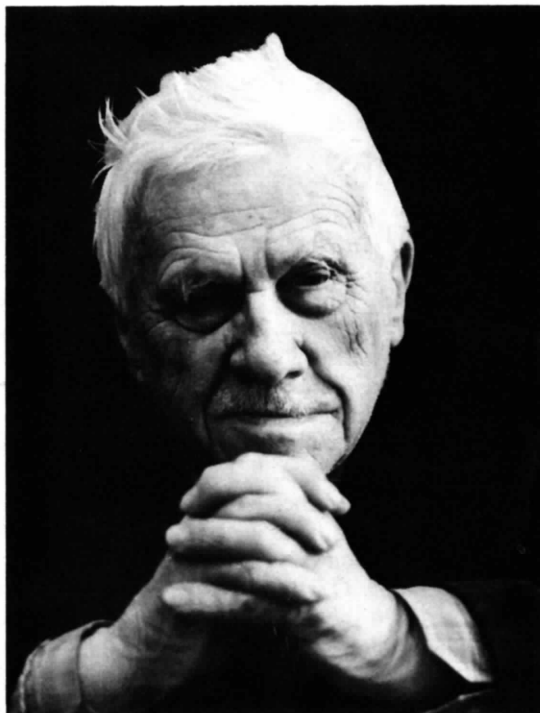


## Obituary

**Nikolay Vasilyevich Belov****14 December 1891–6 March 1982**

The international community of crystallographers suffered a heavy loss on 6 March 1982 when Professor Nikolay Vasilyevich Belov, a full member of the USSR Academy of Sciences and one of the world's greatest crystallographers, died suddenly. N. V. Belov had been full of energy, taking his usual active part in the work of the academic Institute of Crystallography and Moscow State University, until the previous day. The photograph above portrays him two days before his death.

N. V. Belov was born on 14 December 1891 in Yanov (now in Poland) into a physician's family. The family moved to Ovruch (North Ukraine) in 1900, and when Belov talked about his childhood it was to reminisce about this small town. Belov finished Gymnasium in Warsaw and entered St. Petersburg Polytechnic Institute in 1910.

His studies were interrupted by the First World War and then by the Revolution and the Civil War in Russia. He returned to Ovruch and took an active part in reconstructing a city economy devastated by war. It was not until 1921 that he was able to complete his education. He returned to Leningrad in 1924 and joined

Lenkzhtrest (Leningrad Raw Leather Trust); he later headed its Central Chemical Laboratory and also the Chemical Laboratory of the Institute on the Study of the North. His zest for science in this period was manifested by the publication of over 70 popular scientific articles in *Priroda (Nature)* from 1928 to 1932. A. E. Fersman, the Editor-in-Chief of this journal, invited N. V. Belov to join the Lomonosov Institute of the USSR Academy of Sciences.

Practical use of the great Kola Peninsula deposits was, at that time, an important matter. Belov proceeded to investigate the main Khibiny minerals, nepheline and apatite. He soon published a number of papers on nepheline technology in the tanning, textile, paper and woodworking industries and also proposed an original method for extracting rare earths from apatites.

The Academy of Sciences moved to Moscow in 1934 and Belov followed in 1936. Shortly thereafter he transferred from the Geochemical Department of the Lomonosov Institute to its Crystallographic Department headed by Professor A. V. Shubnikov. It was during this period that Belov's scientific interests concentrated on crystal chemistry, structural mineralogy and the X-ray analysis of crystals. He set himself the goal of creating a unique crystallochemical understanding of the atomic structure of inorganic compounds. He elaborated the theory of closest-packed anionic

spheres and analyzed possible schemes for the population of the resulting octahedral and tetrahedral interstices by cations. The results of these investigations led to his doctoral dissertation, which he defended in 1943, and later to his monograph *Structure of Ionic Crystals and Metallic Phases* published in 1947. The first structural solutions of rather complicated silicates were carried out by Belov and his students by the trial-and-error method using the principle of closest packing.

More complicated objects of investigation and new ideas in the field of Patterson and direct methods of determining crystal structures pushed trial-and-error methods into the background. Belov became an enthusiast for new methods and one (together with his students) of their active creators.

The silicates played a major part in his investigations. If W. L. Bragg was the founder of the crystal chemistry of silicates, N. V. Belov was the creator of its 'Second Chapter', in which silicates with such large cations as calcium, potassium, sodium, and rare-earth elements are of major importance. He later became interested in borates, germanates, sulphides, sulphates and other representatives of the mineral kingdom. He and his students determined the structures of more than 500 naturally occurring and synthetic compounds. On the basis of structural representation, he analyzed the geochemical processes in the earth's crust and the problem of isomorphism.

Belov's works in the field of symmetry are well known. He presented the simplest 'visual' derivation of the 230 space groups (suitable for student audiences) and, together with his students, derived the 1651 Shubnikov black-and-white symmetry groups. With his students, he was the author of fundamental works on colour symmetry and investigations in the field of four-dimensional space-group symmetry.

N. V. Belov was elected a Corresponding Member in 1946 and a Full Member in 1953 of the USSR Academy of Sciences.

Nikolay Vasilyevich devoted much time and effort to pedagogical activities. He was professor in both Gorky and Moscow Universities; he had been head of the Chair of Crystallography and Crystal Chemistry of the Geological Department of Moscow University since 1961. He was the founder of the Soviet structural school. Under his guidance, more than 150 specialists prepared and defended their doctoral and candidate

dissertations. The graduates of Belov's school are now scientifically active in Moscow, Gorky, Novosibirsk, Baku, Kishinev, Ashkhabad and many other cities of the Soviet Union.

N. V. Belov was Editor-in-Chief of *Kristallografiya* until his last days; he had been permanent Chairman of the USSR National Committee of Crystallography since 1955. He was a member of the Executive Committee of the International Union of Crystallography from 1954 to 1963 and from 1966 to 1972; he was Vice-President from 1960 to 1963 and President of the Union from 1966 to 1969. He was an Honorary Member of the Mineralogical Societies of the USSR, USA, Great Britain and France; of the Geological Society of the DDR, and was a Foreign Member of the Polish Academy of Sciences. Wrocław University conferred on him the honorary degree of Doctor of Science.

N. V. Belov was honoured with the title of Hero of Socialist Labour and was awarded four Orders of Lenin, the order of the October Revolution and the Red Banner of Labour, as well as many medals for his scientific and pedagogical achievements. His enormous contributions to science were recognized by Lenin and State Prizes. He was also awarded the Lomonosov Gold Medal – the highest honour within the patronage of the Academy of Sciences of the USSR.

His fine human qualities were most admirable. It was typical that, until the day before he died, he was available to any who needed his advice and support in science as well as in everyday life.

His knowledge, not only of science but also of literature, art and history, was indeed encyclopedic. His scientific publications have a charm of style that cannot be found in other authors' work.

Nikolay Vasilyevich Belov – the great expert in science who headed Soviet Crystallography, the educator of several generations of crystallographers, the scientist of enormous erudition, active and vigorous until his last day, a person of rare charm, modesty and kindness – will remain for ever in the history of science and will always be prominent in the memory of those who were fortunate enough to know him.

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