

Lev Petrovich Pitaevskii

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Citation: *Physics Today* **76**, 3, 61 (2023); doi: 10.1063/PT.3.5203

View online: <https://doi.org/10.1063/PT.3.5203>

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OBITUARIES

Lev Petrovich Pitaevskii

The extraordinary theoretical physicist Lev Petrovich Pitaevskii died on 23 August 2022 in Rovereto, Italy, from the consequences of a fall, compounded by age-related health issues. He was known across the physics community for his encyclopedic scientific knowledge; important discoveries in low-temperature physics; contributions to the understanding of superfluidity in helium-3 and helium-4; and the theories of Bose–Einstein condensates, van der Waals forces, and low-density ionospheric plasma. Pitaevskii will also be remembered as a coauthor, with Lev Landau and Evgeny Lifshitz, of the world-famous 10-volume series *Course of Theoretical Physics*.

Pitaevskii was born on 18 January 1933 in the ancient Russian town of Saratov on the Volga River. He possessed an inquisitive mind from a young age and went to study physics at Saratov State University, where his father was a professor of economics. While a student there, he passed the entire set of nine “theoretical minimum” exams designed by Landau—only 43 theoretical physicists in the Soviet Union succeeded in passing them. Landau was duly impressed and, after Pitaevskii received his degree in 1955, offered him a highly coveted place as a graduate student in his research group at the Institute for Physical Problems in Moscow. He earned his PhD in 1958, supervised by Lifshitz, for his work on the theory of superfluid ^4He .

Upon Pitaevskii’s graduation, both Landau and Pyotr Kapitsa wanted to hire him. But he lacked a Moscow residence permit and instead took a position at the Institute of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation in Troitsk, some 30 miles south of Moscow. Eventually, in 1960, Kapitsa solved Pitaevskii’s registration problem in a most inventive way. At a banquet at the Kremlin for Soviet elites held by Nikita Khrushchev, Kapitsa remarked that a brilliant young scientist, akin to the legendary polymath Mikhail Lomonosov, could not serve science for lack of a Moscow registration permit. Khrushchev immediately gave orders to grant one, and Kapitsa was able to hire Pitaevskii at the Institute for Physical Problems. Pitaevskii was head of

its theoretical department from 1988 to 1992, taking the post once held by Landau, Ilya Lifshitz, and Yakov Zel’dovich.

In 1958 Pitaevskii and Vitaly Ginzburg constructed a semiphenomenological theory of superfluidity in the vicinity of the phase transition. A year later Pitaevskii predicted the transition of ^3He into a superfluid state at very low temperatures due to a Cooper-coupling mechanism arising from the van der Waals interaction. He also investigated threshold phenomena in the excitation spectrum of superfluid ^4He .

Pitaevskii’s best-known scientific contribution is the Gross–Pitaevskii equation, which governs the motion of the superfluid component of a weakly interacting Bose–Einstein gas. It was obtained independently by Eugene Gross and by Pitaevskii in 1961. Pitaevskii also collaborated with Evgeny Lifshitz and Igor Dzyaloshinskii on the theory of van der Waals forces in dispersive media. In a widely recognized series of publications, he and Alexander Gurevich developed a theory of collisionless low-density ionospheric plasma to better understand a satellite’s orbit and stability.

After Landau’s death in 1968, Evgeny Lifshitz and Pitaevskii wrote the last two volumes and completed the unique *Course of Theoretical Physics*. After Lifshitz died in 1985, Pitaevskii guided the project by keeping new editions of the volumes up to date. The series is a pride of Russian science and widely recognized as a unique synthesis of classical, relativistic, and quantum physics.

Pitaevskii first visited the University of Trento in Italy in 1989 and started a collaboration on superfluidity in helium clusters. After the first experimental realization of Bose–Einstein condensation in ultracold atoms in 1995, Pitaevskii and the Trento team focused their attention on the emerging field of ultracold atomic gases, where the Gross–Pitaevskii equation turned out to be a fundamental and successful tool.

After spending a few years at the Technion–Israel Institute of Technology, in 1998 Pitaevskii accepted a permanent position in Trento. He and his wife settled in a small apartment near the physics department, with a beautiful view of the Dolomites. He experienced a burst of productivity in those years in Italy. In 1999 Pitaevskii and the Trento team pub-

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Lev Petrovich Pitaevskii

lished the *Review of Modern Physics* article “Theory of Bose–Einstein condensation in trapped gases,” one of the most cited papers in the field. The scientific collaborations of Pitaevskii and the Trento team continued to flourish, resulting in the publication of around 100 papers.

Among Pitaevskii’s awards were the 1980 Landau Prize from the Soviet Academy of Sciences, the 2008 Landau Gold Medal from the Russian Academy of Sciences, the 2018 Enrico Fermi Prize from the Italian Physical Society, and the 2021 Lars Onsager Prize from the American Physical Society. After his death, the Trento Center on Bose–Einstein Condensation was renamed the Pitaevskii Center on Bose–Einstein Condensation.

Despite his busy academic schedule, Pitaevskii always had time for literature and music. Having had the good fortune to know him, we will miss his kindness, charisma, and readiness to help young scientists.

We thank Marina Sakharov-Liberman for her contributions to this obituary.

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