

# obituaries

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## Vitaly Lazarevich Ginzburg

Vitaly Lazarevich Ginzburg, who made important contributions in many fields of theoretical physics, passed away on 8 November 2009 in Moscow; he had suffered for several years from a blood disease.

Ginzburg was born in Moscow on 4 October 1916, during World War I. That war was followed by the Russian Civil War, and hunger and disease raged; Ginzburg's mother died of typhoid in 1920. Ginzburg did not go to school until the fourth grade at age 11; he attended for only four years. At the time, students had to have work experience before they entered a university. Ginzburg became an assistant at an x-ray laboratory, where he developed a great interest in physics. He entered Moscow State University in 1934, graduated in 1938, and continued there as a postgraduate student in experimental physics. Trying to explain some earlier experiments, Ginzburg turned to theory and went to discuss the problem with Igor Tamm, who encouraged the young physicist. Ginzburg became a theoretician and regarded Tamm and Lev Landau as his teachers.

Ginzburg received his PhD in physics in 1940 from Moscow State University for work on the quantum theory of Vavilov–Cherenkov radiation. He moved to the department of theoretical physics at the P. N. Lebedev Physical Institute of the Academy of Sciences of the USSR. In 1942 he received his *habilitation* degree for his work on the theory of higher-spin particles. He stayed with the Lebedev Institute until his death.

To contribute to the USSR war effort, Ginzburg began work on radio-wave propagation in the ionosphere. During his many years in the field, he developed groundbreaking theories of several observable effects: the influence of Earth's magnetic field on radio-wave reflection, “triple” reflection of radio waves, wave absorption, and nonlinear phenomena. Those theories were the starting point of his studies in radio astronomy; in 1946 Ginzburg concluded that radio waves in the meter band should be emitted by the solar corona with a temperature of up to 1 million



Vitaly Lazarevich Ginzburg

degrees. He also suggested using radio-wave diffraction by the Moon edge to increase the angular resolution of details of the Sun during eclipses.

Working on ferroelectricity in 1949, Ginzburg used the general Landau theory of phase transitions to comprehensively describe the phenomenon. He predicted the existence of the “soft mode,” which is fundamental to the properties of ferroelectrics in alternating fields.

Ginzburg was most fascinated by superconductivity. He began work on it in 1944, when its theory was based on equations by Fritz London and Heinz London that described a fundamental property of superconductors—the Meissner effect of expelling a magnetic field. However, the equations made unphysical predictions of negative surface tension when applied to the boundary between the normal and superconducting phases. That problem was a main motivation for Ginzburg and Landau, and in 1950 they developed a new, remarkable theory of superconductivity, one that used only general considerations and no models. It was based on the Landau theory of phase transitions, which introduces an order parameter that is zero above the transition point and finite below. The authors made a courageous assumption that the superconducting order parameter is a com-

plex function  $\Psi$ , which acts as an effective wavefunction of “superconductive electrons.” The theory enabled the calculations of the surface tension. A crucial result of the theory was that a superconductor is characterized not only by a penetration depth  $\delta$  of magnetic field, which enters into the London theory, but also by a “healing length”  $\xi$  of the function  $\Psi$ . The dimensionless parameter  $\kappa = \delta/\xi$  is an essential characteristic of a superconductor. In 1957 Alexei Abrikosov developed a theory of “superconductors of the second kind” with  $\kappa > 1/\sqrt{2}$ . For their work Ginzburg and Abrikosov shared the 2003 Nobel Prize in Physics.

Many experiments that followed confirmed the Ginzburg–Landau theory. In 1959 Lev Gorkov derived its equations from the microscopic Bardeen–Cooper–Schrieffer theory. The G–L theory needed only one, but a quite instructive, correction: The  $\Psi$  function is actually a wavefunction of pairs of coupled electrons. Accordingly, the charge  $e$  in all the equations must be changed to  $2e$ .

Ginzburg's interest in superconductivity never dwindled. We discussed the state of the high-temperature superconductor problem during my last visit with him in August 2009.

In the later years of Joseph Stalin's rule, Ginzburg was a target of dangerous political accusations as “an idealist and a cosmopolitan.” (Oddly enough, he was also rudely criticized late in life, but as an “open materialist” and “atheist.”) Although he was a brilliant lecturer, he could not find a teaching position in Moscow. At the end of 1945, he was invited by a university in Gorky (now Nizhny Novgorod) to be a part-time head of the department of radio-wave propagation. The appointment resulted in his meeting Nina Ermakova, who became his second wife in 1946. Ermakova had been sentenced in 1944 to three years in a labor camp for “anti-Soviet activities.” After her early release in 1945 she was barred from living in either Moscow or Gorky and was not permitted back in Moscow until 1954.

Ginzburg believed that he avoided arrest during Stalin's reign only because of his involvement in the Soviet atomic project. In 1947 he was enlisted, with other members of Tamm's department at the institute, to work on the hydrogen bomb. It soon became clear that the thermonuclear deuterium–tritium reaction  $d + t \rightarrow {}^4\text{He} + n + 17.6 \text{ MeV}$  held promise. However, tritium is radioactive and practically does not exist in nature. Ginzburg suggested using the reaction

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${}^6\text{Li} + n \rightarrow t + {}^4\text{He} + 4.6 \text{ MeV}$  to produce tritium inside the device. Because his suggestion was potentially significant, Ginzburg's life became more safe. However, in 1952 he was removed from the project and denied the right even to read his own notes on the subject.

Ginzburg was an open and democratic person. In 1957 I applied the Ginzburg–Landau method to the shift of the transition temperature in thin films and to vortex lines. Because I concluded that the boundary conditions must be different from the ones in superconductors, I discussed the problem with Ginzburg. He said he had just had the same idea and, to my surprise, suggested that we work together. Ginzburg worked with great passion and care. It was strange for me that he began writing a paper on our first workday. But when the calculations were finished, we already had a complete article.

An important part of Ginzburg's life was the Wednesday seminars he organized at the Lebedev Institute—1700 in all. The subjects of the talks varied, and discussions were lively. The universality of Ginzburg's interests allowed him to compile in 1971 "What Problems of Physics and Astrophysics Seem Now to be Especially Important and Interesting?" (*Soviet Physics Uspekhi*, volume 14, page 21), which listed 17 problems. His revised version, which he expanded to 30 problems, was published in 2005 in his *About Science, Myself and Others* (Institute of Physics Publishing). It is terribly sad that Vitaly Ginzburg will not get to compose another list.

*I thank Robin Scott for help in writing this tribute.*

**Lev P. Pitaevskii**

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## Ephraim Katchalski Katzir

Ephraim Katchalski Katzir was a brilliant intellectual, pioneer in protein sciences, inspirational mentor, icon of Israeli science, and lifelong patriot known for his vision, humanity, and humility. He died on 30 May 2009 at his home in Rehovot, Israel.

Born Ephraim Katchalski in Kiev, Russia, on 16 May 1916, he emigrated to Palestine in 1922 with his Polish Jewish parents and nine-year-old brother, Aharon. As related in his memoir, *A Life's Tale* (Carmel Publishing House, 2009), Katzir chose between either joining a kibbutz and fighting British rule

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**Ephraim Katchalski Katzir**

or pursuing a scientific career. As an undergraduate at the Hebrew University in Jerusalem, he contrasted the universal nature of mathematics and physics with the local relevance of microbiology and botany. He earned his PhD in theoretical and macromolecular chemistry with Max Frankel in 1941 on syntheses of polyaminoacids as models of natural proteins. He published his PhD work on poly-L-glycine and poly-L-alanine in back-to-back articles in the *Journal of the American Chemical Society* in 1942.

Katzir continued as a teaching assistant while rising to company commander in the Haganah self-defense forces. He published in *JACS* in 1947 a paper on exploitation of N-carboxyanhydride chemistry, epsilon-amino blocking groups, and unblocking reactions to make poly-L-lysine. That same year he went to the US for several months of postdoctoral studies at Columbia, Brooklyn Polytechnic, and Harvard universities. While in America, he helped arrange essential arms shipments to Israel.

From 1948 to 1973, Katzir established and led the biophysics department at the Weizmann Institute of Science, while Aharon chaired the polymer sciences department; they were recruited by Chaim Weizmann in 1947. Syntheses of polyaminoacid homopolymers, copolymers, and peptidyl-proteins became a fulcrum for Katzir and his group's seminal studies of physical and biological properties of those protein models. Their work contributed greatly to understanding helix-coil transitions, protein folding, and denaturation; x-ray diffraction, IR spectroscopy, and circular dichroism findings; and determinants of

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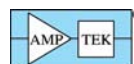
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