SHERLOVA GORA: A DEPOSIT FOR GEMSTONES AND RARE METALS

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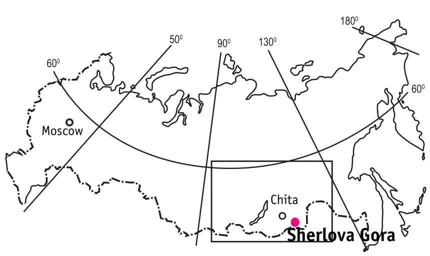
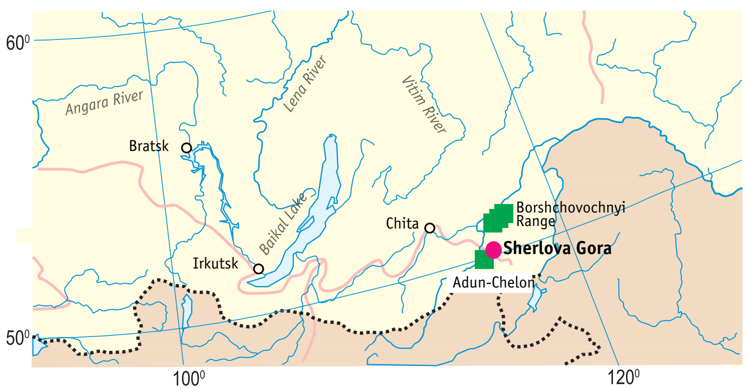
Sherlova Gora is situated in Transbaikal (southeast of the Baikal Lake region), on the northeastern spur of the Adun-Chelon ridge. Its slopes, which are nearly devoid of forestation, face south and southeast and are indented with temporary streams and pitted by contemporary mining. The slopes are clearly visible when approaching the site by car. They stand out from afar as a green carpet of grasses and shrubs emerging in hot summers on the seasonally drying stream beds. The hills constituting Sherlova Gora make up a semi-circle, highlighting a caldera fragment of the Jurassic palaeovolcano.

Sherlova (Sherlovaya) Gora[2] has been known in Russia and abroad since the second quarter of the 18th century as a unique natural resort containing gemstones and collectable minerals, whose samples constitute important collections around the world. Since 1930, it has been classified as a large tin, lead, zinc, indium and cadmium deposit. In the 1950–1970s, the Sherlova Gora magmatic ore system had come under great attention from mining geologists, petrologists, geochemists and mineralogists.

Four deposits are combined here, situated across the territory of a mere 6.6 km^2. One of them is Sherlova Gora itself with its gemstones, wolframite, cassiterite, bismuth and bismuthinite; the second one, the Aplitovyiy spur, which changes to quartz-tourmaline to cassiterite-tourmaline ores, is adjacent from the east; the third is Bolshaya Hill - a large semi-mined out polymetallic deposit; and the fourth is the so-called Vostochnaya (Eastern) anomaly, an explored but untouched low grade polymetallic deposit in the extreme northeast.





1. Sherlova Gora settings.

[1] – Also referred to in literature as Adun-Cholon and Adun-Chilon (*Editor Notes*).
[2] – In the literature one can often find Sherlovaya Gora (*Editor Notes*).

2. View from Obvinskaya Hill.
In front – works on Novikova vein.
Left on the back – dumps of Sherlova Gora GOK Tin open pit,
right – Sherlovaya Gora and Vershinka settlements. Photo: G.A. Yurgenson.

Another highlight of the Sherlova Gora cluster are the modern mineralization zones, formed due to temporary water leakage from waste dumps, low grade dumps, and the pit walls. The formation of multi-coloured crusts of sulphates, copper carbonate, iron, cobalt and magnesium can be observed here. They occur as a result of water evaporation during hot weather and disappear during and after rain. These ephemeral salts are short lived, but in their brief period of existence they can be studied for mineral formation in a natural man-made laboratory. The hills and their spurs are of particular interest during May and June when they are covered by a shroud of motley steppe grass, with inclusions of red and yellow lilies, lilac heads of wild onion and garlic, urgul (Transbaikal snowdrops), clusters of light-blue and light-pink forget-me-nots, tender fleecy edelweiss, referred to locally as “cat’s paws,” and circular conglomerations of iris blossoms. Sherlova Gora has attracted gemstone and mineral amateurs from all over Russia and abroad for almost three hundred years. As with many gemstone deposits, its fate is full of ups and downs. Its history of exploration is far from completion. Not only has its history not been recorded yet, it has not even been properly broadly outlined.

In this work, the authors are touching upon the southwestern part of Sherlova Gora, where the specific greisens and related gemstone deposits are developed.

3. Flowers of Sherlova Gora:
(a) Leontopodium ochroleucum subsp.;
(b) Iris uniflora Pallas ex Link.
(c) Androsace incana Lam.
(d) Lespedeca juncea (L. fil.) Pers.
Photo: G.A. Yurgenson.

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4. **Topaz** cluster. 12 x 9 cm. Novikov vein.
Specimen: I.V. Pekov, #10430.
Photo: D.V. Petrukhin.
5. **Topaz**. 4 x 2 x 1.5 cm. Novikov vein.
Specimen: A.V. Kasatkin, #504T.
Photo: M.B. Leybov.

6. **Beryl** (heliodor) crystals with **siderophyllite** in oxidized siderite. 9 x 9 cm. Mining Museum of St.-Petersburg State Mining University #826/394, A.K. Boldyrev, 1937.
Photo: M.B. Leybov.

7. **Beryl**. 23 x 4 x 4 cm. Novaya vein.
Specimen: A.V. Kasatkin, #618B.
Photo: M.B. Leybov.

8. **Beryl** with zoned colour. 11 cm.
Specimen: Jesse Fisher and Joan Kureczka, # B004. It was once owned by John Sinkankas and is pictured in his book "*Emeralds and Other Beryls*".
Photo: Jesse Fisher.

9. **Beryl**. 12 x 4 cm.
Fersman Mineralogical Museum RAS #54829. Photo: M.B. Leybov.

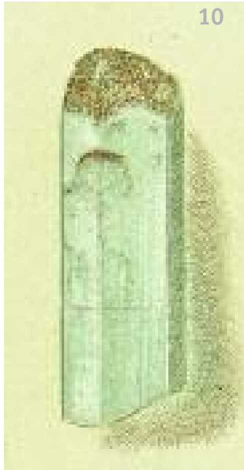
History of Studies

In the literature one can find that gemstones in the southwestern slope of Sherlova Gora were first discovered by Ivan Gurkov from Nerchinsk, but it has most likely been known to the local population much earlier. This assumption is premised by the well dissected relief and deforestation of the Sherlova Gora slope: its entire territory is characterised by surface exposure of the granites disrupted by physical erosion. These are rich in quartz, beryl and topaz. The local population of Buryats must have visited this four peaked hill, which is easily visible from all sides. They could not have avoided noticing the gemstone crystals sparkling in the sunlight. It is not by chance that the entire territory of Sherlova Gora used to bear the Mongolian name of Adun-Chelon, meaning '*stone herd*.' The use of the name 'Sherlova Gora' (or 'Shyrlova Gora' to be exact) for the northeastern part of the mountain massif and ridge was officially proclaimed by the Russian Empress Catherine II, in the second half of the 18th century as a result of the local discovery of a rich elongated schorl crystal deposit that she owned. Peter Simon Pallas' notes are an indirect indication of the Buryat people awareness of these crystals. He wrote that the local people collected the crystals for children's toys and had acquired them in such quantity that he could not find himself (Pallas, 1788, p.314). He assumed that these crystals were tourmaline, or "Brazilian emerald," as it was then called. As much as they could be similar to Brazilian emerald, they showed no electric polarity no matter how many experiments they were exposed to. In guessing that they were tourmaline, Pallas intended to electrify them by friction. But having not achieved the desirable result, he concluded them to be beryl instead.

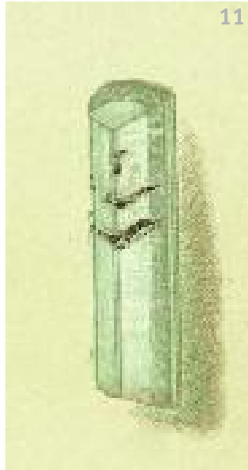
The shallow ancient pits and cuts identified by pioneer researchers of Sherlova Gora are a direct indication of exploration in ancient times. Mining was carried out in a primitive way. Water and fire were used in order to break up the rocks. The crystals would crack too. Their fragments can be found near the old pits to this day. According to A.E. Fersman even the most basic and surface exploration yielded rich discoveries in many cases (Fersman, 1962, 450).

The official history of the Sherlova Gora gemstone deposit commences with a report by Ivan Gurkov, a voluntary worker from the Nerchinsk mining area. Originally from Irkutsk, he was the first to report finding gemstones here, presumably in deluvium. Having no data regarding the time of the first aquamarine crystal discoveries, Alexander Kulibin assumed that it happened in 1723. He wrote that the famous Adun-Chelon (now Sherlova Gora) gemstone deposit must have been discovered in 1723 by Gurkov, a Nerchinsk area local, based on the five roubles reportedly awarded to him for this discovery by the Berg-Kollegium state order, dated to the December, 22nd 1724 (Kulibin, 1829, p.6). In 2000, following the request of the Chita Region State Archive (GAChO), new information regarding the deposit's discovery and early stages of its gemstone exploration was found by PhD candidate Anna Goryachkina (Yurgenson, Goryachkina, 2003). It was then revealed that Ivan Gurkov gave a report in 1724 (presumably in the winter) to Commander Timofey Burtsev, then the director of the Nerchinsk silver smelting manufacture. The gemstones he discovered were attached (GAChO, fund 31, inventory #1, case #24, sheet 151). With the assumption that a reliable correspondence with the capital was facilitated by winter ice on Lake Baikal and the great Siberian Yenisei and Ob' Rivers and their tributaries, the report together with the gemstones must have reached St. Petersburg by the spring of the same year, either via post or the so called "silver caravan." It can be established that the renowned December 22nd 1724 decision of the Berg-Kollegium (Kulibin, 1829) to award Gurkov was put forward following the expert faceting of the gemstones by Ivan Ivanov, whose work was delivered to St. Petersburg by T. Burtsev. Having faceted the gemstones, Ivanov reported them to be suitable. It was only afterwards that the Berg-Kollegium ordered to give five roubles to Gurkov for reporting the finds and for further encouragement (GAChO, f. 31, case #24, sheet # 148). The order reached Nerchinsk only in October of 1725. The document reveals the name of the faceting expert, who paved the way for Sherlova Gora gemstones. The same order called for exploration of not only aquamarine and topaz, but also of ruby. The Berg-Kollegium did not just provide an order to search for gemstones. Specimens of carnelian, oriental crystal (presumably smoky quartz), topaz, hyacinth and jasper were sent along with the order to organize a search for these gemstones. An unknown author of archival material informed in support of this of the 14th of April 1726 order regarding the search and delivery of these gemstones from Major-General Gennin to Yekaterinburg. Gurkov and his workers were sent out to the site to carry out exploration.

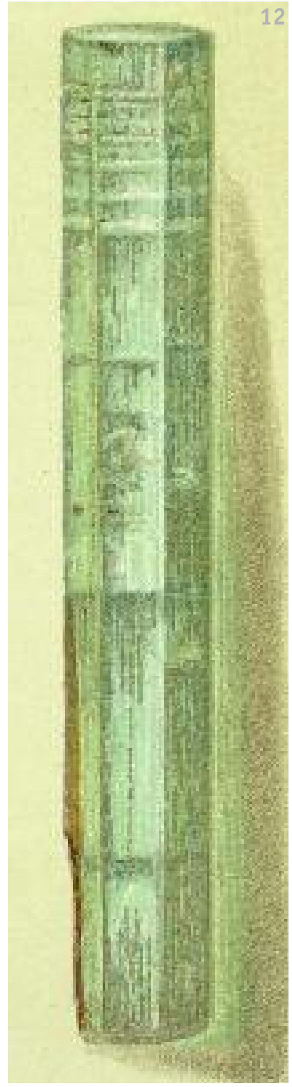
10. **Beryl**, var. aquamarine.
"Greenish blue glossy prism with terminations as if etched."
Nerchinsk, Transbaikalia. *Table 44. Beryl, #8.*



11. **Beryl**, var. aquamarine,
"greenish blue coloured, transparent. First order prism with second order pyramid and pinacoid. Prism with strippings. "
Adun-Chilon Range, Nerchinsk mining area, Transbaikalia.
Table 44. Beryl, #9.



12. **Beryl**, var. aquamarine.
"Prism is dull, pinacoid is lustrous."
Adun-Chilon Range, Nerchinsk, Transbaikalia.
Table 44. Beryl, #14.



All specimens on this page are obviously from Sherlova Gora, Adun-Chelon Ridge, Eastern Transbaikalia, Russia. Localities and descriptions are given here after Browns.

13. **Beryl** *"blue, cylindric."* Adun-Chilon Range, Transbaikalia. *Table 44. Beryl, #11.*

14. **Topaz**,
"cluster of white, cloudy topaz crystals, with brown quartz and beryl covered with a crust."
Adun-Chilon Range, Nerchinsk, Transbaikalia.
Table 46. Topaz, #11.

From Russian edition of *The Mineral Kingdom: Descriptions of major minerals, their localities, and industrial significance. Precious stones* by R. Browns.
translation from German by W.N. Lemann;
with extension about Russia by A.P. Nechaev, P.P. Sushchinskiy.
Editor A.A. Inostrantsev.
St-Petersburg, A.F. Devrien publishing House, 1906, 507 p. (in Russian).

their fragments were up to 2 cm thick and up to 12 cm long. Faultless areas reached up to 6 x 10 x 15 mm. The crystals are zonal, with their colour ranging from blue-green at the base to olive and yellow-green at the termination.

From 1996, authorized gemstone and mineral specimen mining is no longer carried out at Sherlova Gora. Nevertheless, the local people continuously collect gemstones from the surface in the soil and sub-soil strata, extract them from the placers, and develop the already known and new productive veins by open and subterranean methods.

Now Sherlova Gora is a site licensed for the gemstones. This provides hope for a scientifically based systematic exploration of the deposit. Being a unique site, it urgently requires demarcation of the areas to be granted the status of special protection.

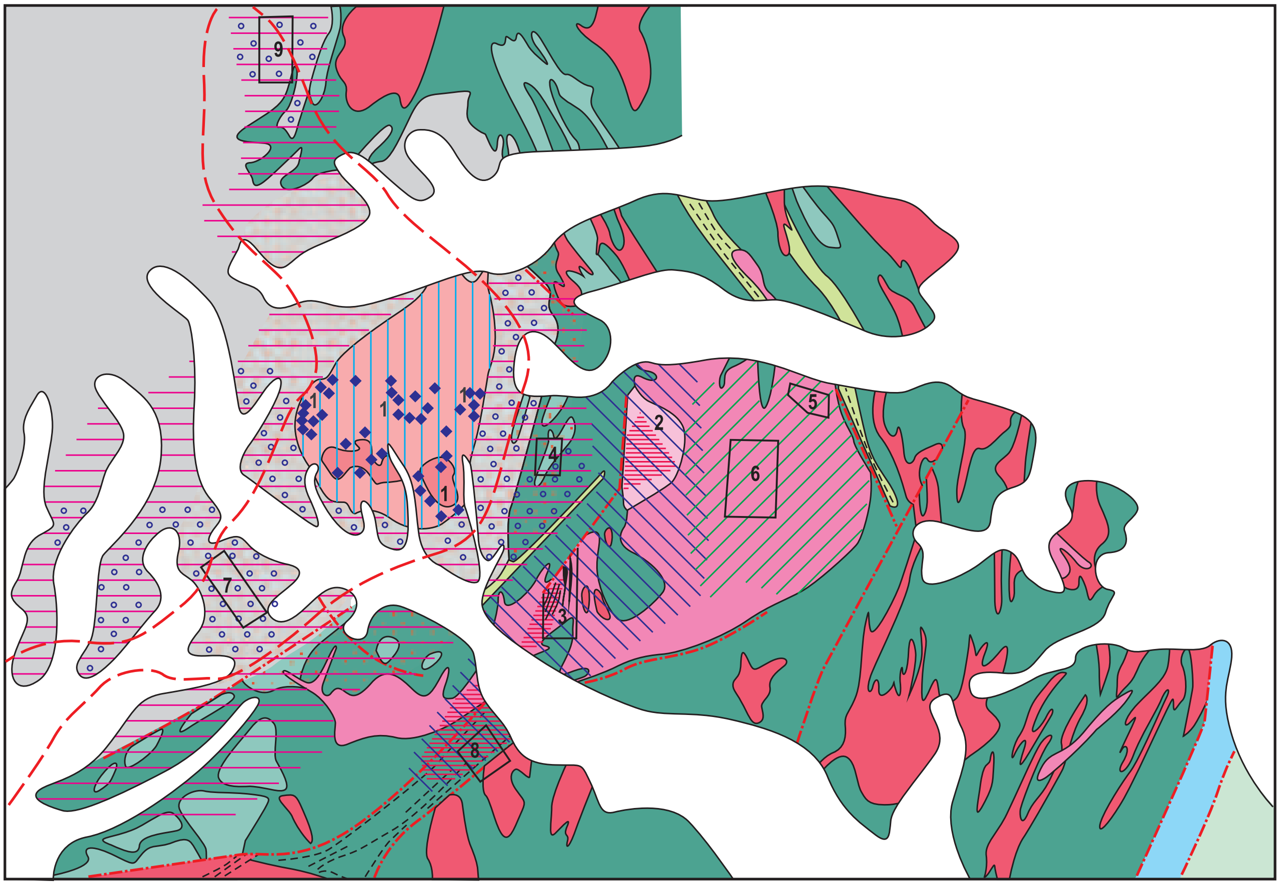
Geology

Before 1915, Sherlova Gora was known only as an economic deposit of gems: beryl, topaz, and to some extent gem-quality quartz. Therefore all researchers considered it a greisen. They focused on the geological structure of the Sherlova Gora granite pluton containing greisen and quartz bodies with prospects of gem mineralization; the study of their distribution and mineralogy was the major target. P.P. Sushchinskiy, who made one of the first geological maps (see *Figure* 29) of the Sherlova Gora granite pluton. After the study by Nenadkevich started in 1914 (Nenadkevich, 1922), the deposit was considered a bismuth deposit, and in 1915 it became as a source of tin. Here, tungsten was produced in Russia for the first time. The deposit was considered as a greisen by 1930, when N.V. Ionin revealed geochemical anomaly of Sn, As, Pb, Zn, W, Bi, and Be as a result from the first geochemical prospecting whose principles were developed in the Soviet Union in the late 1920^{th} to early 1930^{th}. In the summer of 1930 he found economic tin ores in quartz porphyries from prospecting pits on a talus tin placer. In 1931, the exploration of the deposit started and in 1932 it was operating. A large- scale tin mineralization was identified. It appeared this is a specific ore-magmatic system comprising a group of deposits, one of which is a large ore body of sulfide-cassiterite-silicate association identified by S.S. Smirnov at the Khapcharanga tin-polymetal deposit in the Transbaikal region.

Aristov *et al.* (1960), Belov and Gushchin (1955, 1958, 1967), Bibikov *et al.* (1974–1978), Kulagashev *et al.* (1968, 1974), Artamonova *et al.* (1976), Nikolaenko *et al.* (1977), Mukhametshin *et al.* (1979), and Gaivoronskiy (1995) studied the geological structure of the deposit.

According to recent concept, the deposits, which are spatially and genetically related to the Sherlova Gora ore-magmatic system, are located at the junction of the margin of the Aga solid block composed of a volcanosedimentary-metamorphic complex and Mesozoic sediments of the Kharanor depression (Ontoev, 1974; Gaivoronskiy, 1995) (*Figure* 53, 54). The Sherlova Gora granite pluton that is the basis of the ore-magmatic system of the same name is located at the boundary of the Aga structural zone and Argun Massif; this boundary is controlled by the Sherlova Gora fault. The host lithologies are

51. View to the main localities from the Vysokaya Hill (*from left to right:* Karamyshevskiy spur, spur of the Melekhinskaya Hill, Obvinskaya and Lukavaya hils). Photo: G.A. Yurgenson, 2013.



53. Geological scheme of the Sherlova Gora ore field *(after Gushchin, 1967 and Ontoev, 1974 with authors' specification)*.

- Quarternary;
- Lower Cretaceous, Turga Formation sandstone, mudstone, and conglomerate;
- Upper Jurassic conglomerate, tuff conglomerate and tuff breccia intercalated with mudstone and sandstone;
- Lower Carboniferous shale and sandstone sequence intercalated with volcanic rocks and less frequent Tournaisian-Vise fossils;
- zone of contact metamorphism;
- Mesozoic porphyry granite and porphyritic granite;
- equigranular medium-grained granite;
- Mesozoic eruption breccia of second-phase quartz porphyry;
- subvolcanic first-phase quartz porphyry;
- Paleozoic porphyry diorite and porphyries, less frequent porphyry gabbro-diorite, gabbro-diorite, and diorite;
- Paleozoic flow porphyries, their tuff and tuff breccia;
- serpentinite after ultramafic rocks;
- Paleozoic plagiogranite and granite;
- faults: (a) revealed, (b) presumable;
- shear zone;
- geological boundaries,
- presumable underground continuation of the Sherlova Gora granite pluton;
- greisen bodies;
- greisenized zones within country rocks;
- Sn-bearing quartz-tourmaline veins;
- tourmaline zones;
- ore areas and its numbers *(1) Sherlova Gora greisen wolframite, (2) Bolshaya Hill, (3) Quartz-Tourmaline spur, (4) Aplite spur, (5) Northeastern, (6) Vostochnaya, (7) Upper Zavodskaya fold, (8) Vysokaya, (9) Taryatui;*

Mineralized zones:

- greisen wolframite within granite,
- quartz-feldspar-wolframite-cassiterite,
- tourmaline-sulfide-cassiterite,
- sphalerite-galena with poor sulfide-cassiterite mineralization.

Minerals of Sherlova Gora

Nearly 200 mineral species representing almost all classes of the mineral kingdom were found in rocks and ores of Sherlova Gora during the 300 years of its study. Many minerals from Russia were found here for the first time. We tried to review the literature and original data for the most important minerals and focused on the most interesting hypogenic minerals.

Native elements

Silver. Archival data of the 18th century reported silver in the ores of the Sherlova Gora deposit. It was found in the Pb-Zn ores at the Bolshaya Hill when examining the oxidation zone of these ores opened in an adit. Hermann (1801) mentioned native silver for the first time. Dolomanova (1963) and Ontoev (1974) reported this mineral in their reviews. Native silver is associated with galena, tetrahedrite/tennantite, and iodargyrite. Its tiny impregnation was found in arsenopyrite and galena. Dolomanova (1963) indicated that silver frequently fills fractures in sulfides, impregnates rocks hosting sulfide ores, and occurs in the oxidation zone, where it results from "*...replacement of galena with cerussite and anglesite."*

Gold was occasionally observed in the heavy fraction of samples from greisen of the Podnebesnykh location, were late sulfide mineralization is abundant. It occurs as irregular-shaped grains up to 0.1 mm in association with arsenopyrite. In addition, Sushchinskiy (1925) wrote that K.A. Nendkevich found gold "*... in Specimens from Sherlova Gora, which was brought by mining engineer S.D. Kusznetsov*." Dolomanova *et al.* (1962) observed inclusions of native bismuth and gold in the specimen with crystals of bismuthinite from the collection of K.A. Nenadkevich in the Mineralogical Museum of Academy of Sciences of the USSR that Dolomanova received for investigation and in which the new mineral zavaritskite was discovered. According to Dolomanova (1963), M.B. Chistyakova found gold as occasional inclusions "*... in arsenopyrite from orebodies hosted in granite pluton*."

Bismuth was described for the first time in detail by Nenadkevich (1922). It is a minor mineral of ores from quartz-muscovite-topaz greisen bodies within the Sherlova Gora granite pluton (*Figures* 71–73). It is developed to a lesser extent in quartz-siderophyllite and axinite-actinolite assemblages of the cassiterite-silicate stage. Sushchinskiy (1925) mentioned native bismuth in mine no. 6 Zolotoi Cape, where its white crystals up to 1 cm across "*with typical rhombohedral cleavage*" were produced. Ontoev (1974) reported native bismuth in a sphalerite-arsenopyrite assemblage, where this mineral occurs as fine impregnations in löllingite, arsenopyrite, and pyrrhotite. Barabanov (1959) revealed its inclu-

71. **Bismuth**. 3.5 x 2 cm.
Chernyshov Central Scientific Research Geological Survey Museum (TsNIGR Museum) #16/1549, I.I. Chupilin.
Photo: M.B. Leybov.

72. **Bismuth** in **wolframite** with **monazite-(Ce)**. 4 x 3 cm. Fersman Mineralogical Museum RAS#4188. Photo: M.B. Leybov.

73. **Bismuth** with **bismuthinite** and **arsenopyrite**. 5 x 4 cm. Chernyshov Central Scientific Research Geological Survey Museum (TsNIGR Museum) #/4214, N.V. Nikiforova. Photo: M.B. Leybov.

sions in topaz. Dolomanova (1963) wrote that "*insignificant amount of bismuth occurs in all orebodies. According to P.T. Belov, its largest segregations up to 5 cm were found in arsenopyrite vein cutting greisen (after granite).*" This indication was probably in the veins of the Podnebesnykh location.

Sulfides and arsenides

Molybdenite (MoS_2) is mainly developed at the Podnebesnykh location, or in mine no. 15, according to P.P. Sushchinskiy. It occurs in gray quartz of quartz greisen (*Figures* 74, 75) and is associated with beryl, most frequently with aquamarine. Sushchinskiy (1925) wrote "*Vein with molybdenite outcropped in the northern part of working on not mined "column" and close to it reaches 1 m in thickness and contains significant amount of molybdenite phenocrysts, which could provide good museum specimens.*" Some of them are retained in the collection of the Fersman Mineralogical Museum, Russian Academy of Sciences. In 1954, O.V. Kononov and M.B. Chistyakova found a quartz column 1.5 m high with rosettes of hexagonal lamellae of molybdenite up to

74. **Molybdenite**. 14 x 10 cm. Fersman Mineralogical Museum RAS#60951. Photo: M.B. Leybov.

75. Split **molybdenite** crystal. 8 x 7.5 cm. Mineralogical Museum, Department of Mineralogy of St. Petersburg State University #89/19051. Photo: D.V. Dolivo-Dobrovolsky.

112. **Mimetite** prismatic crystal (0.5 x 3.6 cm) on matrix. Tin open pit.
Specimen and photo: G.A. Yurgenson.

thickness of 6–8 mm. The colour varies from pale yellow (nearly colourless individuals are found) to yellow, yellow-green, and dirty yellow. Fine crystals are transparent; relatively large crystals are semitransparent or opaque. The luster is strong, close to adamantine, but dull crystals of a light yellow variety are identified. Mimetite occurs as both isolated crystals and clusters of randomly oriented crystal; sometimes it forms radial and other aggregates (*Figure* 112). The chemical composition of mimetite from Sherlova Gora corresponds to the theoretical formula.

Adamite ($Zn(AsO_4)(OH)$) was found by R.A. Filenko in 2011 in recent assemblages formed after Cu- and Zn-bearing oxidized ores in an open pit. It occurs as green spherulitic aggregates up to 1 mm in size (*Figure* 113). The unit cell dimensions of this mineral are: a = 8.409(2), b = 8.508(2), c = 6.036(1) Å, V = 431.8(3) $Å^3$.

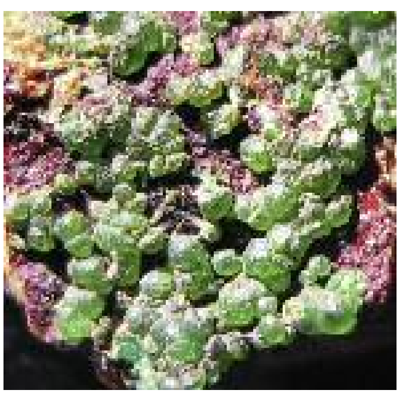
Atelestite $Bi_8(AsO_4)_3O(OH)_5$ was found by O.V. Kononov within cavities in association with scorodite in the oxidation zone of arsenopyrite veins at the Podnebesnykh location. The luster is adamantine; and the colour is yellow-green and grayish green.

Silicates

Topaz ($Al_2SiO_4F_2$) is one of the most abundant minerals of Sherlova Gora. It occurs as monomineralic granular aggregates or druses, and clusters with crystals of smoky quartz and coloured beryl in quartz-topaz, quartz-topaz-siderophyllite, and topaz greisens, and crustification veins throughout mines at the Zolotoi spur, the Podnebesnykh location, Lukavaya, Obvinskaya, and Melekhinskaya hills, the Karamyshevskiy spur, and the Pyatisotka location.

The largest batches of topaz crystals and druses were produced in 1770–1790 and were available to the Cabinet of the Russian Imperial Courtyard. Gem-quality crystals of topaz were sent to the Peterhoff and Yekaterinburg lapidary manufactories. Collection specimens, large and perfect crystals and spectacular druses occasionally with crystals of beryl and morion, traveled quickly to museums and private collections in both Russia and abroad.

113. **Adamine**.
Image size is 1.5 x 1.5 cm.
Specimen and photo: R.A. Filenko.



According to A.E. Fersman, V.M. Severgin, who described topaz crystals and gave their aquarel pictures from one of these collections in his monograph "*First Principles of Mineralogy*" (1796).

Anastasenko (2001) briefly described the specimens of the Sherlova Gora topaz from the collections of archbishop Nil, and mineralogist M.V. Erofeev had them in the Mineralogical Museum of the Department of Mineralogy, St. Petersburg State University. Transparent large crystals of light blue topaz with white tips from the collection of Eremeev are particularly impressive.

According to Fersman (1925), many crystals of topaz and other minerals from Sherlova Gora were in the collection of P.A. Kochubei. Topaz is present as isolated crystals, clusters with crystals of aquamarine and morion, and spec-

119. Crust of **topaz** crystals on **beryl** crystal, a “mineralogical plummet”.
10 x 3.5 cm. Novikov vein.
Specimen: I.V. Pekov, #10165.
Photo: A.B. Suvorov.

121. **Topaz**. 6 x 3.8 x 2.8 cm.
Mineralogical Museum, Department of Mineralogy of St. Petersburg State University #26/3365.
Photo: G.V. Barkhudarova.

120. **Topaz** crystals on quartz. 8 cm.
Specimen: O.S. Bartenev.
Photo: B.Z. Kantor.

122. **Topaz** crystals on **quartz**. 6 x 7.5 cm.
Mineralogical Museum, Department of Mineralogy of St. Petersburg State University #17/3356. Photo: M.B. Leybov.

129. Cluster of **topaz** crystals.
7 x 3 x 3 cm.
Lukavaya Hill.
Specimen: A.V. Kasatkin, #435T.
Photo: M.B. Leybov.

eral is white and nearly opaque, less frequently colourless transparent. It is associated with smoky quartz, golden brown biotite, chlorite, fluorite, hydromicas, rare gahnite, corundum, and sulfides.

Beryl ($Be_3Al_2Si_6O_{18}$). Aquamarine and heliodor, gem varieties of beryl, have brought glory to Sherlova Gora. Beryl is one of the most abundant minerals of crustification veins. It is the most studied mineral at the deposit. Patrin (1791) briefly described the Sherlova Gora aquamarine and heliodor for the first time. At the turn of the 18–19th centuries, these specimens were well known to jewelers and were presented in the mineralogical museums of Russia and other countries. The Sherlova Gora collections were regularly added to in the 19–20th centuries. Large crystals of aquamarine and heliodor are exhibited in the Fersman Mineralogical Museum, the Russian Academy of Sciences, the Mineralogical Museum of St. Petersburg Mining University, and the Mineralogical Museum of the Department of Mineralogy, St. Petersburg State University.

Severgin in 1798 published a detailed description of the beryl. Later, Koksharov (Kokscharow, 1853; Kokscharow, 1856) measured crystals of Sherlova Gora

130. **Beryl** (heliodor) crystals.
6 x 0.8 cm, 4.5 x 2 cm, 3 x 1 cm, 4 x 1.5 cm.
Specimens: A.A. Kuznetsov.
Photo: M.B. Leybov.

131. **Beryl** (aquamarine) crystal. 6 x 1.5 cm.
Fersman Mineralogical Museum RAS #53910.
Photo: M.B. Leybov.

132. **Beryl** (aquamarine) crystal. 8.5 cm.
Specimen: G.A. Yurgenson.
Photo: B.Z. Kantor.

171. **Beryl** crystal on rusty **calcite**.
5.3 cm.
Specimen: Gail and Jim Spann.
Photo: Tom Spann.