

Dimitrie Voinov (1867-1951) and his achievements in biology

Patricia Ioana Riurean*, Madalina Elena Ristea*, Otilia Zarnescu✉

Department of Biochemistry and Molecular Biology, Faculty of Biology, University of Bucharest, 91-95 Splaiul Independenței; *These authors have contributed equally to this work and share first authorship

✉Correspondence to: Otilia Zarnescu, Department of Biochemistry and Molecular Biology, Faculty of Biology, University of Bucharest, 91-95 Splaiul Independenței, 050095 Bucharest, Romania E-mail: otilia.zarnescu@bio.unibuc.ro

Received: 20 November 2023 / Revised: 4 December 2023 / Accepted: 9 December 2023 / Available online: 29 December 2023

Abstract Dimitrie Voinov (1867-1951) was one of the most important and valuable Romanian biologists. He dedicated his life to his passion for biology and he was a great professor, biologist, zoologist, histologist and cytologist. Also, Voinov was a professor at the Faculty of Science, University of Bucharest, where he made his passion for biology into a career. He studied formation and evolution of sex cells, oogenesis, and spermatogenesis in invertebrates. These studies provide essential contributions about invertebrate chromosomes. He also did a lot of research on cytoplasmic elements, such as mitochondria and Golgi complex. Voinov was the first researcher that discovered a case of aneuploidy in the Animalia Kingdom. Some of his research articles are considered the basis of classical cytogenetics and he is known as one of the founders of the Cytogenetics School in Romania. Dimitrie Voinov was a member of the Romanian Academy. This article is a tribute to his impressive career and highlights his human and professional development, as well as his scientific contributions and discoveries.

Keywords: Dimitrie Voinov, Romanian scientist, biologist, cytologist, microscopist

Introduction

More than 70 years have passed since the death of the great scientist and professor Dimitrie Voinov. Dimitrie Voinov is one of the pioneers of Romanian biology and is among the most important and valuable Romanian biologists (Fig. 1).



Fig. 1. Dimitrie Voinov.

https://ro.wikipedia.org/wiki/Dimitrie_Voinov

Although he has done impressive research, there are few people who know the scientific research and discoveries of Dimitrie Voinov. He was a scientist who gave biology a series of impressive discoveries. Many of his discoveries are not widely known, but the work to support evolutionism and materialism became very known and appreciated in the scientific world (Iftimovici, 1971).

Early life and education

Dimitrie Voinov was born on 6 February 1867, in Iasi, Romania, son of Ecaterina and Stefan Desila. When he was 9 months old, after his mother's passed away he was adopted by Niculae and Eliza Voinov (Iftimovici, 1971). Dimitrie Voinov attended primary school in Focsani, and secondary courses at the private high school, the Academic Institute of Iasi (Ceausescu and Mohan, 1977). There he had the opportunity to study with great professors, such as Grigore Cobalcescu - science, Ion Mincu - mathematics, Alexandru Xenopol - history, and Anton Naum - french language (Iftimovici, 1971). In 1882, Dimitrie Voinov became a student at the Saint Sava High School, Bucharest, but later he returned to the Academic Institute of Iasi where he graduated in 1886.

After high school graduation, Dimitrie Voinov enlists in the army, and in April 1886 he becomes a second lieutenant (Ceausescu and Mohan, 1977).

First steps in biology

Dimitrie Voinov's passion for biology began when he was still in school, his teacher, Grigore Cobalcescu, having an important role in developing this passion. As he was very passionate about biology, in 1887, he is supported by his father to continue his studies at Sorbonne University, Paris (Ceausescu and Mohan, 1977).

At Sorbonne University he does his major in zoology due to his zoology professor Henri Felix de Lacaze-Duthiers. In the same year, he started to study also at the University of Medicine, as he wanted to get his Ph.D. before 1893. Because of financial difficulties after only 2 years of study, he had to drop the University of Medicine. However, thanks to the support he received from his closest friends he continued his courses at Sorbonne University of Science (Iftimovici, 1971).

In 1889 for the first time, he gets to Roscoff, in France to start working alongside Pruvot Georges, a friend, and colleague of Professor Lacaze-Duthiers. To improve his knowledge in science he worked every summer in Roscoff and Banyuls-sur-Mer Marine Research Station alongside Emil Racovita and Ioan Cantacuzino. Here, he recreated through detailed drawings various microscopic and macroscopic structures. These impressive drawings were exhibited in science classes in Roscoff and on the hallways of the University of Science in Paris (Iftimovici, 1971).

In 1890 he met the great zoologist Alexander Onufrievich Kovalevski from whom he learned a new technique of using vital dyes to study small marine animals. Voinov worked together with Kovalevski in Banyuls sur Mer, Rascoff and in Italy (Iftimovici, 1971).

Also in 1890, in Napoli, Italy, he meets several professors: Anton Dohrn, Huso Eisig, Paul Mayer, Salvatore Lo Bianco, and Doctor Schonlein. Ioan Cantacuzino introduced him to Ilia Ilici Mecinikov, from whom he learned about the phagocytic capacity of the cells and the importance of phagocytic cells in the body's defense (Iftimovici, 1971).

In the spring of 1892, he returned to Banyuls-sur-Mer so he could start working on his PhD about Ascidians. After a few weeks, he receives a letter from Paul Bujor, a very good friend who announces him about a vacant seat in the Morphology Department of the University of Science in Bucharest (Iftimovici, 1971; Ceausescu and Mohan, 1977).

Initially, Voinov did not want an academic career, but after a few weeks he returns to Romania to participate in the competition for the vacant position at the University of Science in Bucharest. Competition occurred in Bucharest on October 15, 1892. Voinov competed for the same position against his close friends Paul Bujor,

Grigore Antipa and Nicolae Leon. A few days after the competition, Paul Bujor sent him a congratulatory letter for getting the position at the Morphology Department. Therefore, at the age of 26 he became professor at the University of Science in Bucharest (Iftimovici, 1971).

A professor and a scientist

Dimitrie Voinov transforms his passion for biology into a career. Thus, he was a great professor, but also a very important researcher. Voinov was highly noticeable right from the beginning of his career as professor. His lectures were at a high scientific level and listened to with great interest by the students. He was professor of Animal morphology and Zoology at the Faculty of Sciences in Bucharest from 1892 to 1937 (Fig. 2) (Ceausescu and Mohan, 1977).

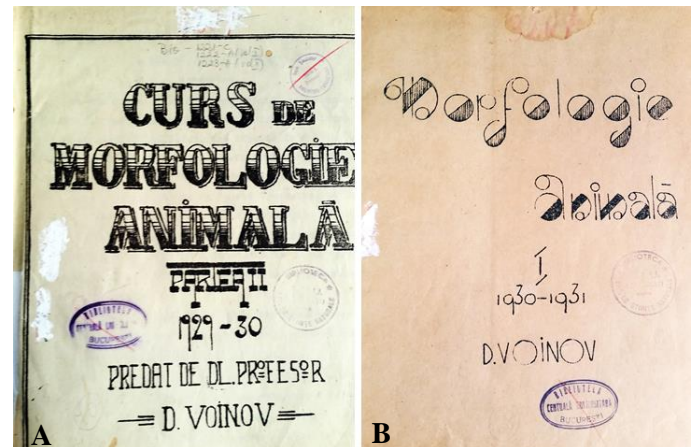


Fig. 2. Front covers of the course *Animal morphology* published in academic year 1929-1930 (A) and 1930-1931 (B).

From the first year of his career, he writes in the Romanian scientific journal *Literatură și știință* the article "The new transformations conquests". In 1894, he writes another two articles that are based on different philosophical and theoretic aspects of life: *The environment as a transformational factor* in journal *Adevărul* and *The method in the morphology studies* in *Literatură și știință*. These two articles are referring to a number of concepts described by Jean-Baptiste Lamarck, Charles Darwin, and August Haeckel (Iftimovici, 1971).

From the beginning of his career, he became passionate about genetics and made his debut in genetics in 1894 by writing a review article entitled *Theory of heredity and Weismann*.

The great discoveries in genetics of that time, such as chromosomes, meiosis, the theory of heredity, the pureline theory, crossing-over, made Voinov start research in cytogenetics, in 1896. He studied heredity as a biological phenomenon until the end of his career, and wanted to explain the mechanism of character transmission. In 1896 cytogenetics was not a developed field of science. Therefore, the first research articles written in 1896 and 1917 by Voinov were considered to

be classical cytogenetics studies, he launching the field of cytogenetics in Romania (Iftimovici, 1971).

At the end of 1896, he published in Paris his research about the excretory system of the annelid worms, *Branchiobdella varians*. In the same year, he discovered in the gulf of Napoli, on the Nisida Iceland a new species of mites, *Capidognathus trouessarti* (Carriglio, 2010). Another series of articles have been written by the professor Voinov regarding the digestive epithelium and adipose tissue of *Odonata* larvae. These last findings can be found in *The Journal of the Comparative Physiology* (Iftimovici, 1971).

Desire to know more, between 1895 and 1897, he went to the University of Heidelberg and Freiburg in Germany, where he studied different techniques for fixation, staining, and examination of the cells and tissues (Iftimovici, 1971).

In 1897, Voinov return to Bucharest where he continues his teaching career and research. Also, in 1897, Voinov together with his best students from the Faculty of Science, University of Bucharest, wrote a course named *Comparative Course of Embryology and Morphology*. Simultaneously, he continues his research regarding the formation and evolution of sex cells, oogenesis, and spermatogenesis in invertebrate animals, such as: a species of butterfly, *Gryllus campestris*, and beetles, *Cybister roesseli* and *Gryllotalpa vulgaris*. These studies provide essential contributions about invertebrate chromosomes, and his research was presented by Professor Yves Delage at the French Academy of Science (Iftimovici, 1971).

Another impressive discovery of Voinov was aneuploidy, in 1912. Voinov studied the spermatogonia of *Gryllotalpa vulgaris* and compared his results with those of the cytologist Vom Rath. Vom Rath reported that there are 12 chromosomes in *Gryllotalpa vulgaris*, while Voinov found 14 in some specimens, 16 in others. Also, around the same time, the American zoologist Fernandus Payne reported that some specimens had 12 chromosomes, others 15. The discovery of the first case of aneuploidy or polysomy in the Animalia Kingdom belongs to Voinov and is one of the greatest discoveries of Romanian biology (Iftimovici, 1971).

Although most researchers of the time were concerned with the study of the nucleus, Voinov chose to study the cytoplasm. Therefore, between 1914 and 1916 he focused on the study of mitochondria and he proves that in the *Gryllotalpa vulgaris* spermatogonia, the mitochondria fragment and form small corpuscles, which he named „chondriosomes”. Following his research, he firmly affirmed that mitochondria have the ability to divide on its own. His statement was vehemently disputed and disagreed upon on many researchers of that time, and only after a few years did modern science confirm the observations Voinov made at that time (Iftimovici, 1971). His findings were disputed by many researchers of the time, but a few years later modern science confirmed the observations made by Voinov.

Following his research on cells from the salivary glands of *Helix pomatia*, he wanted to demonstrate that dictyosomes are elements of the Golgi complex. Later, he proved that the Golgi complex differs from the vacuome and mitochondria. Moreover, he demonstrated that the Golgi complex is not only present as a network, but also as isolated elements. Also, professor Voinov demonstrated that dictyosomes have a chromophil and a chromophobe region, thus supporting the idea that these two parts form a morphological and physiological unit. On the other hand, studies on *Helix pomatia* and *Notonecta glauca* demonstrated that the Golgi apparatus has a secretory role. Therefore, Voinov proposes to replace the name *dictyosome* in *ergosome*, to showing the role of the Golgi complex in the secretion of vitamins, enzymes, and other substances necessary for cellular metabolism (Iftimovici, 1971).

Dimitrie Voinov did cytological research on different insect groups such as Coleoptera, Lepidoptera, and Orthoptera. He studied the form, structure, and development of sperm cells. Also, he contributed to the description and explanation of the fertilization process. Simultaneously, he continued his research on cytoplasmic elements and discovered the existence and function of the condriome and vacuome in the cell (Iftimovici, 1971).

The great biologist Dimitrie Voinov wrote over 50 scientific works published in different journals in Romania and abroad. The most important works are as follows:

“*Sur une nouvelle espece d’Hallacarus trouessarti*” (Paris, 1896)

“*Les néphrites de Branchiobdella varians*” (Paris, 1896)

“*Recherches physiologiques sur l’appareil digestif et tissue adipeux des larves des Odonates*” (Bucuresti, 1898)

„*Microscopy principles*” (Bucharest, 1900) (Fig. 3.A)

”*La spérmatogènes chez Gryllotalpa vulgaris*” (Paris, 1912)

”*Des constituants cellulaires: L’appareil de Golgi et les dictyosomes*” (Paris, 1928)

“*Les dictyosomes dans la celule nerveux*” (Paris, 1929)

”*Intérpretation de l’appareil réticulaire interne de Golgi*” (Paris, 1934)

”*Dictyosome (ergastoblastes), Parasomes, Corps vitellins de Balbiani, Interprétation de l’appareil réticulaire interne de Golgi*” (Paris, 1934) (Fig. 3. B) (Ardelean et al., 2000).

Other achievements

In 1926, Voinov, together with the physiologist Ioan Atanasiu, succeeded in opening the building in Splaiul Independentei, where the Faculty of Biology of the University of Bucharest is still located today (Ceausescu and Mohan, 1977).

Another achievement is that in 1927, Dimitre Voinov became a member of the Romanian Academy, as proposed by Emil Racoviță (Ceausescu si Mohan, 1977).

Between 1929 and 1940, he published a series of reports on contemporary scientific works that belonged to Romanian scientists, such as Vasile Radu and Virgil Nitulescu. In the same period, he wrote the article “*Structures ergastoblastiques*”, which was published in Paris (Iftimovici, 1971).



Fig. 3. (A) Front cover of the book *Principles of Microscopy* published in 1900; (B) First page of the article *Dictyosome (ergastoblastes), Parasomes, Corps vitellins de Balbiani, Interprétation de l'appareil réticulaire interne de Golgi* published in 1934.

Other achievements

In 1926, Voinov, together with the physiologist Ioan Atanasiu, inaugurates new Faculty of Biology building in Splaiul Independentei 91-95, that is still in use today (Ceausescu and Mohan, 1977).

Another achievement is that in 1927, Dimitre Voinov became a member of the Romanian Academy, as proposed by Emil Racoviță (Ceausescu si Mohan, 1977). Between 1929 and 1940, he published a series of reports on contemporary scientific works that belonged to Romanian scientists, such as Vasile Radu and Virgil Nitulescu. In the same period, he wrote the article “*Structures ergastoblastiques*”, which was published in Paris (Iftimovici, 1971).

Besides his amazing contribution to science, he also significantly contributed to the development of Romanian literature. He was one of the founders of the Literature Society “Junimea”, together with Titu Maiorescu, Constantin Alexandru Rosetti, and Constantin Negruzzi (Ardelean et al, 2000).

In 1937, he made his retirement decision after a lifetime of amazing didactic and scientific work, but as he could not stay away from his biggest passion, he continued to teach at the university until 1938 (Iftimovici, 1971). In 1949, at the age of 82, he became an honorific member of the “Romanian Academy” (Ceausescu and Mohan, 1977).

Conclusions

Dimitrie Voinov (1867-1951) was an important personality of the Romanian and universal science. He will continue to live throughout his great scientific works and research, as well as in the hearts of every biology student who have hope that one day they will succeed in becoming great biologists that will change the world. This article is a tribute to one of the most important and valuable Romanian biologists and highlights both his human and professional development as well as his scientific contributions and discoveries.

©The Author(s) 2023

Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

References

- Ardelean A., Mohan Gh., Titu H. 2000. The Dictionary of Romanian Biologists - Vol. II. Mediagraf, Arad, Romania.
- Carriglio D. 2010. Arachnida Acari Halacaridae – Pontarachnidae. *Biol. Mar. Mediterr.* 17, 390-393.
- Ceausescu I., Mohan Gh. 1977. From the life and work of great biologists. Editura Didactica și Pedagogica, Bucharest, Romania.
- Iftimovici R. 1971. Dimitrie Voinov. Editura Științifică, Bucharest, Romania.
- https://ro.wikipedia.org/wiki/Dimitrie_Voinov