

# The Legacy of Professor Dmitry Zernov: Anatomist, Scientist and Educator

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**Abstract.** Dmitry Nikolayevich Zernov (1843-1917) was a renowned Russian anatomist, emeritus professor, head of the medical faculty and president of Moscow Imperial University, and a prominent international collaborator. One of his most important contributions to medicine was as active advocacy of international outreach of an otherwise isolated medical scientific society. Seeking to understand advanced technologies being used in Germany, Dr. Zernov completed a full course of training with the famous German professors Salmon Stricker and Ernst Brücke. To promote Russian science, he published his articles in international journals. Occupying the post of head of the medical faculty, Zernov sought to improve the quality of education based on his personal research into best practices developed by visiting a number of foreign institutions and observing innovative approaches to teaching medical disciplines. He always shared his experiences and knowledge with students and colleagues. Zernov was a pioneer in exploring of structure of the brain and invented the encephalometer, a unique device for anatomical studies, the ancestor of modern stereotaxic apparatus. Among his seminal contributions were *'Individual Types of Brain Convolution in Humans'*, *'On the limits of individual and tribal modifications of typical grooves and convolutions of the brain'*, *'On the anatomical features of the brain of intelligent people'* as well as refuting a controversial theory advanced by Italian psychiatrist Lombroso about innate predisposition to commission of crimes. Zernov's legacy lives on today in the heart of anatomists and surgeons, as well as the Russian anatomical medical community.

**Key words:** Dmitry Zernov; Anatomists; History of Medicine; Educational Techniques; Anatomical History.

## Childhood and adolescence of the famous anatomist

One of the founding fathers of the Moscow anatomy school and author of many important scientific works in the field of comparative anatomy and neurology, Dmitry Nikolayevich Zernov was born on November 7<sup>th</sup>, 1843 (Figure 1). Zernov received an excellent home education, due to his families nobility. His father, Nicolay Efimovich Zernov was a professor in Mathematics at Moscow University and developer of the periscope, supported the ideals of The

Enlightenment. Young Dmitry often watched his father work, which inspired him to follow in his footsteps. He was drawn to the natural sciences. Having completed the general education program by age 16, he entered the Medical Faculty of Imperial Moscow University, which was founded in 1755 on the initiative of Mikhail Lomonosov (1). From this moment onwards, his life focused on medicine, which he replenished and expanded continuously with new fundamental knowledge (2).

At the university, Zernov learned the structure of the human body in detail and was on several occasions



**Figure 1.** Dimity Nikolayevich Zernov (1903, Portrait located at Human Anatomy Department of First Moscow State Medical University). Supplied by the department head with permission to use, no copyright conflicts.

honored for his outstanding work. During the fifth year of medical school, he received an honorary review for his essay *'About liver structure'* (3). He took a keen interest in ophthalmology. After graduating, he worked as an intern at the Moscow Ophthalmology Hospital, under prof.dr. Gustav Ivanovich Braun. Prof. Braun was a Russian with German roots, who was an outstanding ophthalmologist and director of this Ophthalmology Hospital. Over the next two years, Dmitry Nikolayevich conducted significant research into the anatomy of the eye, receiving a Doctor of Philosophy in 1867 for his dissertation *'About microscopic lens structure in humans and vertebrates'* (4). In his dissertation he highlighted and systematized anatomical and histological aspects of the eye. Dr. Zernov described the similarity of the optical structures of human and animal eyes. Additionally, he described the process of lens curvatures changes associated with focus, as well as the role of the lens capsule in vision. His dissertation represented a breakthrough in ophthalmology, as previous scientists offered only descriptive studies (5). His dissertation results were published in the 13th volume of the journal *'Albrecht von*

*Graefe's Arch. Für Ophthalmologie'*(3). After this publication, the founder of the Moscow Histology School and professor at the medical faculty of the university, Alexander Ivanovich Babukhin, recognized Dr. Zernov's talents. Babukhin invited Dmitry Nikolayevich to work as a full-time faculty member to conduct practical courses and teach students.

As part of the academic staff at Moscow Histology School, Zernov along with Babukhin traveled through Europe (from 1860-1865) to gain firsthand knowledge of several significant discoveries: in 1860 Louis Pasteur demonstrated the role of microorganisms in fermentation that led Joseph Lister to discover the use of antiseptics and improve surgical outcomes. I.M. Sechenov researched *'Reflexes of the brain'* in 1863. In 1868 Gregor Mendel published his discovery of the patterns of hereditary traits. Later, in Vienna (1869) Dr. Zernov visited the laboratories of professors Salmon Stricker and Ernst von Brucke. Afterwards Zernov went to Trieste, where he independently studied the structure of olfactory sense in mollusks (for example snakes, slugs, mussels). The results of this research were published in German under the supervision of his scientific chief Babukhin (3).

### Teaching and scientific activity

In 1869, the Council of Moscow University approved Dr. Zernov as an associate professor of the Medical Faculty, which fueled his desire to perform research in the field of emergent medical sciences. Zernov considered the pursuit of knowledge to be the main component of a good educator. Therefore, he completed a second international tour (period of stay in Europe: 1870-1873) to gain additional practical knowledge. In the summer of 1871, Zernov visited anatomical institutes in Leipzig, Göttingen, Heidelberg, Freiburg, and Tübingen, where he sought to learn methods to improve education at home (3). He also attended lectures in Vienna by professors Josef Hyrtl and Patruban. In 1871, Dr. Zernov pursued courses of training at leading institutes in Austria and Germany (6).

Dr. Zernov advanced quickly in his career. In 1880 he became a professor of the Department of Anatomy at Moscow University. From 1879 to 1884, Dr. Zernov

was secretary of the Medical faculty of Moscow University named after M.V. Lomonosov. In 1898-1899, he served as Chancellor of Moscow University. From 1906 to 1914, he was the dean of the Medical Faculty.

Dr. Zernov sought to improve the quality of education throughout his *alma mater*. He organized a mechanical workshop at the astronomical observatory; arranged with the Society of Russian Literature to host a solemn meeting in honor of the 100<sup>th</sup> birthday of the famous write Aleksandr Sergeyeovich Pushkin (7) at Moscow University. He took an active part in the preparation of the XI Archaeological Congress. At this event, several leaders of the famous '*Society of Devotees of Natural Science, Anthropology, and Ethnography*' where present: V.O. Klyuchevsky, V.F. Miller, and D.N. Anuchin were honored speakers.

A turning point was the release of the '*Provisional Rules*' (1899), according to which students involved in "revolutionary activities" were conscripted to serve in the army as soldiers. As described by one of his students, Dr. Zernov was not liberal-minded, but he was the first chancellor who actively sought to reassure and support younger generations. After arrests of students began, he immediately went to the Moscow Governor General to protest the actions of the state police. Unable to achieve their release, he resigned the post of chancellor.

Dr. Zernov remained to teach only the Higher Women's Courses (6) (at Moscow University). While teaching, he completely moved away from medical practice and directed all his strength and abilities to develop a training course to improve the quality of medical training. He started to use a projector during his lectures. To increase understanding of taught material, he used colorful teaching aids. In addition, he drew diagrams on the board that students reported to be easy to understand. One of Dr. Zernov's students, P.I. Karuzin, said:

"Erudition, the gift of words, beautiful figurative speech, excellent diction and artistic abilities, with a broad understanding of the tasks of teaching, made the presentations of Dimitry Nikolayevich lively and interesting. His lectures were usually accompanied by beautifully sketched diagrams, drawings, and demonstrations of a large number of preparations" (8).

In 1890 Zernov's '*The guide of descriptive human anatomy*' was published and successfully established among students. This book became a trusted reference manual not only for students at the university, but also for clinical practitioners. This text was reprinted 14 times, with the last edition published in 1939 on the eve of World War II (9).

Because of Dr. Zernov's activity and his inspired participation in the life of the university, unique collections of natural anatomical preparations were curated and actively used in practical classes. These preparations, which were made by himself and his colleagues, were made so well that they are still preserved in the Anatomical Museum of Sechenov University (Moscow, Russia) and make up a significant part of the museum's archives.

Dr. Zernov's teaching was fruitful in terms of the accomplishments of his students. While at Moscow University, the famous writer Anton Pavlovich Chekhov attended Dr. Zernov's lectures on anatomy, during which the professor used corpses. Chekhov was then inspired to write a humorous book '*Brief Human Anatomy*' (10). Dr. Zernov was an advisor for Konstantin I. Krzhizhanovsky (Russian opera singer). Under Dr Zernov's leadership, Krzhizhanovsky studied the physiology and anatomy of the human throat in depth, which helped him develop his own vocal techniques, which are described in the books '*Causes of the Decline of Vocal Art*' (1902) and '*Vocal Art*' (1909). Dr. Zernov was acquainted personally with the famous Russian opera singer Fedor Chaliapin (5).

Dr Zernov's diverse successes and talents were noted by his colleagues. The famous Russian surgeon, Ivan P. Aleksinsky noted special presentation and small stiffness in the professor. According to him, the professor always carefully approached the choice of attire. Also, he was very demanding: students gave him the nickname "General". Dr. Zernov's lifestyle helped him become a first-class scientist and a good teacher. Demanding complete discipline in scientific work, he did not make exceptions even for himself (8).

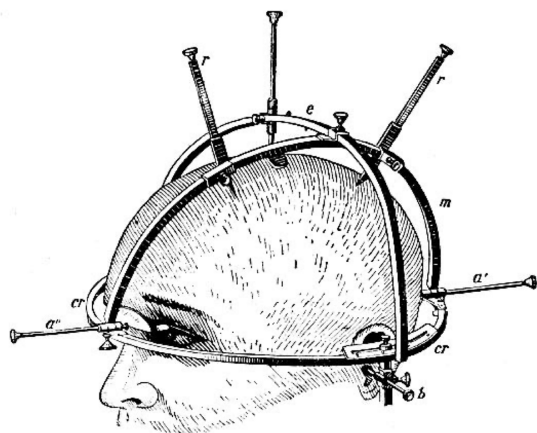
When he was the head of the Department of Human Anatomy, he raised the question of building a new edifice for the department. In 1878, on Mokhovaya Street, the new two-story anatomical building was opened. The building included an anatomical

theater. The second floor of the new building was given over to the anatomical museum, where many of the models made by Dr. Zernov were exhibited. Currently, the 'Zernovsky' building belongs to the Electoral Commission of Moscow (11).

### Scientific achievements

Dr. Zernov paid special attention to the issues of the central nervous system's organization. He was interested particularly in the topographic features of the surface of the hemispheres as well as the location of the sulci and convolutions that varied between individuals. Dr. Zernov believed that it was the sulci that required careful study because by their nature and placement they had to be more than just separators between the hemispheres. About the same time, German anatomist-anthropologists Alexander Ecker and Adolf Pansch also described the surface of the brain. Thereafter, Dr. Zernov constantly referred to the seminal work of these German colleagues (12).

Professor Zernov was able to refute the controversial innate crime theory advanced by the Italian psychiatrist and criminalist C. Lombroso, resting his evidence on data analysis (13). Having invented the encephalometer to study brain topography, he used the device to collect the data that he had used in the refutation (Figure 2).



**Figure 2.** Encephalometer of D.N. Zernov. (1905, Illustration by Professor Zernov). Used with permission from the Human Anatomy Department Museum at Sechenov University.

Using this device, researchers could determine the projections of various parts of the brain onto the skull (14). In 1907 another famous Russian neurologist, G. Rossolimo, improved the device (15). He described the results of his work in publications: '*Individual types of cerebral sulci in a person*', '*On the question of the limits of individual and tribal modifications of typical grooves and sulci of the brain*', '*About anatomical features of the intelligent persons brain*' (12,16,17).

In addition to the research on the nervous system, Dr. Zernov was interested in the comparative morphology of the intestines and their blood vessels. His research was published in several works on this topic, including '*On the position and shape of the mesenteric part of the small intestine and its mesentery*'.

Perhaps surprisingly, Dr. Zernov was also a skilled embalmer. He and his student P.I. Karuzin participated in embalming the body of Russian Emperor Alexander III (11). His son, V.D. Zernov wrote:

"On the day of the emperor's death, the palace general came to our apartment and said that father should immediately leave for Crimea by emergency train. In the beginning he said nothing about the Emperor's death, but later everything became clear. Dad was an anatomist and a major embalming specialist, and he had been called on such occasions before. He embalmed the body of Alexandra Georgievna, one of the members of royal family and the wife of Grand Duke Pavel Alexandrovich, who had died in Ilyinsky near Moscow. Dr. Zernov also embalmed Grand Duke Sergei Alexandrovich, who was the Moscow Governor-General". Taking part in embalming the body of the deceased Emperor Alexander III, also had material benefits. His son preserved a letter from the manager of the Cabinet of his Imperial Majesty (dated December 19, 1894) that Dr. Zernov was to be paid five thousand rubles for "the treatment of the deceased Emperor Alexander III in Bose" (8).

### Final years and conclusion

In 1914, Zernov was diagnosed with prostate hypertrophy. Although he needed surgery, several years



passed before he received the operation. Unfortunately, on the eve of the long-awaited hospitalisation for removal of the prostate on 13 March 1917, Dr. Zernov passed away due to a heart attack. The funeral took place in Moscow at the Dorogomilovsky cemetery, after which the ashes of the scientist were transferred to the Vagankovsky cemetery.

Professor Zernov had been an excellent mentor for many famous scientists including P.I. Karuzin, A.A. Deshin, and others. He not only taught students, but also took care of their self-realisation and the awakening of their creative abilities. The primary task for him was to show his students the necessity and importance of scientific medical advances (18). After the death of Dr. Zernov, Karuzin became head of the Department of Anatomy at Moscow University, and A. Deshin headed the Department of Anatomy at the Higher Women's Courses. Dr. Zernov's dedication to developing international cooperation deserves special appreciation. Throughout his scientific and pedagogical activities, he constantly stayed up to date with the work of foreign colleagues, completed several courses of training in Germany, attended various conferences, made presentations, and brought radically new and innovative ideas to the educational processes of medical universities in Russia, with the support of experienced colleagues from abroad. Russia and the world was served well by the renowned scientist, Dmitry Nikolayevich Zernov.

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