

## Physiological school

History of development of physiology at Kazan University is closely associated with the history of the university itself. Physiology is studied at the University nearly 200 years. Teaching this subject began at the medical division since the foundation of the university in 1804. In 1806 it was opened the department of anatomy, physiology and forensic medical science. At the beginning of the XIX century there were some attempts to conduct experimental research on physiology at the University but taken out of the department. Famous Kazan astronomer I.M.Simonov studied mechanism providing the clarity of vision differently distant objects (accommodation of the eye). Professor of Science in Veterinary F.A.Brauel carried out his first research on the impact of osmic acid on animal organisms and humans. At the beginning of 1847 on the rector Lobachevsky's initiative in the surgical clinic of Professor F.O.Elachicha it was performed clinical study to verify the action of the narcotic properties of the sulfuric ether.

Beginning of systematic studies in the field of physiology at Kazan University is connected with the name of **F.V.Ovsiannikov** who took over the direction of the Department of Physiology of the Faculty of Medicine in 1858. F.V.Ovsiannikov with rector A.M. Butlerov support created **the first experimental physiology laboratory in Russia**, after which other laboratories appeared as well: histological, pharmacological, psycho-physiological, biochemical, experimental pathology. F.V.Ovsiannikov's laboratory became a center of development of the medical faculty and was the basis for the formation of the largest university research school. It is important to note that all work performed in the laboratory, were devoted to the study of the nervous system and combined histological and physiological methods. At the University successfully initiated activities of F.V.Ovsiannikov did not last long. In spring 1863, he was invited to the Academy of Sciences in St. Petersburg. However, Ovsiannikov needed more than five years to laid the main morphological and physiological approaches in the study of nervous system, which subsequently became a characteristic feature of the Kazan school of physiologists. It was in Kazan where F.V.Ovsiannikov began his research about location of the vasomotor center in the brain. This work has received worldwide fame. It is also interesting that The Nobel Prize winner, Academician Pavlov was Ovsiannikov's postgraduate student in St. Petersburg.

After F.V.Ovsiannikov's leaving superintendence of the department took his student **N.O.Kovalevsky**. Name of this scientist is rightly proud not only of Kazan University, but also the whole Russian physiology. Professor Kovalevsky during a quarter of a century was developing with great success fundamental research in

physiology of nervous system, blood circulation, respiration, blood chemistry and psychophysiology. In the 60-70s of the XIX century N.O.Kovalevsky created **the first in Russia center for circulatory physiology** at Kazan University. His research were aimed at studying vascular system and the reflex of mutual relations between breathing and blood circulation. These issues are of direct relevance to medical practice. In the laboratory of Kovalevsky it was made several important discoveries. By the end of the 80s, Kovalevsky intercedes about the organization of the Physiological Institute and achieves the beginning of its construction. The Institute was opened in September 8, 1890. In the history of Russian physiology N.O. Kovalevsky rightfully ranks alongside I.M. Sechenov.

After the death of N.O.Kovalevsky post of a Head took his student N.A.Mislavsky - a graduate of Kazan University. At this time, the physiological laboratory of the University gradually becomes one of the largest scientific research organizations in Russia. The focus of both experimental studies as well as in teaching activity was aimed at studying the morphology and physiology of the autonomic nervous system. In the laboratory of N.A. Mislavsky issues of localization centers in the cerebral cortex studied **V.M. Bekhterev**. Namely in Kazan, he began to study the structure of the pathways in the spinal cord and brain and he constructed a cast iron model pathways of the brain. In 1886 Bekhterev organized **psychophysiological laboratory at the Nervous and Mental Diseases Department** of Kazan Imperial University. It was the first Russian laboratory where experimental and clinical psychology research were conducted.

37 doctoral theses came out from the laboratory of N.A. Mislavsky. The authors of these papers later became well-known scientists- physiologists: academician K.M. Bykov, corresponding full member of USSR Academy of Medical Sciences, I.P. Razenkov, corresponding member of USSR Academy of Medical Sciences, A.V. Kibyakov, corresponding member of USSR Academy of Medical Sciences, A.V. Vishnevsky corresponding member of USSR Academy of Medical Sciences, Professor S.S. Zimnitsky and many others. physicians who created an independent scientific medical schools. It should be also mentioned N.A. Mislavsky's participation in scientific research which were carried out at Kazan Scientific Institute of Labor Organization, created in 1922. N.A. Mislavsky consulted activities related to the development of physiological, psychological and psycho-technical research methods, the study problems of exhaustion in the workplace.

N.A. Mislavsky was awarded the title of Honored Worker of Science (1918), and in 1927 on presentation of I.P. Pavlov he was elected as a Corresponding Member of USSR Academy of Sciences. Under the guidance of N.A. Mislavsky Kazan

physiological laboratory finally took shape as an independent scientific school that studies the regulatory processes providing the integrity of the functions of the body.

The peculiarity of Kazan University was the fact that it was the first time in Russia it was carried out differentiated teaching of physiology at the medical and physical-mathematical faculty of natural division. In 1876 on Professor. N.O. Kovalevsky's initiative it was founded the second Department of physiology. The first head of the department was appointed I.M. Sechenov's student – **K.V. Voroshilov**, known for his studies about the nutritional properties of meat and peas, as well as the study of pathways in the spinal cord. Voroshilov was engaged in teaching and administrative activities. In 1889-1899 he executed as rector of Kazan Imperial University.

Beginning of the 20th century for the Kazan school of physiology associated with the name of **A.F.Samoylov** (1903-1930), who created a new direction of electrophysiological studies and made technical re-physiological laboratory. In 1906 in Holland, Samoilov bought string galvanometer at Professor V. Eynthoven, by means of which for the first time in Russia was registered the first **electrocardiogram** at first **healthy**, and then **sick person**.

Versatile activities of Kazan physiological school manifested itself in the organization of new clinical and scientific research laboratories and institutes. In 1920 was created the first Scientific Research Institute of Medical Profile in Russian - Kazan Clinical Institute (later Kazan State Institute for Advanced Medical) represented the harmonious union of physiology and medicine. In the clinical and physiological laboratory of the Institute was made a successful introduction of new heart disease clinic accurate laboratory methods - electrocardiographic method.

A.F.Samoylov has a priority in establishment of chemical transmission of nerve impulse to the muscle. This discovery marked the beginning of one of the leading areas of research of Kazan Physiologists - physiology of neurotransmitters and synaptic processes. For outstanding scientific achievements A.F. Samoylov was awarded the Lenin Prize in 1930 and was awarded the title of Honoured Scientist.

Since the time of A.F. Samoylov, actually a century Kazan physiologists have been examining in detail the issues of chemical transmission of excitation in the nervous system. The immediate students of corresponding member of the Academy of Medical Sciences of the USSR **A.V. Kibyakov** are professors **I.N. Volkova**, **G.I. Poletaev**, **L.N. Zefirov**, **H.S. Khamitov** who developed the ideas of their teacher

and studied trophic role of mediators in a variety of physiological processes. In the 60s of 20<sup>th</sup> century, Professor G.I. Poletaev implemented microelectrode method in a physiological experiment, thus initiating a new phase of work. Professor Herman Ivanovich Poletaev's Students are Professors of Kazan Medical University: **A.L.Zefirov, E.E.Nikolsky, E.M.Volkov, R.A.Giniatullin** - they created the modern school of sinaptology, which is one of the leading positions in Russia and recognized abroad. They conduct joint research with the physiology of the United States, Italy, Czech Republic, France and others. **Kazan School of sinaptology** twice awarded the title of "Leading Scientific Schools of Russia".

The main research areas of physiological studies laid down the founders of the school, stored for nearly 150 years. At the Department of Human and Animal Physiology of the University of Kazan is still being studied mechanisms of the nervous system, the role of mediators in the process of transfer of excitation in the central and peripheral structures, is developing clinical and psychophysiological research areas.

Under the guidance of **D.S.Vorontsova** (1930-1935) it was conducted the study of changes in excitability of neuromuscular system and the problems of exhaustion in it, it was initiated studies in evolutionary, comparative physiology and the physiology of labor.

In the early 30s, **M.A.Kiselev** (1935-1937) organized one of the first in the country specialization -physiology of labor. Since the beginning of World War II **N.P.Rezvyakov** (1938-1948) brought physiology problem to the practical medicine, studied the properties of vinyl-n-butyl ether, which is used to accelerate the healing of wounds and burns.

**I.G.Validov**, Honored Scientist of TASSR (1948-1965), played a prominent role in the development of problems of neuromuscular physiology. He described the mechanisms of post-tetanic potentiation of muscle contraction and he opened the role of calcium in synaptic transmission in mioneural compound of a frog.

In the 50s of the 20th century at the department it were carried out studies of the effect of the central nervous system functional state of the nerve-muscle preparation. **L.N.Zefirov** (1965-1991) made a great contribution to the development of the department, vigorously took up its restructuring, the creation of a material base. He revived research in the physiology of labor, he extended special training students in the field of psychophysiology of work and ergonomics, experimental and clinical electrophysiology.

In the 70s it was created psycho-physiological laboratory (the Head - Associate Professor **G.A.Aminev**), in which the psychophysiology of speech and memory, psychophysiology of work processes and trainings were studied. It was organized the laboratory of electronics, where necessary equipment were made; with the active participation of **L.N.Zefirov** the history of physiology at Kazan University was described.

**V.I.Alatyrev** (1991-1996) developed the experimental and clinical research areas on motion control and pain. Since 1996, under the guidance of **I.N.Pleschinsky** it is being studied the interactions in the afferent traffic management system in humans and animals, the different mechanisms of functional asymmetries.

At present, in our city scientists from several universities-public, medical and pedagogical, medical, veterinary and agricultural academies, institutes of Kazan Scientific Center of the Russian Academy of Sciences solve problems of physiology.

Active scientific work of a new generation of representatives of Kazan school of physiology is highly appreciated, they are winners of prestigious national and international awards. Research is being conducted on twenty international and domestic grants. It is a big responsibility on Kazan physiologists for the continuation of the great tradition of 'old school' scientists, for maintaining succession priority areas for their creative development using modern methodological approaches.