CLASSIFICATION CONFIDENTIAL CONFIDENTIAL

CENTRAL INTELLIGENCE AGENCY
INFORMATION FROM
FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT

CD NO.

COUNTRY USSR

DATE OF INFORMATION 1947

SUBJECT Geographical - Geology

HOW PUBLISHED Bimonthly periodical

DATE DIST. 14 Feb 1950

WHERE PUBLISHED Moscow

NO. OF PAGES 4

DATE PUBLISHED Nov/Dec 1947

SUPPLEMENT TO REPORT NO.

LANGUAGE Russian

THIS IS UNEVALUATED INFORMATION

SOURCE Izvestiya Akademii Nauk SSR, Seriya Geologicheskaya, No 6, 1947,

STAT

THE BEREZOVSKIY ORE FIELD

V. A. Obruchev

(A review of N. I. Borodayevskiy's and M. B. Borodayevskaya's Berezovskoye rudnoye pole Geologicheskoye stroyeniye -- (The Berezovskiy Ore Field Its Geological Structure). Edited by Academician D. S. Belyankih; published by Nigrizoloto Institute, Moscow, 1947.)

The Berezovskiy gold deposit in the Urals is the oldest gold deposit in the USSR. It is known even in foreign literature because of some of its peculiarities in composition and structure, and because of its richness. Although the deposit attracted the attention of prospectors long ago and has been inspected and briefly described by quite a few mineralogists and geologists, a detailed study and description of it did not materialize for a long time. This lag is explained by the fact that there are no natural outcrops of ore at Berezovskiy, and by the fact that until recently mining was carried on mostly among the weathered rocks in the upper levels, rocks which had lost their original structure and composition and had changed into argillaceous products. Only the extensive prospecting and exploitation work since the 1930's, which involved boring to great depths and which was carried out over almost the entire area of the ore field, has made possible a systematic study of the deposit. This study should have been made long ago because of the urgency for exploitation of the deposit.

The authors of this monograph began to study Berezovskiy 10 years ago, after the ore field had been mapped in detail by personnel of the Sverdlovsk Mining Institute under the supervision of Docent P. I. Kutyukhin. Their book is in effect a reference work, having been written with the cooperation of several mining geologists, with the use of copious documentary materials and detailed maps, and with the advice of Academician D. S. Belyankin and Doctors V. M. Kreyter and Ye. A. Kuznetsov.

CLASSIFICATION CONFIDENTIAL CONFIDENTIAL

STATE	X	NAVY	X	NSRB	DISTRIBUTION
ARMY	X	AIR	X	FBI	

Chapter I contains general information about the location of the Berezovskiy mines, including a geological map of a portion of the Urals and a sketch of the 60-meter level in the Kirov Mine, and a detailed history of the opening, working, and geological investigation of the mines. A table showing total ore and gold production from 1743 through 1925 is interesting. During these 182 years, the Berezovskiy mines and placers have yielded almost 112 million pud of ore, from which 1,581 pud and 13 funts of gold have been obtained. Average gold content was 5.40 pud per 100 pud of ore, while the content range was from 2.60 to 8.54 pud.

Chapter II gives a short orohydrographic outline of the region surrounding Berezovskiy, including photograph which shows a general view of the Lenin Mine and gives a conception of the flatness of the area. The chapter describes the Mesocenozoic and Paleozoic depositions, the volcanic intrusions of ultrabasic and gabbroid rocks, the Murzinsk-Alabashka gneissoid granite complex, the granite veinstone, the structure, the metamorphism, and the gold, nonferrous, and rare metal deposits.

Chapter III contains a description of the geological position of the ore field, its component strata, the schistosity of the rocks, and the structure of the formations which surround the granitoid dikes. The description is illustrated by a geological map of the Berezovskiy ore field on a scale of 1:10,000, three cross sections of the northern and central parts of the ore field on a scale of 1:4,000, a block diagram of the field, and seven cross sections through the field along several lines on a scale of 1:20,000. The map and cross sections give a good conception of the complex composition and structure of the field.

In Chapter IV is found a petrographic description of the rocks of the Berezovskiy ore field. They are sedimentary, pyroclastic, and effusive rocks, which are products of regional and contact metamorphism, and rocks of gabbroid peridotitic formation with their metamorphosed varieties.

Chapter V is devoted to the dikes of granitoid veinstone. The stratification, extensiveness, age, morphology, petrography, disjunctive structure brought about by these dikes, and endo- and exocontactual metamorphism occurring in connection with them are discussed. The description is illustrated by a number of sketches and cross sections in various scales. The petrographical description is illustrated by photographs.

Chapter VI examines the granitoid dikes as a source of beresite ores. Beresites and listvenites, their stratification and relationships, the metasomatic changes of porphyritic granites, the structure of zones which have partly changed into veinstone, the origin of beresites, the characteristics of other rocks, and the changes caused by partial veinstone metamorphism are described. Photographs, tables of analyses, and tables showing mineralization stages when changes into beresite and listvenite occur, illustrate the text.

In Chapter VII, there is a description of ore-bearing veins and their structure. Scheelite-bearing (quartziferous tourmaline) and gold-bearing formations are described. The description is illustrated by diagrams, sketches, and cross sections. The illustrative material has been taken from documentary mining materials and includes sketches of mine faces and mine roofs in various scales.

Chapter VIII is occupied with epigenetic structure (poslerudnaya tektonika) which, however, has not as yet been clarified to any great extent, as the authors point out. They devote only several pages, a diagram, cross section, and block diagrams to it.

The conclusion presents the most important practical deductions which can be made from the total knowledge about the geology of the ore field, knowledge obtained by combining the information gained from theoretical research and from the practical work of mining geologists. This case illustrates how desirable is intimate contact between scientific research organizations and the geological prospecting service of the trusts.

Detailed research work during the Soviet era, more thorough prospecting work, and precise mining documentary materials have naturally combined to produce much that is new in our concept of the Berezovskiy ore field and to explain the complex composition and still more complex structure of this field in which sedimentary, effusive, volcanic, intrusive ultrabasic, basic veinstone, and variegated veinstone rocks lie in intimate association with, and overlap each other, and in which regional and contact metamorphism complicate the composition and often obscure the interrelationships between these various rocks still further. Generally, these rocks belong to the rather deep levels of the syncline but do appear at the surface of the earth because of the processes of orogeny and deep erosion.

According to the description of the researchers, the Berezovskiy ore field has the following structure. Mainly, it consists of a Lower Carboniferous and Upper Devonian tufaceous sedimentary stratum in which siliceous and siliceous argillaceous schists, siliceous and siliceous chloritic tuffs, tufaceous sandstones, and further down, massive and porous tuffs alternate with seams of tuffs, volcanic breccia, diabases, and siliceous rocks. The stratum lies on granular and massive plagioclastic porphyritic tuffs, which in turn lie on massive and granular diabases. These lower igneous rocks and tuffs belong to the Middle and Lower Devonian. Tufaceous sedimentary rocks make up the northeast running anti- and synclinal folds, which are overturned and broken in the southwest by faults and other dislocations. Ultrabasic rocks, for the most part serpentine rocks, intrude into this tufaceous sedimentary stratum in the form of huge conformable sheet-like or laccolithic bodies; dikes and blocks of plagiogranite and diorite, and in some cases also gabbro, fault the serpentine-rock-intruded tufaceous sedimentary stratum. Many of the gabbro massifs also have a sheet-like form and are found along the outer edges of the ultrabasic rock intrusions.

All of the rocks involved in faulting undergo regional and contact metamorphism. The veinstone rocks are typical dikes stratigraphically, but in composition and in chronological sequence of intrusion they are plagiosyenitic porphyries, diorites, dioritic porphyries, granite porphyries, and plagiogranite porphyries. The dikes are from 2-3 to 10-12 meters thick. On an average, they are 1.5-2 kilometers, but sometimes up to 9 kilometers, long. Plagiosyenitic porphyries make up 52 percent of the prospected gold-bearing dikes, plagiogranite porphyries 34 percent, granite porphyries 12 percent, and diorites 2 percent. For the most part, the dikes follow a meridional direction. Their dip is steep to perpendicular. Throughout the entire ore field, the dikes of every succeeding group cut the preceding.

All gold, nonferrous, and rare metal deposits of the Berezovskiy ore field belong to one metallogenetic cycle, that associated with granite intrusions; chronologically, however, they belong to the most recent system of granitoid veinstone rocks. Almost all deposits represent hydrothermal filling of fissures and have become granitoid rock dikes. The sectors with the most dikes become the ore fields, i.e., dikes determine the areas important enough to be prospected and exploited. Quartz is the veinstone mineral; gold and wolfram are the most important industrial ores; polymetallic ores are found less frequently, and molybdenum, very rarely. The wolfram deposits, which are mostly scheelite deposits, are located in the outer edges of the granite massifs or in their contact aureoles. The gold and polymetallic ores are located at a distance from the granites. The overwhelming majority of gold-bearing rocks lies among the carbonaceous rocks and chloritic carbonaceous schists. Ore-bearing qualities are always noted in connection with the carbonization of rocks.

50X1-HUM

The technical terms "beresite" and "listvenite" have been known for a long time. They have been used from the time of G. Rose to designate some of the peculiar varieties of rocks at Berezovskiy. The term "beresite" designates a variety of granite porphyritic rock which developed under the influence of carbonic hot springs containing potassium. The term "listvenite" designates ultrabasic plutonic and effusive rock which has been changed by hot springs. Formerly, listvenite was considered to be metamorphosed limestone.

The authors of the monograph have examined the origin of beresite in detail and have come to the conclusion that in changing to beresite, normal granite porphyry has lost quantities of its silica and almost all of its sodium oxide and has gained K_2O, H_2O, MgO, and FeO. Beresite and listvenite are syngenetic developments, and the changes into beresite and listvenite are virtually two branches of one hydrothermal metasomatic process. Under listvenite the authors understand rock consisting of ankerite and potash mica as the main minerals; under beresite they understand rock consisting mainly of quartz, potash mica, and pyrite. Beresite, in their opinion, is to be regarded as a particular instance of a transformation process applicable to rocks rich in silica and alumina and deficient in the RO group of acids.

Epigenetic structure is in general insignificant in scale. This is in harmony with the fact that recent movements of the Mesocenozoic have generally not been strong in the Urals and have not occurred at all in certain parts of the Urals which still retain the ancient relief created at the beginning of the Mesozoic. The Berezovskiy field, as well as the environs of Sverdlovsk, belong to those parts of the mountain system. These epigenetic movements (poslerudnaya dvizheniya) could still very well be Paleozoic and represent either faults with a steep dip and a meridional or diagonal course, or overthrusts with a comparatively sloping dip and predominantly meridional course. The faults or overthrusts sometimes lead to a breaking down and displacement of quartz veinstone strata much thicker than they themselves are. More significant dislocations are found in regions where these dislocations have taken place in earlier times. Epigenetic dislocations (poslerudnaya smeshcheniya) are indicated by the formation of mylonite and breccia with a part of the quartz veinstone in the form of detritus. Epigenetic structure complicates and increases the cost of mining operations, but mine-survey documentary materials made it possible to carry on prospecting work for ore-bearing veins which have been severed by dislocations but whose location and course are more or less clear.

In conclusion, the authors point out the great importance of knowledge of all the characteristics of the Berezovskiy ore field for the near future, when the deeper levels will be exploited. At these deeper levels, a knowledge of structural features will be of paramount importance. This monograph could help to surmount the difficulties since it is the first to give a complete description of this complex and extremely interesting deposit and is a very valuable scientific work.

With the issuance of this work, the Nigrizoloto Institute has resumed its publishing activity, which had been interrupted by World War II.

- E N D -