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INTERNATIONAL MINERALOGICAL ASSOCIATION

Sixth General Meeting

EXCURSION GUIDES

PRAGUE 1968
August 30 - September 5

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BIBLIOTHEK des INSTITUTES
für MINERALOGIE und KRISTALLOGRAPHIE *03232*
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EXCURSION I. M. A. 01

September 1st

Leaders: J. Hak
L. Žák

CHVALETICE

The mineralogy and complicated genesis of the deposit have been studied by F. Slavík/1928, 1931 etc./ and his successors. The unique mineral association is predominantly bound to a lense-shaped Fe-rhodochrosite horizon up to 30 m thick /Ore formation of Algonkian, J. Svoboda and F. Fiala, 1957/. The finely grained sedimentary carbonate is mostly black /graphite/.

In the Chvaletice-West open pit the carbonate with adjacent pyrite shales is only slightly metamorphosed and penetrated by quartz veins with abundant pyrite, infrequent light-green F-Cl-OH apatite, rhodochrosite, rare pink kutnohorite $\text{CaMn/CO}_3/2$, sphalerite and other minerals. These minerals originated by an Alpine paragenesis process connected with a hydrothermal mobilization of syngenetic sedimentary pyrite, Mn-carbonate, and microscopic apatite present in it.

In the Chvaletice-East open pit the effects of metamorphism in the Mn-horizon are stronger. Fine-grained silicate hornfelses with spessartite, rhodonite, tephroite and Mn-cummingtonite are impregnated by pyrrhotite, pyrite and neotocite. They contain veinlets and lens-like portions of coarse-grained rhodonite /also crystals/ and tephroite, together with long fibrous Mn-cummingtonite. Younger minerals are yellow helvite, spessartite /megascopic rare/, axinite, clinozoisite, pyrrhotite, pyrite, arsenopyrite, sphalerite, black alabandite, chalcopyrite, galena, marcasite, Ba-adularia, neotocite, hisingerite, cronstedtite, dravite /white asbestiform/, rhodochrosite oligonite, dolomite, calcite, chlorites, hematite, opal, chalcedony and very rare melanophlogopite /cubic SiO_2 , cubes sitting on chalcedony/. Pyrophanite / MnTiO_3 / forms scaly aggregates resembling ilmenite.

Most common minerals are rhodonite, Mn-cumingtonite, pyrrhotite, pyrite, rhodochrosite and neotocite. Milky vein quartz accompanies the minerals with exception of tephroite.

KUTNÁ HORA

Kutná hora belonged as early as in the Middle Ages to the best known mining centres of Europe. Owing to silver-rich mines Kutná Hora soon became the most important economic unit of the Kingdom of Bohemia. The boom of mining at that time was also characterized by the introduction of the new currency system in 1300 and by the edition of *Ius regale montanorum*, one of the oldest and most important codes of mining law in the world. Mining operation in the ore district was from the technical and organization point of view on a relatively high level. By means of the so-called heat mining technique a depth of 500 m was reached as early as in the end of the 14th century. There are many medieval monuments of prosperity of the town still preserved.

The Kutná Hora ore district is formed by a system of parallel ore zones associated with faults in gneisses and migmatites. Most ore zones strike N-S, and dip steeply /60-80°/ to the W. Polymetallic sulphide mineralization is hydrothermal and is represented, first of all, by the veins of Zn-Pb-Ag type. At present zinc and lead ores are being exploited in the northern part of the district. A certain amount of Cu and Sn occurs in the northern part of the district, in the southern one there is a larger amount of the Sb. The Kutná Hora ore mineralization shows a striking similarity to the Freiberg mineralization of the so-called kb and eb formations. Zoning in the distribution of ore formations is manifested within the whole district, as well as in the individual ore zones. The Kutná Hora veins formed at a relatively broad temperature interval. Seven mineralization periods can be observed within the whole district.

The earliest mineralization period is characterized by the formation of bulk of the arsenopyrite, pyrite and quartz. The deposition of this mineral association was accompanied by an intensive wall-rock alteration. The most important is the sulphide mineralization period characterized mainly by dark sphalerite, rich in Fe. In addition to sphalerite, pyrrhotite and subordinate galena, stannite and chalcopyrite are commonly present. The above mentioned minerals of those two periods are characteristic for the vein filling in the northern part of the district. The minerals of the younger mineralization periods such as Pb-Sb sulphosalts /jamesonite, boulangerite/, Ag-Sb sulphosalts /pyrargyrite, miargyrite/, bournonite, tetrahedrite-freibergite, berthierite, antimonite, carbonates /siderite, ankerite, kutnohorite, dolomite/ are less abundant in the Kutná Hora ore zones, either locally or in the southern part of the district. Cassiterite, gold-electrum and bismuth were found as accessories in the vein filling. Local occurrences of fuchsite, calcite and chlorites /cronstedtite, orthochamosite/ represent the non-ore minerals. Sphalerite - the most important mineral from the economic point of view - contains Fe 11 - 15%, Cd 0,26 - 0,57%, Mn 0,22 - 1,05% and In 0,02 - 0,11%. Indium is a very characteristic element for the sphalerite mineralization in the northern part of the ore district.

KOZÁKOV

EXCURSION I.M.A. 02

September 1st

Leaders: K. Paděra
J. Bauer

KOZÁKOV

During the development of the sedimentary filling of the Krkonoše piedmont basin volcanism was active, in whose course the quartz porphyries /partly in the form of ignimbrites/ and melaphyres were formed. Volcanic activity reached its maximum in the Lower Permian /Autunian/. One of the significant melaphyre bodies lies on the south-western slope of the hill Kozákov, NW of Jičín, where the ascent of the volcanic mass was facilitated by an extensive tectonic line that revived during the Tertiary and is called the Lusatian Fault.

The melaphyres that display usually intersertal structure and a rather andesitic chemical composition are exposed by a shelf quarry "Votrubečův lom" that is known above all as a mineralogical locality. The rock is strongly amygdular for a large part and heavily fractured. Numerous minerals occur in the amygdulae and compose fracture-filling veins.

The most important species found at this locality are: agate, amethyst, analcime, apophyllite, barite, calcite, goethite, chabazite, chalcedony, harmotome, heulandite, laumontite, mordenite, and stilbite. The deep-green phyllosilicate that rims frequently the amygdulae, formerly considered to be delessite, proved to be a mixture of ferri-saponite /griffithite/ and celadonite. The agates are most popular at the locality but excellent specimens of some zeolite species can be found here, too.

SMRČÍ

The occurrence of basaltic neovolcanics at Smrčí and in its broader surroundings is interesting from two points of view.

Primarily it is important for the dating of Neocidic volcanics in the Bohemian Massif. The basalt effusions rest here on the high terrace gravels of the river Jizera. Though the age of these gravels is as yet not safely proven, it definitely does not exceed the Miocene /Pliocene boundary. This means that the volcanics lying on the gravels belong to the youngest volcanic phase of the Bohemian Massif, which is of Pliocene age.

The rock which is quarried at the northern margin of the village, 2km SE of Železný Brod, consists of olivine, basalt augite, labradorite and magnetite, sometimes with small admixture of nepheline. Two lava sheets crop out in the quarry: the lower is characterized by a thick columnar jointing. At the Podmoklice locality /3,5 km SE/ even four-effusions and two tuff beds are developed above each other.

The basaltic rock contains unusually abundant ultramafic inclusions that were studied by F. Farský as early as in 1876. They consist of prevalent magnesium-rich olivine, grayish-brown enstatite, accessory bright-green chromian diopside and chromian spinel. The mineralogical and chemical composition of the peridotitic inclusions suggests that they represent xenoliths derived from the peridotite layer of the mantle.

The town of Turnov, with about 11 thousands of inhabitants, is located approximately 80 km NE of Praha. The life of its citizens has been influenced by jasper and agate occurrences probably since the 14th century. Besides this, the art of glass-work was acquired from Venice two centuries ago and since that time the glass industry flourished here and in the close neighbourhood.

Turnov is a town of semi-precious stones even nowadays. It is the site of the School of Metal and Stone Art. The cooperative Granát produces fine modern jewelry from Czech garnet - pyrope. The Institute of Monocrystal Research is growing many species of synthetic crystals. The glass industry is concentrated in the trust Precious.

EXCURSION I.M.A. 02a

September 1st

Leaders: R. Rost
K. Žebera

In the country around České Budějovice and Třeboň in southern Bohemia a number of artificial ponds were already in existence in the Middle Ages. The region is well known for fishing. Agriculture predominates in the economy of southern Bohemia. Mining is confined to lignite and graphite. In the western part of the region, outliers of the Šumava range rise above the horizon; to the east lie the Nové Hradý mountains.

The town of České Budějovice /64,000 inhabitants/ is the economic, cultural and administration centre of southern Bohemia. Its products include the world-famous "Budvar" beer, "Koh-i-noor" pencils and "Čezeta" scooters. The tetragonal square, each of its sides measuring 133 m, is one of the largest in Central Europe; it has covered arcades. The Baroque town hall with gargoyles and decorations was designed by the Italian architect Martinelli and built in 1727 - 1731. "Samson Fountain", a Baroque structure, comes from the same period. The "Black Tower" /72 m high/ near the square, was built in the 16th century, as the former butchers shops were /now housing the restaurant/, the armoury and the salt storehouse; all these are Renaissance in style.

At Trhové Sviny, there is a Gothic Church from the 13th century, rebuilt in late Gothic style in the second half of the 15th century.

The excursion will pass also through the historic town of Tábor. This is the district centre /20,000 inhabitants/ with engineering, woodworking and food industries. The fifteenth-century fortifications are well preserved in part. There are many late Gothic and Renaissance houses in the old part of the

town, which was an important centre of the Hussite movement.
 S a n d y p i t a t "Š t i l e c" S. of the village Kamen-
 ný Újezd, S. of České Budějovice

This sandy pit is 490 m above s. l. It belongs to the strewn field, where moldavites fell in the ancient watercourses. The moldavites are here in situ or were transported to a short distance, estimated at a few hundred metres only. In the R. Píša and J. Prokoped collections in Český Krumlov, there are two halved moldavites that were found at this locality. The two halves of the moldavites were found near each other and their surfaces were strongly corroded. At the time of moldavite shower, the locality "Štílec" was some 400 to 500 m lower than it is today.

In the NW. wall of the "Štílec" sandy pit we find fluvio-lacustrine feldspathic gravel-sands. Moldavite-bearing sand is 1 to 2 m under the surface. Its thickness is variable from 25 to 100 cm. The moldavite-bearing gravel-sand is yellowish-brown, rusty brown to black streaked Kosov fluvial-lacustrine gravel-sands. Most gravel grains are up to 1,5 cm across, sporadic grains 4 cm in diameter. Overlying rock is ashy white-grey loamy talus sand; underlying rock is greenish white-grey, rusty brown streaked, fine grained clayey fluvial-lacustrine sands rich in the mica flakes and sometimes contains small lenses of greenish white-grey "Vrábče" clays with a strong admixture of fine sand mica flakes. In the year 1965, in the north-western wall of the "Štílec" sandy pit, there were visible some frost kettles, filled with yellowish brown fine-grained sands with the fossil tropical red soil superjacent on the Kosov fluvio-lacustrine moldavite gravel-sands. The fossil soil represents the relic of the original surface at an altitude of 495 m above sea level. The frost-kettles contained in addition to red soil also coarse limonite- or haematite- coloured quartz gravels. The presence of the frost-kettles or frost-wedges at "Štílec" sandy pit determines the Tertiary age of the moldavite bearing sediments. Under the bottom of the sandy pit "Štílec" are Mydlovary strata of Miocene age. Therefore the moldavite bearing

sands are from the end of Tertiary. In 1 m³ of moldavite bearing sand there is about 15 g of moldavites.

LOČENICE

S. of České Budějovice. At present, this locality is one of the most productive. From the surface of the fields it was collected about 3 000 of pieces in past ten years. This locality belongs to the fluviolacustrine type. Feldspatic gravel sands of this and other similar deposits /for example Koroseky, Vrábče, Holkov etc./ of fluviolacustrine type are well worn by water transport, spherical or ovoid pebbles are quite frequent. Gravels together with moldavites were occasionally carried by water for kilometres. After settling, the pebbly moldavites were finely striated or concavely corroded. Gravel fraction of this deposit consists of milky, common, gray to black quartz, smoky quartz, rock crystal, pegmatite /quartz + feldspar + tourmaline, sometimes muscovite/, silicites from fossil tropical weathering material of serpentinites. Rounded feldspar fragments are abundant. Some silicites show a typical fossil tropical violet patina /according to K. Žebera/. V. Bouška was the first who pointed out that the fluviolacustrine and lacustrine sediments are in all the area of České Budějovice at an altitude of 500 m above sea level, for example in the Koroseky-Holkov-Ločenice-Něchov group and others. Moldavites in medium-grained sand or gravel sand are very well sculptured and lustrous. Average weight is about 7 grams. By digging we can find in one cubic meter of sandy gravel about 3 - 4 moldavites but sometimes also nothing. The average thickness of the gravel sands in the environs of Ločenice is 2 - 3 metres.

BESEDNICE

An abandoned brick-pit. This locality is interesting because moldavites occur here in a very fine grained clay, which consists of muscovite, montmorillonite, kaolinite, quartz,

plagioclase and K-feldspar. The parent rock of this sandy-silty clay is gneiss or granite that weathered practically on the same place. If any transportation took place, it was very short up to 200 metres only. Moldavites from the brick-pit in Besednice are very distinctly corroded. Mainly the alkaline etching was active in this clay according to M. Störr and J. Konta /1964/ and moldavites occur in lower horizon in this brick-pit. The moldavites in the brick-pit at Besednice lie at the place of their fall from the atmosphere or in the close vicinity /=' true strewn field/'. This locality is a local filling of a small axial depression in an old relief of this area. Its age is very probably upper or uppermost Miocene. In the neighbourhood of the brick-pit at Besednice in the field there occur moldavites of the fluviolacustrine type of sediments /sandy gravel under loam in the fields/.

BOROVANY

This locality is situated in the border of the Třeboň Tertiary basin. Moldavite occur here in the slope debris, composed of weathered gneiss, very rich in white, angular fragments of quartz. Slope debris fill in mild inclined axial depression on the west slope of the large and deep diatomite quarry.

In the western wall of the diatomite quarry, K. Žebera distinguished the following layers of sediments /from the top to the basement/:

- 1/ Yellow quarternary /Pleistocene/ slope debris, loes loams, thickness 0,5 - 2,5 m
- 2/ Blue or white gray clays, thickness 0,7 - 1 m /equivalent of Ledenice strata?/
- 3/ Limonitic clays, very thin, which according to K. Žebera indicate the former surface and border between Miocene and Pliocene

- 4/ Slope debris somewhere with rusty spots and quartz fragments and moldavites. This layer changes laterally in quartz-feldspar sands
- 5/ Somewhere under slope debris are lenses of grey clays which belong to the "Mydlovary strata". In some places are also hard, clastic Spongiodiatomites, evidently of Miocene age
- 6/ Diatomite deposit of 6 - 8 m thickness. White. Miocene

The following stratigraphic units are in the basin sediments of Southern Bohemia /A. Maleřha, Z. Špinar and others, 1962/:

- A/ Quaternary sediments
- B/ Lednice strata /Pliocene/
- C/ a/ Mydlovary strata /Miocene/
 b/ Zliv strata
- D/ Lipnice strata /Oligocene/
- E/ Klikov strata /Senon - upper Cretaceous/

Paleontological verification of the oldest age of moldavite bearing sediments is still missing. Most of the Czech geologists believe they are upper or uppermost Miocene in Bohemia. In Moravia moldavite bearing sediments are redeposited and are considered as Pliocene age.

EXCURSION I. M. A. 03

September 4th and 5th

Leaders: J. Kutina
J. Švenek

The excursion will visit three mineral deposits: Příbram /Ag-Pb-Zn formation; one of the mine levels will be inspected/, Sedlec near Karlovy Vary /kaolin/ and Jáchymov /U-Ni-Co-Bi-Ag formation/. The route is as follows: Praha - Příbram - Plzeň /night-quarters/ - Mariánské Lázně - Karlovy Vary - Jáchymov - - /Kladno/ - Praha, total approximately 500 km. It leads through the area of Central and West Bohemia, will enable to see shortly also Horní Slavkov /Sn-W-Mo/ and Kladské /U/ and will include the visit of some well-known spas just as of the famous brewery PRAZDROJ at Plzeň /established 1842/.

The geological structure of the region traversed by the route is a varied one. The area of the first day of the excursion is built by the Lower Paleozoic and the Proterozoic of the Barrandian, along the periphery of the Central Bohemian Pluton. The second day the route will enter the West Bohemian crystalline complex /Mariánské Lázně/, then traverse the Karlovy Vary granite pluton, the projections of Tertiary volcanics /E of K. Vary/ and after crossing the Permo-Carboniferous it will enter the Cretaceous tableland SW of Prague.

Note: the fulfilment of the whole programme is dependent on the discipline in maintaining the prepared schedule.

PŘÍBRAM

The deposit started to be mined in the 13th century already, as proved by the contents of the first written document from 1311. The first period of successful mining culminated at the beginning of the 16th century and resulted in total exhaustion of the upper levels of the mined silver-bearing ore veins. The Příbram mining experienced a new era of rapid advance to the end of the 18th century due to the fortunate decision to open the deep portions of the veins by new mines. In 1875, it was here for the first time in the world that the depth of 1000 m has been reached.

The high prosperity lasted till the beginning of the 20th

century, the maximum output was attained in 1912: 50,000 kg Ag and 60,000 q Pb. The present-day development of the Příbram mining has been brought about by the exploitation of recently discovered rich uranium veins in a belt stretching along the boundary of the Central Bohemian Pluton.

Ore veins in the Příbram Ore Field

The Příbram Ore Field, lying in the central area of the Bohemian Massif /about 55 km SW of Praha/ shows pronounced examples of regularity in distribution of ore veins and structural control of ore shoots localization.

Main part of this ore field is represented by ore veins penetrating Algonkian /Proterozoic/ and Cambrian sedimentary complexes of the SE flank of the Barrandian synclinorium. Smaller part of the ore field extends to the adjoining Central Bohemian Pluton composed of granitoids.

Cambrian sediments together with the previously folded Algonkian rocks were folded and faulted during the Variscian orogenic process. As a result, continuous alternation of two NE-trending Cambrian and Algonkian belts originated. Parallel with the elongation of the belts and with the direction of the axis the local Cambrian syncline and Algonkian anticline, big faults are running here, along which the Algonkian has been pushed and thrust over the Cambrian. The major of these NE-trending faults are the Clay Fault, Dědovská Fault and Dubenec-Druhlice Fault.

Detailed revision of the Clay Fault course /J. Kutina, A. Tělupil, 1966/ revealed that it is displaced by several N - S trending faults. Main accumulation of ore veins proceeded around the intersection of the Clay Fault with the above NS-faults. The two historical mining districts of the Příbram Ore Field, i. e. the Březové Hory and Bohutín mining districts are situated in the SW-sector of such cross-sections. Main ore veins of these two districts are of N-S up to N 25°E strike, following

the course of older diabase dykes with which they are connected in space. In shallower depths also veins of other strikes were mined. At Březové Hory /Anna Mine, Prokop Mine, Vojtěch Mine/ the veins of the N-S system are opened now up to the depth of more than 1 500 m.

While the ore veins along the Clay Fault, especially at Březové Hory and Bohutín, are typical representatives of the Ag-Pb-Zn formation, all of the veins along the Dědovská and Dubenec-Druhlice Fault do not belong to this formation. Several of them are rich in pitchblende and thucholite-like component, both accompanying especially one of the carbonate generations - the main gangue of these veins. In places they carry also Co-Ni minerals.

The ore veins in the adjoining part of the Central Bohemian Pluton are rich namely in silver, lead, zinc and copper /Vrančice/ with abundant chalcosite.

In the classical area of Březové Hory the main accumulation of silver of the Ag-Pb-Zn veins took place in the upper horizons. The beautiful specimens of pyrargyrite, proustite, miargyrite, stephanite, pyrostilpnite a. o., disseminated in mineral collections all over the world, come from them. The mineral content of the veins becomes simpler with the increasing depth. In the banded structures with typical signs of multiple re-opening of the fissures at the deepest 36th up to 41st horizons predominates: siderite /with MnO 10-14 %/, vein calcite /MnO 4%/, barren quartz and the so-called "Dürrerz" with local accumulations of galena, sphalerite of the 1st generation and boulangérite. Microscopically the "Dürrerz" represents an intimate intergrowth of siderite, quartz /the latter replacing siderite in irregular metasomatic forms and metacrysts/ and of several ore minerals. Some of them selectively replace siderite or the preceding ore minerals in the sequence: sphalerite - galena - - boulangérite.

A detailed sequence of mineral deposition has been established for the Main Vojtěch Vein at Březové Hory by J. Kutina

/1955, 1963/ and for the Bohutín veins by M. Píša /1966/. The latter paper deals also with the trace and minor elements of the individual minerals.

Geochemical prospection in perspective areas along the Clay Fault is the most interesting among the most recent investigations. Lead, zinc and tin are being especially used in the discussion of geochemical anomalies in the soil.

HORNÍ SLAVKOV (formerly also Schlaggenwald) - KRÁSNO

The deposit is one of the famous centers of the medieval mining on the Czechoslovak territory. As early as in the 14 th century cassiterite and Cu-Ag-Pb ores were mined here, later also wolframite and molybdenite. The mining reached its greatest expansion after World War II by opening of very rich veins of the U /Bi-Ni-Co/ formation, exhausted in the late fifties. The mineral wealth has not, however, been exhausted totally in the area. Geological exploration has recently discovered new resources of Sn-ores that place Horní Slavkov among world deposits of medium category.

The mining district is situated in a tectonically subsided block and is built by the autometamorphic Karlovy Vary granite /E/ and its crystalline mantle /NW/. The Variscian mineralization resulted in 3 types of ore deposition: impregnations, local accumulations /"bonanza"/ and quartz veins. The first - at present the most promising type - is situated in granite and greisen stocks along the contacts with their mantle, in a SW - - NE stretch. More than 100 mineral species have been determined at Horní Slavkov. The specialities comprise cassiterite crystals /"Graupen"/ and carpholite, described for the first time in this deposit /Werner 1817/.

SEDLEC (NNW of Karlovy Vary)

The locality lies in the district of the world-famous

Bohemian porcelain industry and the rich kaolin deposits in export of which Czechoslovakia occupies the third place in the world. The area is formed by Tertiary sediments underlain by metamorphics and autometamorphosed granite. The kaolinization is due mainly to surface weathering in the conditions of tropical climate /Cretaceous-Paleogene/. Some deposits are allochthonous.

The Sedlec kaolin occurs in a bed underlying Oligocene quartzites silicified by silica gel released in the kaolinization process of granite. The thickness of the deposit is 30-40 m, and the clay substance contains 5-10% illite and tiny siderite concretions. The residuum consists of quartz, muscovite, accessory tourmaline, zircon, anatase, brookite and pyrite. The raw material of this deposit, opened in the middle of the last century, was accepted as a World Standard /Copenhagen 1924/. The mining ceased in 1961.

JÁCHYMOV

The name of Jáchymov appeared in history several times: as one of the richest silver deposits in Europe, as an important source of radioactive raw materials and finally as a unique health resort.

The first rapid inflow of miners /especially from Saxony/ started after the find of pure silver near the original village of Konradsgrün /1516/; a town with 18,000 inhabitants had arisen here till 1533. Its European significance is manifested by the silver output estimated at 400 000 kg between 1516 and 1594. The exceptional position of the town is evidenced also by coining right of the owner count Štěpán Šlik; the name of the coins /"Joachimsthaler"/ is preserved in the currency unit dollar.

The development of the mining technique, metallurgy and mining law in the district of the "five elements formation" deposit /U-Ni-Co-Bi-Ag/, contributed also to an advance in the

science of ores. This manifested by the book "Sarepta oder Bergpostilla" /Nürnberg 1562/ by the preacher Johannes Mathe-sius, but first of all by the work of Georgius Agricola, the town physician /1527-33/. His "Bermannus sive de re metallica dialogus" /Basel 1530/ and "De re metallica libri XII" /Basel 1546/ constitute the fundamental works in mineralogy. The decline of the mining in Jáchymov began, however, already at the end of the 15th century, for some time being slowed down only by the exploitation of Co-ores for the production of enamel. A substantial revival of mining enterprise was called forth by the use of uranium colours in glass industry /Patera 1852/. For the first time pitchblende became the object of mining.

A new historic era of Jáchymov was initiated by Madame Curie's discovery of radium /1898/ in 1 000 kg of waste from the uranium-colours factory, handed over to her as a gift. The production of Ra-substances started in 1908 /monopoly till 1913/ and was gradually accompanied by the modernization of 3 mines after World War I: Rovnost /formerly Werner/, Svornost, Bratrst-ví. Production: U-colours /1853-1936/.....5 246 q, Ra /1909-1936/.....62 g.

The greatest and also the last expansion of the mining in Jáchymov was brought about by the discovery of uranium splitting. An extensive complex exploration after World War II secured a high prosperity of the district for more 15 years. In 1965 all mines have been closed by official record.

In spite of exhaustion of the ore wealth, however, there is a good and lasting future in store for Jáchymov - in its value as a health resort.

Geology and mineralogy of the Jáchymov area

/For detailed information see the exposition "Geological picture of Czechoslovakia" in National Museum in Prague and the exposition of the Town Museum in Jáchymov/

In the neighbourhood of Jáchymov, the mighty Krušné hory

anticlinorium is formed by part of the Karlovy Vary granite pluton /SW/ and by crystalline rocks of its mantle /N and E/ in which 3 belts have been distinguished: 1. Proterozoic paragneisses /south/, 2. Upper Proterozoic micaschists with intercalations of orthogneisses, quartzites, limestones and calc-silicate rocks, 3. Lower Paleozoic phyllite group /north/. The area is penetrated by dykes of Variscan porphyries and lamprophyres and by Lower Miocene basalts.

The ore veins /more than 150/ belong principally to two systems: NW-SE /producing veins/ and W-E /mostly barren veins/. The veins of the first group attain a length up to more than 1 km /exceptional/, a thickness of 20-30 cm /rarely up to 2 m/ and a maximum depth of 800 m. Their polyascendent filling is constituted by dolomite /less by calcite/, quartz, fluorite /rare/, Ag-ores /near the surface/, uraninite /especially in the central portions/, and Ni, Co, Bi-ores /at lower levels as arsenides, at higher levels as sulphoarsenides/. The following stages have been distinguished in their mineralization by F. Mrňa, D. Pavlů, 1963: 1. older sulphide polymetallic stage /Pb, Zn, Cu/, 2. barren stage /quartz, hematite/, 3. uraninite stage, 4. arsenide stage - in 4 types / a/ Ag; b/ Bi, Co, Ni; c/ mixed type a + b; d/ without pure metals/, 5. sulphoarsenide stage, 6. younger sulphide stage. More than 150 mineral species are known from the Jáchymov district, many of them /proustite, sternbergite, argentite/ being decorative pieces of many world collections.

Hydrogeology - Balneology

The Jáchymov thermal waters have been known since 1863-4 /at that time the spring water partly flooded the present-day Svornost Mine/, but their radioactivity was established by Mach and Meyer only in 1905. The exploitation of the mineral springs began in 1908, when the government had modernized the technique of spring collection and started an accelerated construction of modern installations of the health resort which soon became

world-famous.

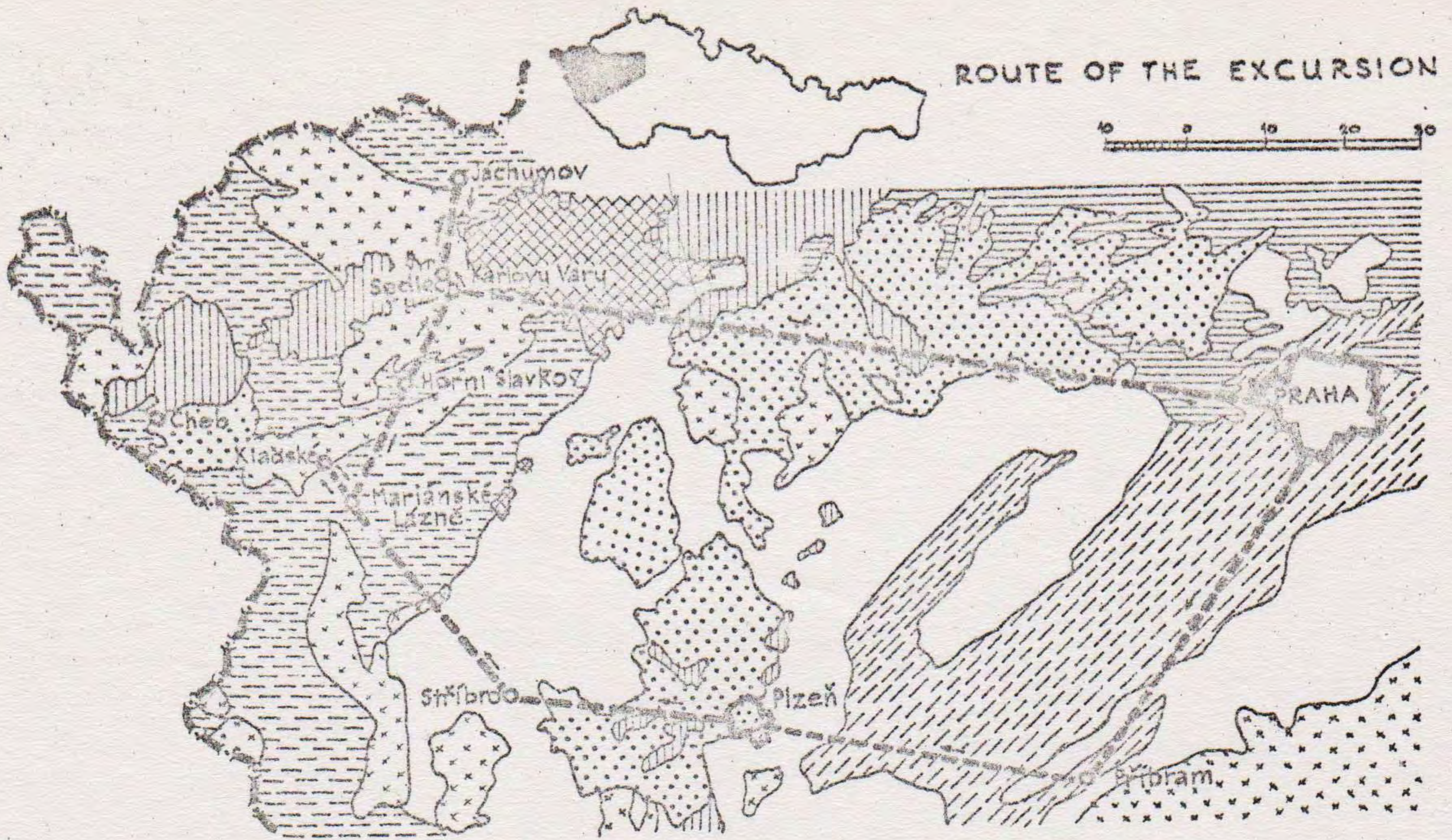
The future of the resort is very promising. The recent mining has not affected the springs to any substantial degree, and hydrogeological exploration during last years struck by drilling upon new productive sources fed by vadose waters from the so-called lower joint system in granite along the Geschieber Vein. Therefore the mine has secured against flooding out of the abandoned underground spaces. However, even the single recently opened spring HG-1 /"Běhounek"/ can be exploited by the existing capacity of the installations only to 30-40% /yield: 570 l/min.; temperature: 29,59°C; pressure: 19 atm.; Rn-content: 3430 curie . 10^{-10} ; radioactivity: 750-800 Mach's units/l /.

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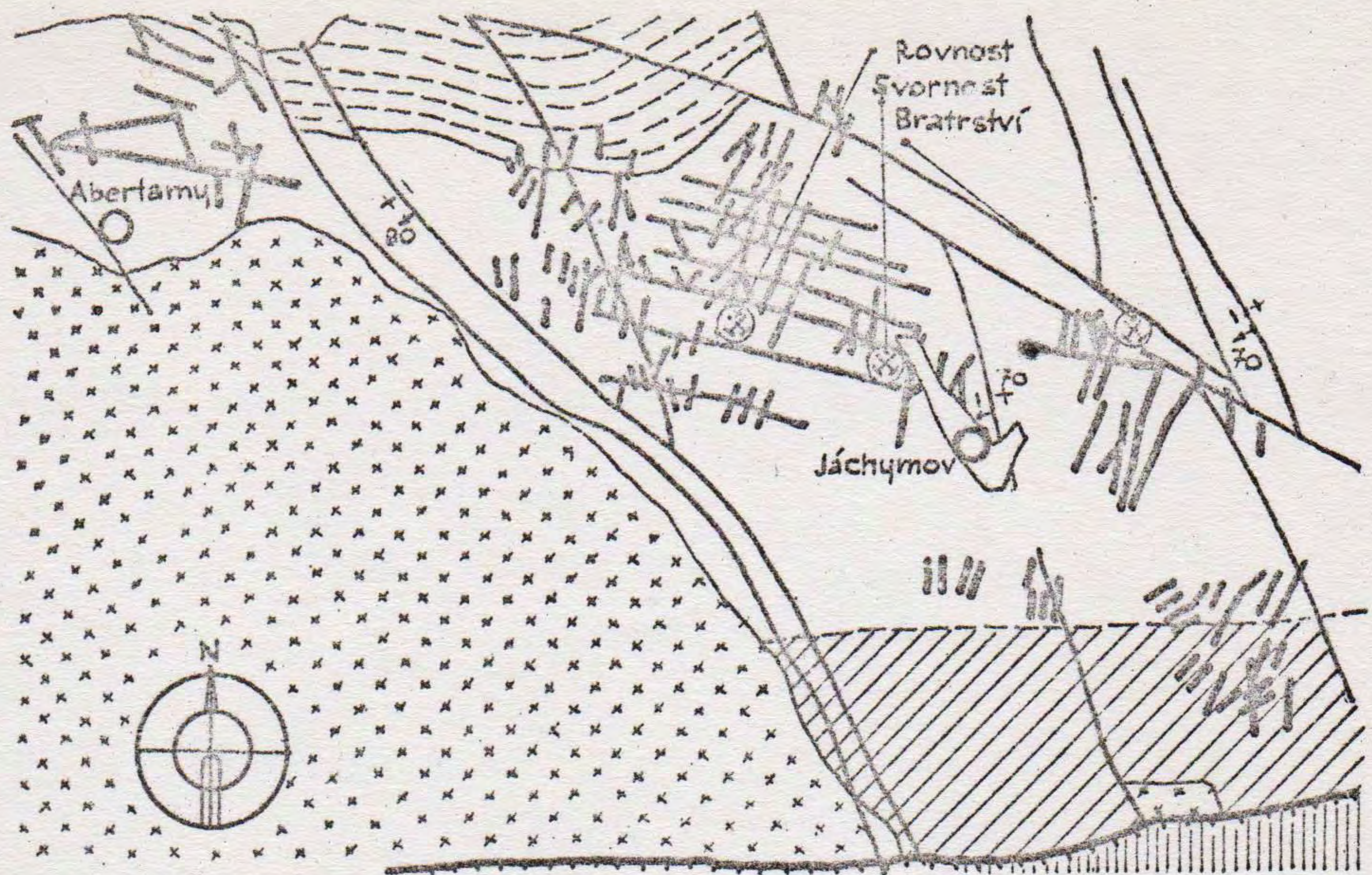


EXPLANATION OF THE MAP:

- | | | | |
|--|--|--|-------------------------------------|
| | metamorphic rocks | | sediments of Cretaceous age |
| | Proterozoic | | sediments of Tertiary age |
| | early Paleozoic | | granites and similar eruptive rocks |
| | sediments of Permian-Carboniferous age | | volcanites of Tertiary age |



GEOLOGICAL-MONTANISTIC SKETCH OF JÁCHYMOV-AREA



EXPLANATION OF THE MAP:

- | | | | |
|--|-----------------------------------|--|--------------------------|
| | sediments of Tert. and Quart. age | | Proterozoic paragneisses |
| | lower Proterozoic phyllites | | ore veins |
| | upper Proterozoic mica-schists | | mine |
| | granite pluton of Karlovy Vary | | |



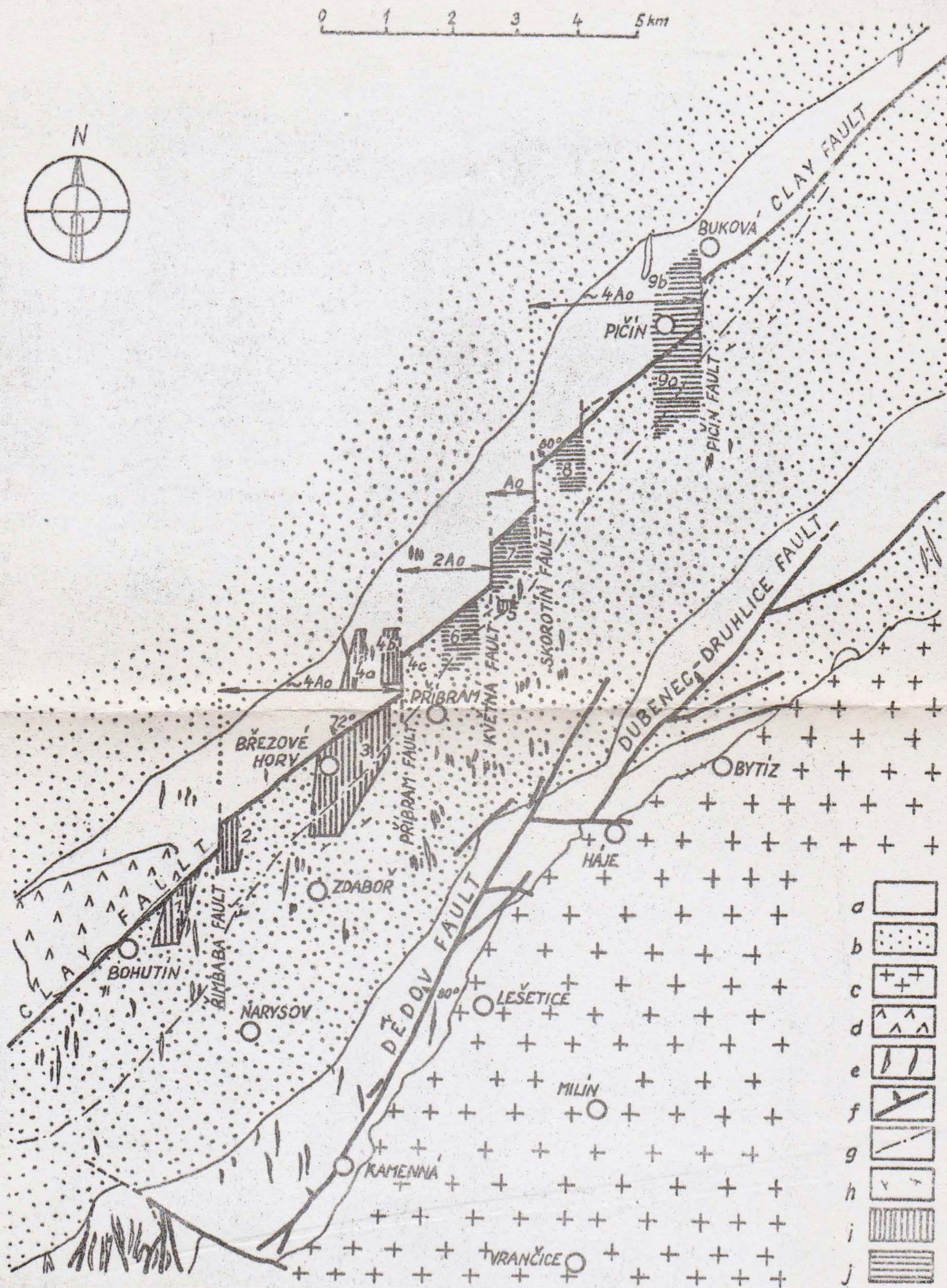


Fig. 1. Prospecting forecasts along the Clay Fault in the Příbram Ore Field. *a* — Proterozoic; *b* — Cambrian; *c* — granitoids; *d* — quartz-diorite of Bohutín; *e* — diabase dykes; *f* — the Clay Fault; *g* — axial plane of the Příbram Syncline; *h* — strike and dip of beds; *i* — areas of ore veins accumulations sofar known; *j* — areas recommended for prospecting for hidden ore veins

After J. Kutina and A. Tělučil (1966).