

CHRONICLE AND INFORMATION

UDC 574.5(091)

**OUTSTANDING RUSSIAN ZOOLOGIST AND HYDROBIOLOGIST  
VLADISLAV KHLEBOVICH,  
ON HIS 90<sup>th</sup> BIRTHDAY**

© 2023 N. V. Shadrin<sup>1</sup>, M. I. Orlova<sup>2,3</sup>, E. V. Anufrieva<sup>1</sup>, and A. O. Smurov<sup>3</sup>

<sup>1</sup>A. O. Kovalevsky Institute of Biology of the Southern Seas of RAS, Sevastopol, Russian Federation

<sup>2</sup>Saint Petersburg Research Center of the Russian Academy of Sciences, Saint Petersburg, Russian Federation

<sup>3</sup>Zoological Institute of Russian Academy of Sciences, Saint Petersburg, Russian Federation

E-mail: [lena\\_anufrieva@mail.ru](mailto:lena_anufrieva@mail.ru)

Received by the Editor 14.01.2023; after reviewing 14.01.2023;  
accepted for publication 20.10.2022; published online 14.03.2023.

In 2022, Professor Vladislav Khlebovich, a prominent zoologist and hydrobiologist, turned 90. This essay is a brief review of his diverse activity and contribution to science.

**Keywords:** Khlebovich, main results, salinity, evolution, ecology

“Without emotions, without passion,  
there can be no science.”

*S. Korolev*

(cited from: [Khlebovich, 2017d])

The results of research by D. Sc., Professor Vladislav Khlebovich are reflected in scientific publications that have become classics [Khlebovich, 1974, 1981, 1996], in the articles published in the last decade [Smirnov et al., 2015; Khlebovich, 2013a, b, c, 2014a, b, 2015a, b, c, d, e, f, 2016, 2017a, b, c, 2018, 2019, 2020, Khlebovich, Ivanov, 2018], and in memoirs. All these works form a whole layer in understanding the physiological, ecological, and evolutionary role of the salinity factor, autecology [Khlebovich, 2015d], and fine mechanisms of physiological and behavioral reactions of aquatic invertebrates [Khlebovich, 2015b] inhabiting marine and continental waters, especially the most variable aquatic systems – estuaries [Khlebovich, 2019]. His interests are so diverse that it is hard to set the boundaries. In 2022, V. Khlebovich turned 90.



Photo from <http://casp-geo.ru/>

An outstanding Russian zoologist was born on 27 February, 1932, in Voronezh. He spent his first years in the Voronezh Natural Reserve, where his father, Vilgelm Khlebovich, worked in 1933–1939 as deputy director for science, and his mother, Vera, was a weather observer. In the autobiography [2017d], Vladislav Khlebovich recalls: “When I was a child, the world of the forest cut by the Usmanka River (in Tatar, *beauty*) seemed endless... Because of the reserve, I have always wanted to be a biologist and became one.” In 1939, his father began working at the Voronezh University as an associate professor at the zoology department, which was headed by his teacher – Konstantin Saint-Hilaire<sup>1</sup>. In the same year, the future biologist went to a Voronezh school. In the years of the war, the family was evacuated to the Voronezh Nature Reserve (1942). His father joined the militia.

In 1945, the family moved to the city of Braslav (Western Belarus), to the father’s homeland. In 1949, V. Khlebovich graduated from a Braslav school with a silver medal and realized his dream – entered the biology and soil faculty of the Leningrad State University and chose the invertebrate zoology department. His studies at the university began with the lectures of Valentin Dogiel<sup>2</sup> – the author of *Zoology of Invertebrates*. With this textbook, the university life of most Soviet biology students (belonging to the generations of the authors of this article) usually began, both in leading and provincial universities. In 2022, V. Dogiel would have turned 110.

In 1954, Vladislav Khlebovich graduated with honors from the university. His project was focused on polychaetes. He entered the PhD graduate school at the Zoological Institute of the Academy of Sciences of the Soviet Union and continued studying polychaetes under the guidance of Pavel Ushakov (1903–1992). He always talks about his teacher with gratitude and great respect [2017d]. In 1959, he defended his PhD thesis *Polychaeta Worms of the Littoral of the Kuril Islands*. After a vacation spent at the Kaliningrad Biological Station, even *prior* to defending his PhD thesis, V. Khlebovich, as he uses to say, “fell ill”: “It was at this ornithological station that I got the virus of my main scientific interests – Nereididae and the salinity factor.” These interests led him to a series of discoveries and generalizations that brought fame and respect among colleagues all over the world. His monograph on polychaetes was published in the *Fauna of Russia* series [Khlebovich, 1996].

In 1960, he began his research on salinity adaptations; later, he developed the concept of critical salinity of biological processes [Khlebovich, 1974], which received wide international recognition and was further deepened in his works [Smirnov et al., 2015; Khlebovich, 2014a, 2015c]. In 1971, he defended his D. Sc. dissertation *The Concept of Critical Salinity in Zoology*. In three years, Vladislav Khlebovich published the monograph *The Critical Salinity of Biological Processes* [1974]. The development of ideas and the acquisition of new data resulted in the publication of another scientific work – *The Acclimation of Animal Organisms* [1981]. In 2008, he was awarded the prestigious prize for biologists “for a series of works on the topic *The Salinity Factor in Zoology*” – Pavlovsky Prize of the Russian Academy of Sciences.

<sup>1</sup>K. Saint-Hilaire (1866–1941), Russian and Soviet zoologist, hydrobiologist, organizer of the first biological station in the Russian Empire [in the Kandalaksha Bay of the White Sea (Kovda)], Professor at the Yuryev and Voronezh universities.

<sup>2</sup>V. Dogiel (1882–1955), Russian and Soviet zoologist, corresponding member of the Academy of Sciences of the Soviet Union (1939), D. Sc., Professor, the Lenin Prize winner.

One of the results of his work in this direction was the creation of a scientific school recognized by the scientific community: he brought up a whole generation of researchers, *inter alia* PhD and D. Sc. Analyzing salinity adaptations and osmoregulation in hydrobionts, he substantiated the concepts of physiologically freshwater animals of marine origin [Khlebovich, Komendantov, 1985]. At present, his concepts are developed by numerous students and followers, including the authors of this article.

It is impossible not to recall many years of his interest in the issues of phenotypic adaptations and the theory of evolution in general. Assuming that an individual should be considered as an indivisible quantum of life, V. Khlebovich is focused on the ecology of individuals [2012]. He experimentally showed that modification variability is often based on the inclusion by the environment of alternative hereditary programs (those are present in the genotype of an individual). He established that one of the ways of diversification is the formation of species *via* sequential creation and “falling out” of alternative norms of gene expression. To date, this is confirmed by the works of molecular geneticists.

He was an active participant and organizer of several expeditions aimed at studying the Far Eastern and Arctic coastal regions of our country. I remember, for example, 1971 (N. Sh.): the Barents Sea, in the scientific village of Dalnie Zelentsy, on a used hunting schooner, two expeditions of the Zoological Institute live and work – *Freshwater Life* (headed by not yet an Academician A. Alimov) and *Salty Distances* (headed by V. Khlebovich). In 1993 and 1994, he headed the Russian–American expeditions aimed at studying the Arctic estuaries. In his life, there was the Chernobyl period as well. Specifically, for many years, Vladislav Khlebovich was a member of a complex radioecological expedition in the ecology section of the integrated program to eliminate the consequences of the disaster at the Chernobyl nuclear power plant. In 1987, he was awarded a diploma. In 1997, he was awarded the medal *For Saving the Dying*.

Speaking of V. Khlebovich, it is impossible not to mention the versatility of his talents. According to him, after the famous ornithologist Aleksey Malchevskiy<sup>3</sup>, he was the best bird impersonator in Leningrad. He is an outstanding organizer of science as well: for 12 years, he headed the Belomorsk Biological Station of the Zoological Institute and made it the best in the USSR. He wrote the book *Kartesh and Around* [2007] about this. Is it worth listing everything that this amazing person has done and continues to do? He has his own vision of many things that go far beyond the scope of his professional scientific activity. He is an incredibly interesting speaker. He became the author of several popular science books [Khlebovich, 1987, 1991, 2015g]. Through the prism of biology, he is not afraid to consider human problems, and this is confirmed by his articles in the literary magazine *Zarya* (no. 5, 2002) *This Is Our Beginningless World... Biological Models of Human Societies* and in the newspaper *Novaya Gazeta* (15.06.2005) *In the Structure of the Brain, There Is No President*. Moreover, he is one of the creators of public aquariums in Saint Petersburg.

The concept of active creative longevity is strongly associated with Vladislav Khlebovich. Having celebrated his 80<sup>th</sup> birthday, which we wrote about as well [Shadrin et al., 2012], he published a series of interesting papers on the role of potassium in animal evolution. Developing the ideas of his co-author,

<sup>3</sup>A. Malchevskiy (1915–1985), one of the leading Soviet ornithologists, dean of the biology and soil faculty of the Leningrad State University (1969–1973).

friend, and peer, Academician of the Russian Academy of Sciences Yury Natochin<sup>4</sup>, he convincingly showed that life originated in the potassium environment, and Na<sup>+</sup>/K<sup>+</sup>-ATPase played a key role in animal evolution. An insight on the fundamental works, on activity aimed at popularizing scientific knowledge, and on philosophical reflections of V. Khlebovich in the decade between two jubilees can be gained from the reference list at the end of this article.

Vladislav Khlebovich is in creative search, and we – his friends, followers, and students – wish him strong health and success!

#### REFERENCES

1. Smirnov A. V., Khlebovich V. V. Marine biologist V. V. Kuznetsov: All life at the front line. *Priroda*, 2015, no. 5 (1197), pp. 80–84. (in Russ.)
2. Khlebovich V. V. *The Critical Salinity of Biological Processes*. Leningrad : Nauka, 1974, 236 p. (in Russ.)
3. Khlebovich V. V. *Akklimatsiya zhivotnykh organizmov*. Leningrad : Nauka, 1981, 136 p. (in Russ.)
4. Khlebovich V. V. *Poka eshche ne domashnie*. Moscow : Agropromizdat, 1987, 160 p. (in Russ.)
5. Khlebovich V. V. *Agrozoologiya*. Moscow : Agropromizdat, 1991, 172 p. (in Russ.)
6. Khlebovich V. V. *Mnogoshchetinkovye chervi semeistva Nereidae morei Rossii i sopredel'nykh vod*. Saint-Petersburg : Nauka, 1996, 223 p. (Fauna of Russia and neighbouring countries ; vol. 22). (in Russ.)
7. Khlebovich V. V. *Kartesh i okolo*. Moscow : WWF Rossii, 2007, 72 p. (in Russ.)
8. Khlebovich V. V. *Ekologiya osobi (oчерki fenotipicheskikh adaptatsii zhivotnykh)*. Saint Petersburg : ZIN RAN, 2012, 143 p. (in Russ.)
9. Khlebovich V. V. The experience in the graphs analysis of the experimental and field hydrobiological data. *Astrakhanskii vestnik ekologicheskogo obrazovaniya*, 2013a, no. 2 (24), pp. 71–81. (in Russ.)
10. Khlebovich V. V. Critical salinity – homeostasis – sustainable development. *Proceedings of the Zoological Institute RAS*, 2013b, vol. 317, suppl. 3, pp. 3–6. (in Russ.)
11. Khlebovich V. V. To the 75<sup>th</sup> anniversary of BBS [Nikolai Pertsov White Sea Biological Station] MGU. *Priroda*, 2013c, no. 4 (1172), pp. 42–43. (in Russ.)
12. Khlebovich V. V. Milestones and principles of evolution of water–salt relationships in living organisms. *Biosfera*, 2014a, vol. 6, no. 2, pp. 170–175. (in Russ.)
13. Khlebovich V. V. Sketches of protoevolution. *Priroda*, 2014b, no. 8 (1188), pp. 93–94. (in Russ.)
14. Khlebovich V. V. Critical salinity as a marker of transition from the potassium to sodium stage of life development. *Uspekhi sovremennoi biologii*, 2015a, vol. 135, no. 1, pp. 18–20. (in Russ.)
15. Khlebovich V. V. Applied aspects of the concept of critical salinity. *Uspekhi sovremennoi biologii*, 2015b, vol. 135, no. 3, pp. 272–278. (in Russ.)
16. Khlebovich V. V. Presumption of the marine beginning in the animal physiology and ecology. *Proceedings of the Zoological*

<sup>4</sup>Yu. Natochin (born 1932), Soviet and Russian scientist, physiologist, and evolutionist, Academician of the Russian Academy of Sciences, D. Sc.

- Institute RAS*, 2015c, vol. 319, no. 4, pp. 536–544. (in Russ.)
17. Khlebovich V. V. Origin of life and animals. *Priroda*, 2015d, no. 6 (1198), pp. 69–71. (in Russ.)
  18. Khlebovich V. V. Individual as a quantum of life. *Russkii ornitologicheskii zhurnal*, 2015e, vol. 24, no. 1188, pp. 3265–3273. (in Russ.)
  19. Khlebovich V. V. New window to epigenetics. *Russkii ornitologicheskii zhurnal*, 2015f, vol. 24, no. 1231, pp. 4639–4653. (in Russ.)
  20. Khlebovich V. V. *Zhivotnye i my*. Moscow : KDU, 2015g, 49 p. (in Russ.)
  21. Khlebovich V. V. On predator–prey taxocenoses. *Biosfera*, 2016, vol. 8, no. 2, pp. 151–154. (in Russ.)
  22. Khlebovich V. V. Memoirs of Vladimir Lvovich Wagin. *Uchenye zapiski Kazanskogo universiteta. Seriya Estestvennye nauki*, 2017a, vol. 159, no. 3, pp. 361–366. (in Russ.)
  23. Khlebovich V. V. Adaptivnye reaktsii organizma v menyayushcheysya srede. *Nauka – shkole : sbornik nauchnykh publikatsii / Rossiiskaya akademiya nauk, Sankt-Peterburgskii nauchnyi tsentr*. Saint Petersburg : Art-Ekspress, 2017b, iss. 6, pp. 33–46. (in Russ.)
  24. Khlebovich V. V. Acclimation of animal organisms: Basic theory and applied aspects. *Uspekhi sovremennoi biologii*, 2017c, vol. 137, no. 1, pp. 20–28. (in Russ.)
  25. Khlebovich V. *Kadry iz zhizni odnogo zoologa. Vospominaniya*. Moscow : Novyi khronograf, 2017d, 336 p. (in Russ.)
  26. Khlebovich V. V. On strategic solutions of living nature. *Uspekhi sovremennoi biologii*, 2018, vol. 138, no. 6, pp. 627–630. (in Russ.)
  27. Khlebovich V. V., Ivanov V. V. Estuarine ecosystems and their place in natural river mouth complexes of the Arctic (by the example of the Yenisey mouth area). *Uspekhi sovremennoi biologii*, 2018, vol. 138, no. 2, pp. 218–224. (in Russ.)
  28. Khlebovich V. V. About the origin and fate of extraterrestrial civilizations. *Uspekhi sovremennoi biologii*, 2019, vol. 139, no. 2, pp. 206–208. (in Russ.)
  29. Khlebovich V. V. The Tree of Life – animals – man – science. *Russkii ornitologicheskii zhurnal*, 2020, vol. 29, no. 1923, pp. 2192–2195. (in Russ.)
  30. Khlebovich V. V., Komendantov A. Yu. On physiologically freshwater invertebrates of marine origin. *Zhurnal obshchei biologii*, 1985, vol. 46, no. 3, pp. 331–335. (in Russ.)
  31. Shadrin N. V., Shulman G. E., Zaika V. E., Aladin N. V., Plotnikov I. S., Smurov A. O. Jubilee of DS (biol.), Prof. Vladislav Vil’hel’movich Khlebovich. *Morskoj ekologicheskij zhurnal*, 2012, vol. 11, no. 4, pp. 108–109. (in Russ.)

**ВЫДАЮЩИЙСЯ ОТЕЧЕСТВЕННЫЙ ЗООЛОГ И ГИДРОБИОЛОГ  
ВЛАДИСЛАВ ВИЛЬГЕЛЬМОВИЧ ХЛЕБОВИЧ,  
К 90-ЛЕТИЮ**

**Н. В. Шадрин<sup>1</sup>, М. И. Орлова<sup>2,3</sup>, Е. В. Ануфриева<sup>1</sup>, А. О. Смуров<sup>3</sup>**

<sup>1</sup>ФГБУН ФИЦ «Институт биологии южных морей имени А. О. Ковалевского РАН»,  
Севастополь, Российская Федерация

<sup>2</sup>Санкт-Петербургский научный центр Российской академии наук,  
Санкт-Петербург, Российская Федерация

<sup>3</sup>Зоологический институт Российской академии наук, Санкт-Петербург, Российская Федерация  
E-mail: [lena\\_anufrieva@mail.ru](mailto:lena_anufrieva@mail.ru)

В 2022 г. исполнилось 90 лет выдающемуся зоологу и гидробиологу — профессору Владиславу Вильгельмовичу Хлебовичу. Очерк представляет собой краткий обзор его многогранной деятельности и вклада в науку.

**Keywords:** Khlebovich, main results, salinity, evolution, ecology