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CONTRIBUTION OF RUSSIAN SCIENTIST BORN IN NAGORNY KARABAKH TO NATIVE CIVILIAN AND MILITARY SCIENCE

Nikolay Nikolaevich Zinin (1812, Aug, 13 (25), Shusha of Artsakh, now Nagorno-Karabakh Republic - 1880, Feb, 6(18), St. Peterbourg) is a famous organic chemist, an academician of St. Peterbourg Academy of Science (1858), the first President of Russian Physics and Chemistry Society (1868-1877).

N.N. Zinin was born in the Caucasus, where his father N.I. Zinin executed a diplomatic mission. Zinin's parents and elder sisters tragically died from a raging epidemic and the boy was sent to Saratov, where his uncle lived. In 1820 Nicolay entered a classical school, where he was brilliantly good and demonstrated various talents.

In 1830 he moved to Kazan and entered the Mathematics Department of the Philosophy Faculty (later the Physics and Mathematics Faculty) at Government expense. He was remitted from paying for classes and living but had to work for 6 years as a state employer after graduation. Bright student N. Zinin was paid attention at by such outstanding people as mathematician N.I. Lobachevsky, astronomer I.M. Simonov, a trustee of the University, earl M.N. Musin-Pushkin.

N. Zinin graduated from the University in 1833; he was awarded a Degree of Candidate and a golden medal for his work "On perturbations of elliptic motion of planets". He became a Physics teacher at the University. His major subject was Mechanics. From 1835 he also delivered a course of theoretical Chemistry.

N. Zinin was not especially interested in chemistry, as a Mathematics teacher he considered himself a mathematician in the first place. But there was a problem with chemistry professing at Kazan University in those years, as the subject was delivered by a scientific assistant Dunaev, a theological seminary graduate. Lobachevsky foresaw the talented young scientist Zinin to improve the Chemistry Department. As Zinin worshiped Lobachevsky he could not refuse; as a result Russian Science obtained a brilliant chemist, a pioneer and founder of a Scientific School.

In 1835 Zinin brilliantly passed his Master's of Science Degree examination. The University Council proposed him a theme of his thesis "On chemical affinity phenomena and superiority of Berzelius' constant chemical proportions over Berthollet's Chemical Static". In 1836 Zinin defended his thesis and obtained a Master of Physics and Mathematics Degree.

After university reorganization in 1837, Nikolay Zinin was appointed a scientific assistant at the Chemistry Department, and in spring of the year was sent abroad for knowledge under protection of earl Musin-Pushkin. First Zinin studied chemistry from A. Mitscherlich and H. and G. Rose brothers (both known chemists). Then he worked with professor U. Liebig, in Hessen. At the same time he received training from K. Erenberg,

T.Schwann, Jochann Mueller.

Subsequently, he worked in France with J.T. Pelouse and in the UK with M. Faraday in 1839-1840. His first work was published in the "Liebig's Annalen" in 1839, he reported about a new method of transforming bitter-almond oil into benzoin. In 1840 another work on benzoic compounds was published in the "Liebig's Annalen". These works formed his Doctor's theses "On benzoyl compounds and new solids of the benzoyl series".

In 1841 Zinin was constituted an extraordinary professor at the Technology Department. He had stayed in Kazan till 1847 when he was invited to St. Peterbourg Medical Academy. He developed his career from an ordinary professor (1848-1859), then an academician (1856) and an Honored professor (1864-1869). The top of him was the Director of Chemical Works (1864-1874).

N. Zinin successfully combined teaching and scientific activities with various other jobs and public works. For twelve years he was the Secretary of the Academy, for four years he was a member (1869) and the Chief Justice of the Academic Tribunal (1871-1872). Since 1848 Zinin had been a member of the Manufactory Council at the Ministry of Finance, since 1855 he - a member of the Scientific Committee of Medical Corps. He also delivered Physics at Female Medical Courses in 1873-1874.

In 1855 Zinin became a junior scientific assistant of St. Peterbourg Academy of Sciences; in 1858 he was constituted an extraordinary academician, since 1865 - an ordinary academician.

In 1868, together with D. Mendeleev, N. Menshutkin and others, N. Zinin became a founder of Russian Chemical Society and was the Chairman for ten years.

Zinin's activities often included scientific missions to the Caucasus for mineral waters investigation, to the Crimea for therapeutic mud investigations (1852), overseas for learning of setup of modern chemical laboratories (1860), as a jury member to the Paris Exhibition (1867). His last research was that of amar acid and its homologs. In the autumn of 1878 N. Zinin suffered from first attacks of disease that caused his death in 1880.

Nikolay Nikolaevich Zinin junior (his son) was a well-known mathematician and the first chancellor of Donskoy Polytechnic Institute.

N. Zinin was the first who obtained benzoin by benzaldehyde condensation in the presence of potassium cyanide; benzyl by oxidization of benzoin with nitric acid. In 1842 N. Zinin discovered the reaction of reduction of aromatic nitroderivatives to aromatic amines by action of sulfurous ammonium. This method was used by Zinin for synthesis of aniline and -naphthylamin in 1842. Since that, aniline could be produced commercially. Later he proved universality of his reaction, having obtained by this method of reduction such substances as 4-phenylendiamin by reduction of 4-dinitrobenzene (1844) and 4-aminobenzoic acid by reduction of 4-nitrobenzoic acid (1845).

In 1844 Zinin obtained deoxybenzoin by the method. He synthesized hydrazo benzene by reaction of ammonium sulphur with azobenzene, hydrazo benzene Zinin rearranged to benzidine by addition of sulfuric acid. Zinin's reaction of synthesis became a scientific foundation for industry of synthetic dyes, explosives, pharmaceuticals, flavoring substances.

In 1845 N. Zinin discovered "benzoidine rearrangement" of hydrazo benzene under action of acids. He proved that amines were substructures capable to form salts with different acids. In 1854-1855 Zinin described ureides (substructures of carbamide); he synthesized, independently from Berthlot and DeLukas, synthetic mustard oil (allyl ether of isothiocyanate acid) and investigated its reaction with amines, with formation of analogous thioureas. He proved that allyl-phenyl-thiourea formed from reaction of mus-

tard oil with aniline; he also investigated allyl radical derivatives, synthesized allyl alcohol. In 1860-s Zinin obtained dichlorobenzene and tetrachlorobenzene, toluene and toluylene. In 1870-s Zinin focused at investigation of lepidene (tetraphenyl-furan) and its derivatives.

From 1857 till 1860 Zinin was investigating acetylbenzoene and benzoylbenzoene, some naphtoldin and azoxybenzidine. From 1860 his researches were devoted to derivatives of bitter almond oil and benzene. In 1861 Zinin worked on infusion of hydrogen into organic compounds. By reaction of hydrogen on bitter almond oil he obtained hydrobenzoene and reported on deoxidized benzoene. Zinin described nitrobenzyl, in 1864 he reported on the action of hydrochloric acid on azobenzene, in 1886 - the action of potassium hydroxide on benzoene in a vacuum tube; Zinin obtained lepidene by action of hydrochloride acid on benzene, and both its products such as oxylepidene and dibromolepidene. In 1867 in Paris N. Zinin submitted his work "Some facts on substances referred to toluylene series" to the Paris Academy and published it in the "Comptes rendus". From 1870 till 1876 his investigations were being aimed at studies of lepidene and its derivatives. His last voluminous work covered 'amaric acid and its homologues'.

Collective work with a young but prominent military engineer V.F. Petrushevsky led to solution of the problem of obtaining and use of nitroglycerine, the most powerful explosive. N. Zinin developed the most advanced method of synthesis nitroglycerine from glycerin, by use of nitric acid and low temperature. When in 1853 joined English-Turkey army landed in the Crimea and the war decelerated, Zinin had made great efforts to provide Russian Army with the strongest explosives.

Professor N.N. Zinin was the initiator of practical application of nitroglycerine for explosive warheads in shells in 1854, during the Crimea War. He suggested grenades would be stuffed with nitroglycerine, developed the method of obtaining volumes of nitroglycerine and its exploding. But the Chief Artillery Department refused to use nitroglycerine because of its extreme explosiveness that exposed to danger shell manufacturers and gunners.

Only in 1863-1867 nitroglycerine was successfully applied for underground and underwater blasts. For the first time pure nitroglycerine was applied for manufacturing of explosive compositions for mining industry in 1867. But artillery officer V.F. Petrushevsky, an apprentice of N. Zinin, developed and applied an explosive "magnesia dynamite" - a substance of 75% of nitroglycerine and 25% of magnesium carbonate for blasting operations at East Siberia goldfields in 1853.

But a true revolution in peace and war applications of dynamites and blasting powders on the base of nitroglycerine as well as their igniters was performed by a famous Sweden engineer and businessman A. Nobel, who developed nitroglycerine ballistic powder in 1888; the powder was obtained by jellification of nitrocellulose with nitroglycerine. In Russia D.I. Mendeleev developed a manufacturing process of pyroxylin smokeless powder in 1891.

N.N. Zinin together with A.A. Voskresensky educated a pleiad of Russian brilliant chemists (A.M. Butlerov, A.P. Borodin, N.N. Beketov, L.N. Shishkov, A.N. Engelhardt) at Kazan University. He took an active part in arrangement of Russian Chemical Society (now All-Russian Chemical Society named after D.I. Mendeleev).

In 1880 the Department of Chemistry of Russian Physical and Chemical Society instituted The Zinin and Voskresensky Award for the best independent works in the field of chemistry. N. Zinin was an honorary member of Russian and foreign scientific societies, academies and universities, Academie des Sciences of France, Berlin and London Chemical Societies.

Zinin's works greatly contributed to acknowledgement of Russian Chemical School abroad.

In spite of all his exterior prosperity and creative successes, Zinin, according to reminiscences of his contemporaries, was unbalanced and got annoyed in such cases where other scientists would take sincere interest.

A German scientist, A. Hofman, was a success to modify the method of production aniline from nitrobenzene. The method was developed by Zinin; but Hofman substituted hydrogen for ammonia sulphide in the moment of emitting. He arranged manufacturing of aniline on the base of this modified method; that inspired a vexed reaction of Zinin, though his priority had not been dis-puted, "These Germans always steal our discoveries".

Investigating nitroderivatives N. Zinin in cooperation with V.Petrushevsky began to develop an explosive composition on the base of nitroglycerine that was safe for transportation. Finally a satisfied method was found - impregnation of magnesium carbonate with nitroglycerine. Zinin mentioned in passing the idea to Alfred Nobel, his summer cottage neighbor. Some years later Nobel used the idea. Once a bottle of nitroglycerine was broken and the liquid impregnated the soil filled between bottles for damage prevention. Nobel probably reminded Zinin's information about powder-like substances having been impregnated with nitroglycerine; so Nobel developed the new composition named 'dynamite' and was a great success on the market of explosives. Dynamite brought Nobel enormous benefits. Having known all that Zinin said: "This Alfred Nobel snatched dynamite out of our hands".

There are no grounds to believe Zinin to be too vain and jealously treating his successful col-leagues. Probably absence of inner harmony was caused by his moral certainty that he would be more successful in another field - mathematics. To the death his hobby was reading of mathematical works.

N.N. Zinin is the author of many scientific works that made him internationally known.

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ԱՄՓՈՓՈՒՄ

Ռուս անվանի գիտնական

(ծնունդով Լեռնային Ղարաբաղից)

Ն.Ն. Զինինի ներդրումը հայրենական գիտության
և ռազմական գործի մեջ

Վլադիմիր Պոնոմարյով
Լարիսա Շուրպիկ

Աշխատանքում վեր է հանվում ռուս անվանի գիտնական Ն.Ն. Զինինի գիտական գործունեությունը, նրա ձեռքբերումները օրգանական քիմիայի և տարբեր գիտությունների ասպարեզում, ռազմական գործում, նշում նրա համաշխարհային ճանաչման ու հայրենական գիտության մեջ թողած հետքի մասին:

РЕЗЮМЕ

Вклад российского ученого, уроженца Нагорного Карабаха в отечественную науку и военное дело.

**Владимир Пономарев
Лариса Шурпик**

В работе рассматривается научная деятельность выдающегося российского учёного, уроженца Нагорного Карабаха Н.Н. Зинина. Его труды в области органической химии, вклад в развитие отечественной науки и военного дела снискали ему мировую славу и уважение потомков в современной России.