TO THE MEMORY OF ACADEMICIAN NIKOLAI DMITRIEVICH ZELINSKY

The death occurred on July 31, 1958, at the age of ninety-two of the eminent chemist Academician Nikolai Dmitrievich Zelinsky, senior professor at the M.V. Lomonosov Moscow State University, Hero of Socialist Labor, recipient of three Stalin prizes, and holder of four Orders of Lenin and two orders of the Red Banner of Labor. In the person of Zelinsky Soviet science has lost a great organic chemist, founder of the science of heterogeneous organic catalysis and of petroleum chemistry, inventor of the first universal charcoal gas mask in the world, scientist of manifold activities, and teacher and trainer of several generations of chemists.

Zelinsky was the author of about six hundred original scientific papers and inventions in the fields of organic, physical, and inorganic chemistry, including petroleum chemistry and the chemistry of artificial liquid fuel. The investigations of Zelinsky and his school, the largest in the USSR on the synthesis of hydrocarbons, organic catalysis, petroleum chemistry, and protein chemistry, have occupied and continue to occupy a leading position in world science.

N. D. Zelinsky was born on February 6 (New Style), 1861, in Tiraspol in the province of Kherson (now Moldavian Autonomous SSR). At the age of two he lost his father, and a year and a half later his mother died also. He was brought up by his maternal grandmother, M. P. Vasilyeva, a good, sympathetic, cultured woman, very progressive in ideas for the time in which she lived; Zelinsky retained fond memories of her to the last days of his life. He received his early education from his grandmother, and she provided for his further education at the Rishelyevsky Gymnasium in Odessa, which he attended until 1880. While still a schoolboy, Zelinsky listened enthusiastically to the lectures of the eminent physiologist I. M. Sechenov at the university. From the gymnasium, Zelinsky passed to the Natural History Department of the Physico-mathematical Faculty of the Novorossiisky University (Odessa), which he attended until 1884. His first chemistry teachers at the university were E. F. Klimenko, A. A. Verigo, V. M. Petriev, and P. G. Melikov (Melikishvili). It was under the direction of Melikov that Zelinsky, as a student, carried out his first scientific investigation on the "Product of the Addition to Methylamine to \( \beta \)-Methylglycidic Acid", which was published in 1884 in the Journal of the Russian Physicochemical Society.

With regard to his first teacher, P. G. Melikov, Zelinsky wrote with great warmth of feeling in 1950: "All my life I have been constantly grateful to my teacher for the attention and cooperation that he gave to me over a period of many years"; and also "The memory of this man, who was my first teacher, I preserve as the best of my memories of my student days at the Novorossiisky University".

In biology Zelinsky's teachers included the eminent Russian scientists A. O. Kovalevsky (zoology), I. I. Mechnikov (embriology and evolutionary theory), and I. S. Tsenkovsky (botany).

Personal intercourse and friendship with his eminent teachers, and later with the giants of Russian progressive science -- I. M. Sechenov, K. A. Timiryazev, P. N. Lebedev, N. A. Umov, and A. G. Stoletov -- had an exceptional, favorable influence on the formation of the materialistic world-view of N. D. Zelinsky, whose interests in the future were to range over such a wide field of science, and who as a research chemist was to enter into the highest ranks of the creators of world chemical science.

Soon after completing his course at the Novorossiisky University, Zelinsky was sent as a faculty stipendiary to Germany, where he worked under the great organic chemists of that time, J. Wislicenus (Leipzig) and Prof. Victor Meyer (Göttingen), and then somewhat later, during his second visit abroad, under the famous Wilhelm Ostwald, one of the founders, after Lomonosov, of classical physical chemistry.

The investigational work carried out by the young Zelinsky under the direction of these great chemists determined, to a great extent, the three important directions of his subsequent investigations. He began some
investigations, of great interest from the point of view of theory, on the chemical nature and isomerism of compounds of the thiophene series and on the stereoisomerism of carboxylic acids, and these subsequently provided valuable material for his Master's (1889) and Doctor's (1891) theses. In Ostwald's laboratory Zelinsky began his original investigations in physical chemistry and electrochemistry, and these had an important influence on his subsequent classical investigations in organic chemistry and heterogeneous catalysis.

It is worthy of note that Zelinsky, the future inventor of the charcoal gas mask, while carrying out the synthesis of the then unknown tetrahydrothiophene in Victor Meyer's laboratory at Göttingen, obtained mustard gas, i.e., bis (2-chloroethyl) sulfide, for the first time, and, not suspecting the toxicity of the intermediate product in his synthesis, became the first victim of this treacherous, poisonous substance; he had to remain in the hospital for a whole term with badly burned arms.

On returning to Odessa, Zelinsky immediately began to build up his investigational school, bringing together his first students and collaborators, among whom we may note A. A. Bychikhin (later professor at the Novorossiysk University), A. M. Bezredka (later deputy director of the Pasteur Institute in Paris), S. G. Kripygin (later second professor at Moscow State University), and A. G. Doroşhevsky (later first privy dokor at Moscow State University). In the Odessa period of his activities the main attention of Zelinsky and his students was concentrated on the synthesis of many di- and tri-substituted succinic, glutaric, adipic, and pimelic acids, and also of some substituted dibasic hydroxy acids, and the investigation of the stereoisomerism phenomena exhibited by these substances. Stereochemistry was then a completely new branch of organic chemistry, and here in Russia Zelinsky was one of the first bold investigators and exponents in this fruitful field of ideas. Zelinsky's investigations on isomerism in the thiophene series and the stereoisomerism of dibasic aliphatic acids made a substantial contribution to the development of A. M. Butlerov's Theory of Chemical Structure, the secure materialistic basis of organic chemistry.

On the recommendation of D. I. Mendeleev, N. D. Zelinsky was invited in the summer of 1893 to take up the post of extraordinary professor at Moscow University in the department of analytical and organic chemistry, and from that time, and for the remainder of his life (nearly sixty years), Zelinsky carried out exceptionally valuable scientific, pedagogic, administrative, and social work within the walls of the university, as well as in the Academy of Sciences of the USSR, to which he was elected as Active Member in 1929.

In Moscow University, Zelinsky's attention gradually passed over to a new, wide, and very important field, the chemistry of alicyclic hydrocarbons, or naphthenes. Before this time remarkable investigations had been made in Russia in this direction by such eminent chemists as F. R. Wreden, F. F. Beilstein, D. I. Mendeleev, and V. V. Markovnikov. Zelinsky, however, in this field also made a path for himself, bridging over from the dibasic carboxylic acids of the aliphatic series that he had studied so thoroughly to the alicyclic systems. This bridging over was possible because of the perfection and further development by Zelinsky of Wislicenus' cycloketonization of dibasic carboxylic acids.

In the period from 1894 to 1911 Zelinsky with his students and coworkers synthesized and characterized more than forty hydrocarbons of the cyclopentane and cyclohexane series. Many of them, and many of those synthesized later in the detailed investigations made by Zelinsky into the chemical nature of Soviet Petroleum, have served as valuable standards in the establishing of the composition of narrow gasoline fractions. It should be noted that also in this new field of work much attention was given to the stereochemical side of the study of cyclic hydrocarbons.

The following investigations belong to this first period of Zelinsky's activities at Moscow University: the remarkable work on the pyrogenetic decomposition of petroleum; the beginning of the classical investigations on selective dehydrogenational catalysis, which was discovered by Zelinsky; the development of a simple method for the preparation of α-amino acids and their esters; the beginning of extensive investigations on the catalytic hydrolysis of proteins and a series of original physicochemical investigations.

N. D. Zelinsky, appreciating the high value of work by A. A. Letny on the pyrolysis of petroleum which had remained unnoticed, made a deeper study of the thermal decomposition of petroleum distillates, and by his direct participation in large-scale trials rendered great scientific and practical service in the development of the pyrolysis industry in Russia. Already in 1901 Zelinsky gave his support to the technologist Nikiforov and helped the latter to realize his project of petroleum pyrolysis at high pressure; as he was engaged in a study of the thermal decomposition of petroleum, he joined with Nikiforov in developing the first variant of the modern thermal cracking of petroleum products.

The field of Zelinsky's investigations on heterogeneous organic catalysis is so wide, and the results are so important and varied in character that we must confine ourselves to a citation of a few of the most brilliant ex-