Chemical school

In year of foundation of Kazan University in 1804, the Department of Chemistry was opened. This event afterwards marked the beginning of the creation of the Faculty of Chemistry and the world famous **Kazan chemical school.**

Kazan. Kazan University. Kazan chemical school. The history of science strictly captures this sequence. In the chemical laboratory of Kazan University in the mid-19th century arose a scientific school, gave the world a galaxy of outstanding scientists whose work compile the golden fund of world chemical science. **K.K.Klaus, N.N. Zinin, A.M.Butlerov, V.V.Markovnikov, A.M.Zaytsev, F.M.Flavitsky, A.E.Arbuzov, B.A. Arbuzov** - here is a list of prominent names that make up the "main line" of the school.

N.N. Zinin and later A.M.Butlerov being elected an academician of the St. Petersburg Academy of Sciences, in accordance with the traditions of that time moved their research from Kazan to St. Petersburg. There was a "St. Petersburg branch" of Kazan chemical school.

V.V.Markovnikov after leaving Kazan University, continued studies at Novorossiysk (now Odessa) University and then at Moscow University. "Branch of Moscow" was formed. A.M.Butlerov's students and later A.M.Zaitsev's students headed the department in other Russian universities: A.N.Popov, E.E.Vagner - in Warsaw, S.N.Reformatsky - in Kiev, A.A.Albitsky - in Kharkov.

The inception of **Kazan chemical school** put the works of two great scientists: **K.K.Klausa and N.N. Zinin**. K.K.Klaus, Professor of Kazan State University, belongs the glory of the discovery in 1844, the ruthenium element. "I name a new element in honor of my fatherland - ruthenium " (in Latin: Russian) - wrote K.K.Klaus.

Two years earlier, in 1842, a remarkable discovery makes N.N. Zinin. He carries out reduction of nitrobenzene to aniline. This reaction is initiated industrial organic synthesis and, in particular, such branche as aniline-dye industry. N.N.Zinin is not only an outstanding scientist he is a prominant public figure, one of the organizers of Russian Chemical Society (1868) where he was the first president during 10 years.

The glory of his teachers multiplied A.M.Butlerov (1828-1886). Founded in 1861 by Butlerov, theory of chemical structure of organic compounds become a tool of knowledge of structure of organic compounds, identifying ways of their synthesis, establishing communications between structure and reactivity of organic

compounds. Its provisions constituted the foundation of modern organic chemistry. Butlerov's area was developed in Kazan in the most outstanding works of his students: V.V.Markovnikova, A.M.Zaitsev, F.M.Flavitsky. V.V. Markovnikov (1838-1904) developed the idea of the mutual influence of atoms in molecules. It has entered in science and in the textbooks on organic chemistry around the world appears "Markovnikov's rule" defining the procedure of joining the reagents to unsaturated compounds. Oil Chemistry is another area of V.V.Markovnikov's research.

There is "Zaitsev's rule" in organic chemistry which determines the order of cleavage reagents in the formation of unsaturated systems. A.M.Zaytsev more than any of A.M.Butlerov's students contributed with his classical works to the strengthening of a young theory of chemical structure. A.M.Zaytsev (1841-1910) brought a galaxy of organic chemists. Among them remarkable scientists are: S.N.Reformatsky, A.N.Reformatsky, E.E.Vagner, A.A.Albitsky, I.I.Kanonnikov, etc. A.E.Arbuzov.

F.M.Flavitsky takes a special place (1848-1917). F.M.Flavitsky belonged to that rare even for the end of the XIX century the type of scientists who worked equally well in all selected areas of chemistry.

Since 1884 F.M.Flavitsky worked fruitfully in inorganic and physical chemistry. He was the first in Kazan to teach a course of Physical Chemistry and initiated the introduction of physical methods in the study of organic compounds.

It was expressed by him original ideas about a new form of periodic image of the system and a new "output" of the periodic law of D.I. Mendeleev, it was made an attempt to create a unified theory of the structure and form of chemical compounds, solution properties and interactions of substances in the solid state.

He is considered a pioneer of solid state chemistry. In 1901 he proposed a " Pocket laboratory of Professor F.M.Flavitsky to study the chemistry of solids and application to the analysis of his method," he achieved its patents in some countries; created a new chemical analysis system, which is of interest at this time.

Flavitsky is author of serious papers on dendrochemistry, a founder of cutting farming in Russia. He rebuilt his theory of solutions, published in 1914 an article "The chemical theory of solutions," dated it "1897-1914." He is known for delicate and complicated studies of complex natural compounds - terpenes, part of the resin of coniferous trees. This area was further development in the works of **A.E.Arbuzov** and particularly, of **B.A. Arbuzov.**

With the name of A.E. Arbuzov (1877-1968) is associated creation of a new branch of chemistry chemical organophosphorus compounds, which was the foundation of the chemistry of elements of organic compounds. Opened by A.E.Arbuzov reaction that bears his name, became according to the president of the Academy of Sciences of the USSR Nesmeyanov's figurative expression "high road" forforo-synthesis of organic compounds, many of which have practical application.

In Kazan it was originated the world-famous "Arbuzov's" school of organic chemists of phosphorus. The immediate A.E.Arbuzov's students are: **B.A.Arbuzov, A.I.Razumov, V.S.Abramov, G.H.Kamay** - first the most remarkable representatives. The school gave branches. G.H.Kamay developed the chemistry of arsenic organic compounds **A.N.Pudovik** - organophosphorus compounds.

The role as an organizer of science of A.E.Arbuzov in Kazan is very important. In 1928, it was the V Congress of the All-Union Chemical Society of D.I.Mendeleev, celebrated the 100th anniversary of the birth A.M.Butlerov. The Congress decided to establish at the Kazan University Chemical Research Institute, named after the great chemist. By Resolution of the Council of People's Commissars of the RSFSR in October 1, 1929 was opened Chemical Scientific and Research Institute of A.M. Butlerov. The Director of the Institute was approved by prof. A.E. Arbuzov.

B.A.Arbuzov (1903-1991) for more than thirty years was the head of Kazan chemists. He is a receiver of father at the Department of Organic Chemistry of Kazan University, A.M. Butlerov's on NIHI. He is an organizer and first director of the Institute of Organic and Physical Chemistry of A.E.Arbuzov created in 1965.

There is a huge scale of scientific activities of B.A.Arbuzov. Chemistry of organophosphorus compounds, chemistry of terpenes, chemistry of unsaturated compounds, the stereochemistry of organic compounds - the main directions of his research. B.A.Arbuzov was among those who first began to use physical methods of research to study the structure and reactivity of organic compounds. In 1969, at the international symposium dedicated to the 300th anniversary of the discovery of phosphorus, B.A.Arbuzov as an outstanding organic phosphorus was awarded a large silver medal in Paris.

A great role of the scientific contribution of students and followers of Arbuzov. Among them, a member of the Russian Academy of Sciences and an honorary member of the Academy of Sciences of Tatarstan, laureate of the State Prize is **A.N.Pudovik** - one of the leaders in the field of chemistry of organophosphorus

compounds; Corresponding Member of the Russian Academy of Sciences and an honorary member of the Academy of Sciences of Tatarstan, laureate of the State Prize of the USSR is **P.A.Kirpichnikov** - a prominent specialist in the field of high-molecular compounds; Academician of the Russian Academy of Sciences and the Academy of Sciences of Tatarstan, laureate of the State Prize of the USSR is **A.I. Konovalov** - researcher reactivity of unsaturated systems and intermolecular interactions; Professor **A.N.Vereschagin** - is known for his work on the study of the spatial structure of organic compounds and intramolecular interactions.

A great role in the further development of the Kazan chemical school played the opening of the Faculty of Chemistry, which dates from 1933. Initially, the Faculty had two departments: inorganic (Head. Prof. **F.I.Bogoyavlensky**) and Organic Chemistry (Head. Prof. **V.V.Evlampiev**), and only in 1935 were discovered two other departments: analytical (Head. Prof. **A.M.Vasilyev**) and Physical Chemistry (Head. Prof. **A.F.Gerasimov**).

Until April 2003 there were five departments of inorganic, analytical, organic, physical chemistry, macromolecular chemistry and a few problem laboratories in the structure of faculty.

In April 21, 2003 in life not only of university chemists, but also in all Kazan University was not just remarkable but truly historic event: on the basis of the decision of the Academic Council of Kazan State University by merging two formally earlier "independent" the chemical divisions of the Kazan State University (the Faculty of Chemistry and NIHI of A.M.Butlerov) Chemical Institute of A.M.Butlerov was established.

It is a new type of educational and scientific divisions of universities, which is based on organic unity of fundamental science and higher education. In fact, this mini-model or prototype of "research university". The idea of creation of such elite universities (such as the title on all counts and deserves Kazan University) has long been hovering in the depths of the Russian research and education community - including, Russian Ministry of Education. However, so far across the country, it still remains just an idea. Our university itself made a practical step towards its implementation. The Director of the Institute of Chemistry was elected Professor **V.I.Galkin.**

It was created and actively works a powerful educational and scientific complex, which in its educational potential, according to the Ministry of Education is the best among its subordinate 43 chemical faculties of classical universities and

scientific potential for quite comparable with the leading research institutes of the Russian Academy of Sciences.

Now in new Institute there are 5 departments and 7 research divisions, where work 26 doctors and 70 candidates of sciences. Among them Academician and 2 Corresponding Member of the Russian Academy of Sciences, Academy of Natural Sciences, more than 10 Honoured Scientists of the Russian Federation and the Republic of Tatarstan, dozens of Sorosovsky professors and associate professors.

Chemical Institute causes a legitimate pride of achievements of students and graduate students. Every year they get dozens of awards, scholarships and grants for the most prestigious international Russian and Tatarstan competitions.

A new status was not unnoticed and almost immediately began to bear fruit, a new powerful impetus for further development. From around the country we are approached for the cooperation by universities, research institutes and leading enterprises of the chemical industry. In October 2003, at the suggestion of the American side it was signed a cooperation agreement with the corporation InnoCentive.Inc.

The Institute trains chemists to work in laboratories of higher educational institutions, academic and industrial research institutes, industrial laboratories, schools, colleges and high schools. Students gain fundamental knowledge in mathematics, physics and computer science, the necessary legal knowledge, learn the basics of economics and management, in-depth study foreign languages. Many graduates of the institute work in organizations and services of the Ministry of Environment of the Republic, dealing with organization of environmental monitoring.

Under the Institute there is a museum, which is the custodian of the history and development of famous Kazan chemical school. There preserved, the XIX and XX centuries. The museum is visited by scientists from both Russia and the CIS and foreign countries, students and schoolchildren.