the effect of plasma wind, that is, forces acting on a satellite in ionospheric plasma perturbed by its motion. The theory of such processes was elaborated in detail by L P P and his co-authors and published in the book by Ya L Alpert, A V Gurevich, and L P Pitaevskii, *Cosmic physics with artificial satellites* (Moscow: Nauka, 1964) based on a well-known review (see *Usp. Fiz. Nauk* **79** 23 (1963); *Sov. Phys. Usp.* **6** 13 (1963)). The results of later studies of the same subject were published in a review by A V Gurevich, L P Pitaevskii, and V V Smirnov (see *Usp. Fiz. Nauk* **99** 3 (1969); *Sov. Phys. Usp.* **12** 595 (1970)).

At that time, the center of LPP's interest shifted to plasma perturbations whose profile does not change when moving in the plasma, i.e., to solitons. In the paper by A V Gurevich and L P Pitaevskii, "Simple waves in rarefied plasma kinetics" (see *Zh. Eksp. Teor. Fiz.* **56** 1778 (1969); *Sov. Phys. JETP* **29** 954 (1969)), the authors applied the exact soliton solution to the Korteweg De Vries equation, found in the foundational 1967 paper by Gardner et al., to rarified plasma, tracing how solitons arise and move from the original plasma cloud.

In a large series of studies by LPP with S Stringari and other co-authors, including many experimental studies, processes were examined in clouds of alkali and alkaline-earth metal atoms, laser-cooled to temperatures below 10^{-6} K, when their De Broglie wavelength is comparable to the average interatomic distance and the gas becomes quantum. The results of these studies are included in the monograph *Bose–Einstein condensation* (Pitaevskii L P and Stringari S (Oxford: Oxford University Press, 2003)).

Among such diverse, intensive, and laborious activity, L P P found time to complete the great program of Landau and Lifshitz to create a course of modern theoretical physics, and update and republish it: from 1968 to 1985, together with E M Lifshitz, and after his death, he continued this great work by himself. It is to him that physicists around the world are obliged for the fact that on their shelves there are volumes of a course incomparable to any other in its breadth of coverage, the depth and the unified viewpoint, the brevity and beauty of the mathematical framework. New volumes of the course, in which L P P's authorship is either whole or shared, are volumes IV, IX, and X. Presented in volume IV, *Relativistic quantum field theory*, written together with V B Berestetskii and E M Lifshitz, is the unified Weinberg–Glashow–Salam theory of electroweak forces and an introduction to chromodynamics. Special attention is paid to Feynman–Schwinger–Tomonaga quantum electrodynamics.

Volume IX is *Statistical physics* II, presenting the techniques of Green's functions in statistical physics and their application to the problems of Landau's theory of normal and superfluid Fermi liquid, to Bose liquid and quantum weakly interacting gases, to the properties of metals, semiconductors, and dielectrics, and to the theory of critical phenomena. Volume X is devoted to physical kinetics. This is a unique book, considering the kinetics of atomic gases and plasma, the kinetics of electrons and phonons in metals, semiconductors, and dielectrics, quantum kinetic Keldysh–Schwinger equations, and the fundamentals of mesoscopy. A mere list of subjects considered in the book impresses with its coverage and variety. The high pedagogical and scientific levels of each section are amazing.

Lev Petrovich Pitaevskii was an author in the journal *Uspekhi Fizicheskikh Nauk* (*UFN*) beginning in 1961 (he published in *UFN* 26 reviews and papers and, in addition, 86 informal signatures in Personalia). In 1967, he became an associate editor-in-chief of *UFN* and took up this post for 36 years (to the last days of his life), taking a very lively and active part in the work of the journal. The authority of Lev Petrovich was deferred to in the most difficult cases when judging the reviews and articles to be published in *UFN*. His opinion about the possibility or impossibility of publishing controversial material was almost always decisive.

LPP's scientific merits received recognition at home and abroad. This is evidenced by the list of his awards: the 1980 L D Landau Prize of the USSR Academy of Sciences, the 1997 Eugene Finberg Medal, the 2008 Landau Gold Medal of RAS, the 2018 Fermi Prize of the Italian Physical Society, the 2018 I Ya Pomeranchuk Prize (together with G Parisi) of ITEP, and the 2021 Lars Onsager Prize of the American Physical Society.

Since November 2022, the Bose–Einstein Condensation (BEC) Center in Trento (Italy) has been renamed as Pitaevskii Center on Bose–Einstein Condensation.

The number of LPP's first-class scientific publications is striking: 10 books and 14 major reviews in *UFN*, *Rev. Mod. Phys.*, and *Adv. Phys.* The total number of citations is 44,413, according to Web of Science, and the Hirsch index is 80. This constitutes a huge amount of everyday work. It may seem that such a man must be very busy every day and inaccessible. But actually, it was quite the contrary. LPP was naturally kind and affable. One could easily talk with him, say, in a corridor at IPP or in the street. He took interest in other people, in particular, his colleagues, but not only in them. V L Ginzburg, Ya B Zel'dovich, L P Gor'kov, A A Starobinskii, M I Kaganov, and many others collaborated with him. However, he was not a lackadaisical softie afraid to offend his interlocutor by disagreeing. On the contrary, he had a quite clear idea of how any occasion should be arranged, were it a commission meeting, an international conference, or an evening get-together. No wonder I M Khalatnikov often sought his advice and P L Kapitza cherished his opinion. He found time to read fiction and to listen to music. He was a lover and connoisseur of Russian poetry. He knew by heart the long poems by Pasternak and other poets of the Silver Age and contemporaries Brodsky and Gandlevsky. He also followed modern Russian and foreign prose.

We are grateful to the Fates who brought us together with Lev Petrovich Pitaevskii as are, certainly, all those who had the good fortune to know him. His memory will be as vibrant and informal as he was.

A F Andreev, S S Gershtein, A V Gurevich, V V Dmitriev, N M Kreines, M A Liberman, B E Meierovich, V L Pokrovsky, V I Ritus, M P Ryutova, A A Starobinskii, M V Feigel'man, I A Fomin, A V Chaplik