

Memoirs of a super scientist

On Superconductivity and Superfluidity A Scientific Autobiography

Vitaly L. Ginzburg
Springer, Berlin, 2009. \$64.95
(232 pp.). ISBN 978-3-540-68004-8

Reviewed by Valery Pokrovsky

I received the sad news in November that Vitaly Ginzburg, a giant of 20th-century physics, had died.

Ginzburg's final book, *On Superconductivity and Superfluidity: A Scientific Autobiography*, contains his 2003 Physics Nobel Prize lecture, his views on contemporary scientific and political issues, and his contributions to physics, particularly to his two favorite fields, mentioned in the book's title. His versatility was striking: He made fundamental contributions to such diverse fields as phase-transition theory and applications, ferroelectricity, atmospheric electromagnetic-wave propagation, radio astronomy, and astrophysics. He was also one of the creators of the Soviet hydrogen bomb.

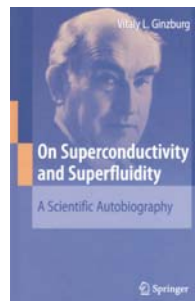
Ginzburg started working on superconductivity when it was still a riddle with few clues. Thus, the famous Ginzburg-Landau theory of 1950 was a brilliant display of physical intuition and insight. It introduced both the wavefunction for the superconducting carriers—identified eight years later as Cooper pairs—and the quantum coherence length. The Ginzburg-Landau equation is a mainstay of theoretical physics and its time-dependent generalization governs the propagation of optical solitons in fiber optics.

As *On Superconductivity and Superfluidity* illustrates, Ginzburg's main scientific strength was a direct approach that used a minimum of mathematics. For example, he recounts the sugges-

tion he made to Lev Landau that the wavefunction can serve as an order parameter for superconductivity (page 44). And in describing the Levanyuk-Ginzburg criterion (pages 54 and 193), he uses simple mean-field theory to validate the mean-field approximation in the theory of phase transitions and to estimate the phase-transition fluctuation amplitude; the proof, which led to the observation of strong fluctuations in the vicinity of second-order phase transitions, resolved the apparent contradiction between Landau's theory and Lars Onsager's exact solution of the two-dimensional Ising model. The book ends with a bibliometric study by Manuel Cardona and Werner Marx from which I drew one conclusion: Ginzburg's papers are much cited.

The general public will find Ginzburg's personal views interesting: Among other things, he discusses his relationship with his mentors Landau and Igor Tamm, and he opines on the Arab-Israeli conflict. But the book is intended for people with a physical-science or mathematical education. The science is explained simply enough that engineers and scientists outside Ginzburg's fields of expertise will understand it. Nonetheless, the construction of the text is somewhat loose and the book contains many repetitions. Also, many annoying misprints appear in the English translation from the *Soviet Journal of Experimental and Theoretical Physics* of the famous 1950 Ginzburg-Landau article. But the book compensates with translations of Ginzburg's texts that convey his characteristic energy, passion, and sincerity.

On Superconductivity and Superfluidity complements Philip Anderson's scientific autobiography, *A Career in Theoretical Physics* (World Scientific, 1994), which also addresses the theory of superconductivity. Ginzburg focuses on basic questions regarding the nature of the order parameter and its coupling with the electromagnetic field, whereas Anderson is more concerned with the completeness of the Bardeen-Cooper-Schrieffer theory. In other respects the



two books differ even more. Anderson's does not contain biography. Rather, it is mostly a collection of his papers, supplemented by comments. Although personal opinions and preferences can be seen in those comments, Anderson's work is much more restrained than Ginzburg's more open autobiography.

Russian American poet Iosif Brodsky once said that Russians deserve a place in heaven merely because they were born in Russia! That's a fitting statement for Ginzburg, who was born to a Jewish family and whose career and even life were in grave danger on several occasions during World War II and during Joseph Stalin's anti-Semitic campaign. Ginzburg's worldview was a striking and endearing mix of deep insight and naiveté. Once under the delusion that it was his social duty to create nuclear arms for the Soviet government, he later acknowledged that he failed to perceive the criminal nature of the Communist regime until the end of Stalin's rule. It is surprising the revelation came so late, given that both his colleague Landau and his second wife, Nina Yermakova, were incarcerated under Stalin's regime—Nina spent a year in prison for the fabricated charge of conspiring to assassinate Stalin. Ginzburg, who wed Nina while she was in exile after her imprisonment, was himself a victim of political persecution.

In his daily life Ginzburg acted with decency and courage. As head of the theoretical division at the Russian Academy of Sciences' P. N. Lebedev Physical Institute, he kept the nuclear physicist, dissident, and 1975 Nobel laureate Andrei Sakharov employed during his exile in the 1980s. More recently, after his book was written, Ginzburg wrote letters to Russian president Vladimir Putin requesting that he release several Russian scientists jailed on bogus espionage convictions. And at age 93, Ginzburg, an avowed atheist, was still fighting attempts by the Russian Orthodox Church to penetrate into educational and military systems; for that activity the church fathers had been calling for his deportation.

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Ginzburg had repeatedly stated that his career was driven by chance. We should all be grateful for the chance event of the KGB's denying Ginzburg access to classified documents, including his own reports, which caused him to switch from nuclear physics to superconductivity. His subsequent success earned him significant influence in the Russian scientific community: He led a famous scientific seminar that for 40 years attracted both experimentalists and theorists of diverse specializations. Ginzburg's dedication to science and his energy, sincerity, and benevolence make him a fine model for both young and seasoned scientists.

Lives in Science

How Institutions Affect Academic Careers

Joseph C. Hermanowicz
U. Chicago Press, Chicago, 2009.
\$55.00 (323 pp.).
ISBN 978-0-226-32761-7

We all know someone like Sammie, who got a PhD in physics from Summa University and landed a faculty position at Elite University. But despite a productive career that featured several grants and early tenure, Sammie failed to meet the department's expectations for major awards and international recognition. Sammie's graduate-school classmate Bobbie settled on a position at North East State University, which emphasized teaching physics-to-non-majors courses to keep the department afloat. Funding agencies rejected all but one of Bobbie's grant proposals. Apart from a few senior projects, Bobbie's research program faded away.

In reality, how common are those life histories? How satisfied are those physicists with their academic careers? How do career expectations change over time? And what role do universities play in shaping careers and physicists' perceptions of their careers? Those are questions addressed by sociologist Joseph Hermanowicz in *Lives in Science: How Institutions Affect Academic Careers*.

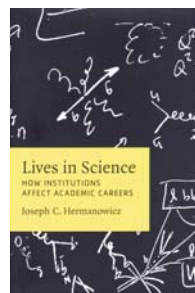
In 1994 Hermanowicz interviewed 60 physics faculty members (56 men and 4 women) at six PhD-granting universities in the US. The physicists were divided into early-career, midcareer, and late-career cohorts. In the National Research Council's (NRC's) assessment of graduate physics departments, two of the universities ("elites") were ranked near the top; one ("pluralist"), near the middle; and three ("communitarians"), near the bottom. The interviews and questionnaires collected

from the six department chairs formed the basis of Hermanowicz's earlier book *The Stars Are Not Enough: Scientists—Their Passions and Professions* (University of Chicago Press, 1998). Ten years later the author reinterviewed 55 of the original cohort (one had died, and four—notably few—had changed institutions) to find out how their careers had changed over time and how those changes were shaped by the culture and expectations of their universities.

Lives in Science begins by laying out the sociological framework for the analysis. The rest of the book reports on the changes that have occurred in the careers of the 55 physics professors: Hermanowicz quotes freely from his interviews with the physicists, who speak frankly and often passionately about their careers. The reader will find several surprises. For example, the strongest dissatisfaction comes from some of the late-career elites. Although they like their institutions, they lament that they had not made a major—let alone revolutionary—impact in research and had not received the external recognition valued by their institutions and the physics community. As one elite physicist put it: "The dream is to discover some fantastic new effect that knocks the socks off my friends and colleagues. . . . I want my effect" (pages 86–87). Nonetheless, the elites state that they would make the same career choices again if given the chance to start over.

The pluralists express the most satisfaction. Many, after some initial discontent, have found a comfortable mix of teaching and research and realize that internal as well as external sources of recognition are important for their sense of personal satisfaction. The communitarians, at universities where teaching dominates over research, feel they have become disconnected from professional science as their careers have evolved. By midcareer their expectations have adjusted to meet the low research expectations and meager resources of their universities. Many of the communitarians state that they dislike their universities and would not choose an academic career if they could begin again. They look forward to a retirement in which they can pursue interests outside of science.

Why should the physics community be interested in what Hermanowicz has to say? There are several reasons. The life stories he presents are fascinating and often touching. Hermanowicz doc-



uments how the local university culture shapes a faculty member's expectations and sense of career satisfaction. But the most important lesson is that the science community's obsession with research as the sole reason for recognition and reward leads to frustration and dissatisfaction when reality fails to match expectations. And that, as sociologists would put it, "leads to anomie."

Can the physics community afford to lose the energy and passion of a large fraction of its highly trained talent? And how does a university that wants to advance in the NRC rankings elevate the career expectations of its faculty members who have been socialized to live with low expectations for research and do those characterizations hold for the 50% of physics faculty members who work at non-PhD-granting institutions that conduct some research? Hermanowicz does not provide all the answers, but in *Lives in Science* he forces us to think about these important questions.

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Advanced Condensed Matter Physics

Leonard M. Sander
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ISBN 978-0-521-87290-4

The first problem any lecturer runs into when planning a graduate course in condensed-matter physics is finding a good textbook that covers both classical and modern topics at a sufficient level.

Classics such as Neil Ashcroft and David Mermin's *Solid State Physics* (Brooks Cole, 1976) lack many of the modern topics because the field has naturally matured in the past three decades. In *Advanced Condensed Matter Physics*, Leonard Sander sets out to fill that gap. An experienced researcher in several condensed-matter subfields, Sander based the book on his lecture notes for a course he taught at the University of Michigan.

Other authors have attempted to replace the classics. Sander's offering is

