

**CENTENARY OF THE BIRTH OF V. A. OBRUCHEV  
SOVIET GEOLOGIST, GEOGRAPHER, TRAVELLER,  
AND PIONEER IN PERMAFROST RESEARCH\***

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Vladimir Afanas'evich Obruchev, who was born on October 10, 1863 in the village of Klepenino in the upper Volga region, was an outstanding natural scientist, who made great contributions to the exploration of Asia. His father was in the military service and often transferred with his family from one province to another. For some time they lived in Lithuania where Obruchev completed his high school education in Vilnius in 1881 and then passed the entrance examinations of both the Mining and the Technological institutes in Petersburg. He chose the Mining Institute and completed his studies there in 1886.

On the recommendation of I. V. Mushketov, Obruchev was appointed to lead a survey along the railway in the Transcaspiian steppe, which occupied him for three summers. In 1888 he was named geologist of the Irkutsk Mining Administration. When the Tomsk Technological Institute was established in 1901 he became head of its department of General Geology and was afterwards dean of the Faculty of Mining for 9 years. In 1912 he moved to Moscow. In 1918 he was awarded the degree of Doctor of Geological Sciences in the University of Kharkov and became professor of the Tavricheskiy University in Simferopol', where he stayed until 1921. He then returned to Moscow and became a professor at the Mining Academy, where he headed the Department of Ore Deposits, undertook scientific research and acted as deputy vice-chancellor of the Academy.

For his great achievements the Academy of Sciences of the USSR named Obruchev a corresponding member of the Academy in 1921, and an active member in 1929. From this time on he was working in the Academy of Sciences and for 3 years, beginning in 1929, he was director of the Geological Institute. During World War II he was Academician-secretary of the Department of Geological and Geographical Sciences and as such led the scientific research of all academic institutes in this field.

Obruchev was among the first to advocate the organization of a special committee for the study of permafrost. He was president of this committee from 1930 to 1939. In this year he became director of the Permafrost Institute, which now bears his name, and held that position for the rest of his life.

One of Obruchev's outstanding achievements is the exploration of little-known lands that were often indicated by white areas on geological and geographical maps. He led several long expeditions across the deserts and mountains of Middle and Central Asia, Siberia, and China, which yielded a very large amount of new geological and geographical information. One of his main interests was the study of deserts. Working in Middle Asia he discovered that not long ago in the geological past the Amu-Darya flowed into the Caspian Sea through the present Uzboy, thus establishing that rivers whose beds are now dry played an important part in the development of the landscape of the deserts of Middle Asia.

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He was the first to realize that the sands of the Kara-kum are not marine deposits, as had been thought, but have been transported by wind from the alluvium of the Amu-Darya. He established the laws that govern sand movement, and proposed ways to protect roads and settlements from drifting sand.

Between 1892 and 1894 Obruchev took part in the expedition of G. N. Potanin, the famous Russian geographer. Starting from Kyakhta he travelled through Mongolia, the Shansi and Shensi provinces of northern China, the southern regions of the Ordos, the Nan-Shan mountains, the Ala-Shan mountains and the Gobi desert to Kuldja. This expedition gave Obruchev opportunity to complete the research he had begun in Turkestan on the evidence for the geological significance of wind in the transport and deposition of vast quantities of sand and dust. Impressed by the great effects of the wind, Obruchev became an ardent advocate of the eolian origin of loess. He found strong evidence for his view in the Ordos desert region. The extensive plateau south of the desert is covered by thick loess as the result of the dust that has been carried from the desert and settled there. Obruchev returned to the loess problem often during his lifetime. Concerning the question of the origin of loess, Obruchev pointed out that loess is almost completely absent from the depressions of Central Asia, which, according to Richthofen's belief, it should have filled, but that it accumulates near deserts where mountains or other obstacles stand in the way of the wind, causing it to slow down and deposit its load of dust.

Besides his researches in Middle and Central Asia, Obruchev worked much on the geology of Siberia. He explored the Altai, the Sayan, the Transbaykal, the Cisbaykal, the Kuznecki Alatau, the gold-bearing region of the Lena, and many other areas. He believed that gold is one of the most important economic minerals of Siberia. He studied the origin of placer deposits and discovered that gold does not occur in the quartz veins in the Lena basin as had been thought originally but that it is associated with pyrites. The most important gold placers are located in old depressions filled with glacial deposits. With the aid of careful scientific analysis he found several gold deposits in the Transbaykal, in the Marlinsk taiga, in the Kalbinskiy ridge and many other places. His studies concerning the geology of gold deposits contributed greatly to the history of the Quaternary period in Siberia.

He was also deeply involved in the exploration of northern regions. While analysing the geology of the greater part of Asia north of the Arctic Circle he concluded that during Quaternary times two glacial periods had occurred there, and that a thick ice sheet had covered not only the arctic zone but had extended south to 60°N. He established that at the beginning of the Quaternary dry land occupied the present Kara Sea area and that glaciers extended from there to the south between the Urals and the Taymyr Peninsula, which were also covered by a continental ice sheet at that time.

Obruchev thought that the present Greenland ice cap and other glaciers of the North American islands, the glaciers of Spitsbergen, Zemlya Frantsa Iosifa, Novaya Zemlya, and Severnaya Zemlya are the remnants of ice caps and glaciers of the Ice Ages. Further evidence for the glaciations is the existence of fossil ice, which Obruchev discussed in detail in several of his works. His research concerning the Ice Ages helped to establish the southern limits of glaciation and the present distribution of permafrost. The very large amount of geological and geographical information collected by Obruchev in northern Asia has very great value in permafrost research, especially in the preparation of long-term climatic predictions and in the determination of the degree of climatic amelioration in the Arctic. He did not isolate permafrost from other natural phenomena but studied it in relation to the geology of the region.

Obruchev paid great attention to the causes of the cooling of the vast northern territories and the time when it occurred. He thought that the advances and

retreats of the ice in the Quaternary period were caused by geological processes that led to the raising and lowering of large parts of the crust of the earth. He was convinced that the characteristics of the Quaternary period and the presence of ground ice today were related to the geological history of Eurasia.

Seeking a solution to the problem of the glaciation of northern Siberia, Obruchev compared this region with the Antarctic continent, which is at present covered with a thick ice cap. He explained the different degrees of glaciation in the Arctic and Antarctic through the submergence of an Atlantic continent, "Atlantis", whose existence is inferred from mythology. He thought that this event occurred 10,000 to 12,000 years ago, and that it coincided with the beginning of the climatic amelioration in the Arctic. The disappearance of Atlantis must have opened the way for the warm Gulf Stream to the north, causing climatic changes in the Arctic.

While surveying the mineral wealth of Siberia other than gold, Obruchev discovered deposits of iron, manganese, and other ores. His "*Metallogeneticheskiye epokhi i oblasti Sibiri*" (The metallogenetic epochs and regions of Siberia, 1926) is based on intensive study of the distribution of economic minerals in the Asiatic USSR and contains a classification of the various regions according to their ages under the headings Archean, Eozoic, Caledonian, Hercynian, Tien-Shanian, and Maritime. He furthermore listed the ores associated with each region, thus greatly assisting later searches for minerals.

His studies in ore deposition enabled Obruchev to improve the classification of ore deposits, which he arranged in the three main groups of deep-lying (endogenic), surficial (exogenic), and altered (metamorphic) ore deposits. Further subdivisions are based on the geochemical processes that produced the ores.

Besides the ore deposits Obruchev also studied the non-metallic economic minerals. He was the first to describe the caustic alkalies of the Transbaykal, Tuva, and Dzungaria, and in northern China he discovered veins of a new type of asphaltite, later given the name Obruchevite.

In his regional studies Obruchev gave first consideration to tectonic conditions. He advanced the theory that the basin of Lake Baykal is a graben. This lake, the deepest in the world, occupies a relatively young rift valley. He pointed out further that the main features of the landscape in the western Transbaykal region have been formed by tectonic movements. He studied the same processes in Dzungaria, the Altai, the Sayan, and several other parts of Siberia and came to the conclusion that in all these regions young crustal movements were the main relief and mountain forming forces, as they were in the Baykal region.

Contrary to the accepted belief that the Altai consists of folded arches that have subsequently been eroded to a peneplain, Obruchev stated that the Altai mountains were formed by recent faulting that produced the horst and graben topography. His theory that much of Siberia and Central Asia had been shaped by faulting was severely criticized, but it has since been fully accepted, as it is now widely realized that fault structures are very common features of the crust of the earth.

His giving primary importance to recent tectonic movements led him in 1948 to name the products of these processes neotectonic landforms. He emphasized that the study of recent tectonic movements helps to clear up the problems of landscape development, sediment accumulation, and placer deposits. He considered the zone of archean rocks in eastern Siberia the ancient core around which the Asiatic continent developed. On this subject he was an ardent supporter of E. Suess's theory of the "ancient sinciput of Asia", based on his own early research and that of I. D. Cherskiy.

Obruchev was greatly interested in problems of theoretical geophysics and in 1940 he presented a modified form of the pulsation theory, stating that the most significant geophysical processes are caused by contraction and expansion of the

earth, with contraction predominant. Regression, folding, and intrusion processes occur during stages of contraction, whereas those of expansion are marked by transgression, faulting, and volcanic activity.

Obruchev's publications consist of hundreds of books and articles, and thousands of essays, published in the USSR and abroad. His most important work "Geologiya Sibiri" (Geology of Siberia) is of outstanding value. It was first published in German in 1926 and was awarded the Lenin Prize. The second, revised and enlarged edition was published in Russian in three volumes in 1935-8 and in 1941 it was honoured with the first degree of the State Prize of the USSR. He had a wide knowledge of the literature of the geology and geography of Siberia and produced a multi-volume annotated synopsis "*Istoriya geologicheskogo issledovaniya Sibiri*" (History of geological investigations in Siberia, 1931-49) for which he was awarded, for the second time, the first degree of the State Prize of the USSR in 1950.

With the aim of making the geological and geographical sciences popular Obruchev wrote a large number of popular and science-fiction stories that attracted the attention of young people to the study of the natural sciences. His writings are well known all over the world and several natural science societies at home and abroad named him an active or corresponding member. His name is often found on maps in connection with ridges, volcanoes, peaks, glaciers, etc. and also as part of geological terms. Among the numerous honours bestowed on him are "Distinguished Scientist of the RSFSR" (1927), "Hero of Socialist Labour" (1945), the Order of Lenin (five times), the Order of the Red Banner of Labour, and numerous other Soviet decorations; the Order of the Red Banner of the Mongol Peoples Republic, as well as prizes of the Academy of Sciences of the USSR and France, of the Russian and Hungarian geographical societies, and several other organizations.

Obruchev died on June 19, 1956 and was buried in the Novodevich' cemetery in Moscow.

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