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Volodymyr Lushchak: A life in science

To the 70th anniversary of a biochemist, educator, and founder of a scientific school

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Born on September 18, 1956, in Stanislav (now Ivano-Frankivsk), Volodymyr Lushchak followed a rather unconventional route into science. Only after completing military service, he entered the Faculty of Biology at Moscow State University, the most prestigious center of biological research in the Soviet Union. Upon graduating in 1982, he continued his academic training as a doctoral student of Professor Alexander Boldyrev, whose group focused on membrane ion transport processes. Four years later, he earned his PhD with a dissertation entitled “The role of protein-protein and protein-lipid interactions in the functioning of the sarcoplasmic reticulum Ca pump.”



Volodymyr Lushchak after finishing school in Lysets (Ivano-Frankivsk region)

Work abroad

The next stage of Volodymyr Lushchak career was closely linked with Crimea. Between 1987 and 1998, he led the biochemistry laboratory of the Qaradağ Branch of the Institute of Biology of the Southern Seas of the National Academy of Sciences of Ukraine. During this period, international collaborations began to play an increasingly important role in his scientific development. Research stays in the laboratories of Kenneth Storey in Canada (1993-1994) and Marcelo Hermes-Lima in Brazil (1996-1997) introduced him to new approaches in comparative physiology and stress biology, fields that would later become central to his own research.

It was in the 1990s that Volodymyr Lushchak became interested in the study of oxidative stress and biochemical adaptations. Mechanisms of adaptation and stress response were among the scientific interests of Professor Kenneth Storey, renowned for his work on cryptobiosis, particularly the mechanisms of animal resistance to low temperatures, hypoxia, and anoxia. Professor Storey became a long-term collaborator of Volodymyr, and more than 70 articles were published in co-authorship with him. One outcome of the Brazilian collaboration was the publication of the paper "Oxidative stress and antioxidant defenses in goldfish Carassius auratus during anoxia and reoxygenation" in the American Journal of Physiology [1]. More than two decades later, this article remains among Professor Lushchak's most cited publications.



9th International Congress of Comparative Physiology and Biochemistry (ICCPB), held in Kraków, Poland, August 2015. From left to right: Top row – Volodymyr Lushchak, Doris Abele, Kenneth B. Storey; Middle row – Marcelo Hermes-Lima, Daniel C. Moreira, Alexis F. Welker; Bottom row – Georgina Rivera-Ingraham

Returning to Ivano-Frankivsk

A new chapter began in 1998 when he returned to western Ukraine. After working at Ivano-Frankivsk Medical University, he joined Vasyl Stefanyk Precarpathian National University, where he started building his own research group. He opened his own laboratory in an abandoned basement of the university's administrative building (today the former laboratory houses the Paragraph Youth Center). The first employees of the laboratory were Associate Professor Tetyana Bagnyukova, a hydrobiologist and colleague from the Institute of Biology of the Southern Seas, and Halyna Semchyshyn, a chemist and microbiologist and colleague from the medical university. Several enthusiastic students also joined the team of scientists, including the current head of the Department of Biochemistry and Biotechnology at Vasyl Stefanyk Carpathian National University, Maria Bayliak. In fact, during these years Volodymyr Lushchak was selecting the future staff of the Department of Biochemistry.

The year 2002 proved particularly important. Following the successful defense of his doctoral dissertation "Biochemical mechanisms of fish adaptation to environmental conditions: anoxia, hypoxia, and physical activity" at Yuriy Fedkovych Chernivtsi National University, he became the founding head of the newly established Department of Biochemistry. That same year, Lushchak spent time at the University of Liverpool as a visiting professor. Working with Professor Andrew Cossins, an expert in thermal adaptation, he expanded his international research network and contributed to a study that was later published in the Ukrainian Biochemical Journal in 2007 [2].



Members of Professor Volodymyr Lushchak's laboratory at the Ukrainian Biochemical Congress in 2002 (Chernivtsi); from left to right: Serhiy Mandryk, Andriy Ikalyuk, Halyna Semchyshyn, Oleh Lushchak, Tetyana Bagnyukova, Volodymyr Lushchak, and Dmytro Gospodaryov

Scientific achievements

Over the course of his career, Professor Volodymyr Lushchak has become one of Ukraine's leading experts in free radical biology. His scientific contributions include an original classification of oxidative stress based on its intensity, a concept that has been widely recognized by researchers working in the field [3, 4]. To date, he has authored or co-authored more than 250 publications indexed in the Scopus database.

The scope of his research has expanded continuously over the years. Initially focused on fundamental mechanisms of adaptation to adverse environmental conditions, his work later encompassed stress physiology, aging, metabolic disorders, and immune responses. More recently, he has extended these interests to the biological basis of post-traumatic stress disorder and to the role of the intestinal microbiome in maintaining health and contributing to disease [5].

The range of model organisms used in his studies is wide. The first experiments were conducted on fish (and occasionally amphibians [6]). Since the early 2000s, bacteria [7] and unicellular fungi [8] have been employed as models for studying oxidative stress. Between 2005 and 2012, many graduate students supervised by Volodymyr Lushchak defended their PhD theses using the baker's yeast *Saccharomyces cerevisiae* model. In 2008, the department headed by Professor Lushchak began studying the mechanisms of senescence and metabolic disorders in the fruit fly model. This line of research resulted in highly cited publications in the prestigious *Journals of Gerontology* [9]. Later, articles appeared in the *Journal of Insect Physiology* (including the most cited article in the journal of 2017) [10] and *Frontiers in Physiology* [11]. In 2017, the department began working with a mouse model and in 2018 established its own vivarium. The mouse model is used to study aging [12], the effects of dietary supplements – in particular α-ketoglutarate – on animal behavior, energy metabolism, antioxidant defense [13, 14], and, most recently, on markers of post-traumatic stress disorder [15].

Professor Volodymyr Lushchak has built a strong scientific school that continues his initiatives. Under his supervision, two doctoral dissertations and eighteen candidate theses were successfully defended. The research school established by Professor Lushchak continues to develop the ideas and directions that originated in his laboratory.

The international visibility of his work is reflected in numerous distinctions. In recognition of the impact and citation of his publications, he received the Scopus Awards Ukraine in 2016, the title "Leader of Science of Ukraine," and the Web of Science Award Ukraine in 2016 and 2018. As of June 2026, his Scopus h-index had reached 52. He is also included in the Stanford University and Elsevier ranking of the world's most cited scientists, consistently remaining among the global Top 2%.



Professor Volodymyr Lushchak at the Web of Science Awards Ukraine, Kyiv, 2018. From left to right: Professor Maksym Strikha, Professor Volodymyr Lushchak, and Academician Yaroslav Yatskiv

“Science is impossible without freedom”

Professor Lushchak is a frequent guest in the media. Many of the opinions expressed in his earlier interviews have not lost their relevance. In particular, he has repeatedly emphasized that high-quality research can be produced not only in large academic centers but also in regional universities. The example of his department in Ivano-Frankivsk demonstrates that even in “peripheral” conditions it is possible to achieve international recognition if there is a critical mass of researchers capable of sustaining a vibrant intellectual environment. According to him, scientific teams are “living organisms” that must reproduce themselves. If they are not capable of self-renewal, they are doomed to decline.



Professor Volodymyr Lushchak as a speaker at TEDx Ivano-Frankivsk, 2017

Professor Volodymyr Lushchak is convinced that true science cannot exist without freedom. Freedom of thought and inquiry is not an abstract idea but a prerequisite for generating new knowledge. Scientific creativity loses its meaning when bureaucratic pressure prevails and intellectual autonomy is absent.

He has also emphasized that funding for science is important, but it is not the only factor of success. Biochemical research is expensive, yet the key is the permanence of the support system and the ability to secure grants. He noted the real competition for resources in the West, while stressing that at the same time there are genuine opportunities. In Ukraine, scientists are often forced to work despite financial instability, proving that the effectiveness of science is determined not by its location but by its presence in the global scientific space.



Receiving equipment from the nonprofit organization Seeding Labs (Boston, MA, USA), 2018

Volodymyr Lushchak also highlights the social role of science. Scientific thinking is systemic and can offer solutions at critical moments. However, this requires public demand for intellectuals. Without such demand, science cannot develop, because it does not exist in a vacuum but in constant dialogue with society.

"Learning from science"

No less important for Professor Lushchak is the idea of "learning from science." He is convinced that education should grow out of scientific thinking and not be detached from it. Science forms a system that allows students not only to assimilate facts but also to independently discover new knowledge. "It is important to me that the student discovers something new independently – his own little 'eureka'", the professor said in one of his interviews.



Professor Serhii Kosterin (left) delivering a guest lecture on enzymology at the Department of Biochemistry, 2007

Lushchak emphasizes that teaching should be integrated with research: only then do students feel a living connection between theory and practice. At the same time, only a scientist who is regularly engaged in research is able to transfer to students not only knowledge but also a way of thinking. Education cannot be reduced to the mechanical reproduction of material. True learning is a process in which the student becomes a co-creator of knowledge. That is why Lushchak believes that universities should be environments where science and learning mutually reinforce each other.

Civic Position

For Volodymyr Lushchak, scientific and civic responsibilities have always gone hand in hand. His participation in both the Orange Revolution and the Revolution of Dignity reflected a conviction that intellectuals should not remain detached from society during critical moments of national development. In public speeches and interviews, he repeatedly stressed the importance of scientific thinking as a source of new ideas and constructive solutions. He also viewed students and the academic community as an important force capable of shaping the country's future and promoting societal progress.



Professor Volodymyr Lushchak with businessman and philanthropist Vladyslav Kyrychenko at Maidan Square (Independence Square, Kyiv) during the Revolution of Dignity, 2013–2014

His civic stance was also evident during the full-scale Russian invasion in 2022: at the age of 65, he voluntarily joined the territorial defense [16], although he later returned to university work. Lushchak repeatedly emphasized that Ukrainians must be strong and educate leaders who are capable not only of working in their professional fields but also of taking responsibility for the state. "The Maidan – one and the other – fizzled out precisely because there were no leaders," he noted emotionally, adding that his department aims to prepare such leaders.

An important component of his civic stance is the language issue. In his column in the newspaper *Halychyna*, he called on Ukrainians to communicate in their native language, stressing that Ukrainian is not only a means of communication but also a code of national security. He called for tolerance toward Russian-speaking fellow citizens, but at the same time insisted on establishing Ukrainian as the only authentic basis of statehood.

In addition, Lushchak also spoke out on educational policy and the challenges of the COVID-19 pandemic. He criticized formalism in reforms, emphasizing the need for real integration of science and education, and also commented on vaccination strategies and the impact of war on the human body. All this testifies to his active civic position: he is not only a scientist and teacher but also a patriot who consistently defends European values and authentic Ukrainian identity.

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