MINERALS–GIANTS OF THE SOUTHERN URALS

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Mineralogy of the South Urals has different variations. The set of deposits, which has been and is being mined for minerals in addition to the useful component do also often contain unique minerals, sometimes in the form of giant properly shaped crystals. The article presents information on the findings of such giants, according to the literature, on personal observations and on the oral reports of geologists.
6 figures, 10 references.
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The stone nature of Earth is generous and diverse. In it's marvelous works, it is attractive with imagination, originality and exclusivity of creations. The same mineral may have been born in different parts of the world and may look like a twin or may look fabulously dissimilar. There is no person who has never admired these masterpieces — crystals! As he admires the sunset and sea wave, or a heap of stone mountains.

Crystals have surprised human intellect at the dawn of the emergence with it's perfection and completeness of forms. Special rarity passed from person to person, from generation to generation for hundreds of years. The evidence for this are the legends about giant precious rubies and diamonds.

There are cyclops and giants in the world of mineral monsters. Not every corner of the earth has given birth to its bosom these rarities. In the South Urals so many unique crystals were found that was enough for a large narrative. Giant crystals were observed by researchers, mineralogists, geologists. Often, these creatures of nature long maintained, but more often simply destroyed during production or used as a raw material. Rare findings settled in museum collections.

Interestingly, the phrase "crystal giant" for different minerals characterizes completely different in size crystals. For example, even a meter long quartz crystal (morion) from the Urals is not a giant compare to quartz veins of Kazakhstan or Ukraine, where in pegmatites much more substantial in size individuals were mined. And at the same time, transparent quartz crystals "Diamonds" (Herkimer "Diamonds" or the South Urals Ust Katavsk "diamonds") are considered as giant with crystal size of only 3—5 cm! In this article there more than two dozen South Ural minerals noted, crystals which have outstanding size.

Perovskite. This mineral several times pleased Urals with its "appearance in the world". First found in the mines of the Zlatoust, Urals, he remained a "native" residents of those places. Until now, the best and large crystals of this mineral occur at perovskite mines of Chernorechenskie Mountains. The largest crystals are considered to be samples of M.P. Melnikov in 1882. It was a crystal-individuals with an edge length of 12 cm. Nowadays there are perovskites up to 5—6 cm in size. A rare lump has sometimes up to 30—40 perovskite crystals of up to 4 cm each!

Zircon. Large zircon crystals were found in the Ilmeny Mountains. One of them is a sample found in 1837: *"... in this pit [kop' number 12 — hereinafter in brackets annotations made by author] found the most enormous zircon in the Ilmeny mines, weighing 8 pounds 61 spool. It consists of several fused in a parallel position indivisible"* (Melnikov, 1883). It is extended to 22 cm splice of several individuals weighing about 3.5 kg. In the pit of academician Koksharov No. 20 *"zircons crystals differentiate — up to 1.5 inches long (6.5 cm) and met very often."* Crystals of a "fist" size caught in the Ilmeny Mountains repeatedly in syenite-pegmatite veins. Also, A.E. Fersman noted that G.G. Kitaev has presented him a similar sample (Balandin, 1982). Zircon crystal (8×6 cm) from the vicinity of Selyankino village exhibited at the exposition of Natural History Museum of the Ilmeny State Reserve.

Giant zircon crystals are constantly mined in Vishnevogorsk on the Mountain Karavay. In nepheline pegmatites of "Vein No. 5" proper shaped zircon crystals can reach sizes up to 10 cm and weight of 2—2.5 kg, crystals weighing 1 kg are no rarity. There were rumors that at the mine "Central" of Vishnevogorsk niobium deposits was found a crystal weighing 17 kg!

Microcline. This mineral goes alone with granitic pegmatites. Reliable data on crystals-giants are on topaz pit "Polyakov" on the

Fig. 1. Microcline crystals. Length of the longest is 0.75 m. Eremkinskaya pegmatite vein, the South Urals. Photo: S. Kolisnichenko.
Fig. 2. Morion. Crystal weight is 100 kg. Svetlinskiy pegmatite quarry, South Urals. Photo: V. Musatov.

shores of Lake Argazi in the Ilmeny Mountains and on Svetlinskiy pegmatite quarry. There were met crystals with length of about 50 cm. In 2008 pegmatite vein at the former steading Eremkin (Kochkarskiy district) was discovered area with crystal size of 60×75 cm! (Fig. 1)

Amazonite. The large-sized crystals were observed in the pits of Ilmeny Mountains. On Lobachevskaya pit No. 85 *"... Amazon stone was more than $^1/_4$ yard and actually because of this, topaz crystals reached to one pound weight"*. On pit No. 82, *"the value of the pieces of the Amazon stone reached $^1/_2$ yard..."* (Melnikov, 1883). Amazonite crystals up to 30 cm were found in the pit No. 395.

Rock crystal. South Urals is characterized by particularly large size of quartz crystals. In 1967 at Svetlinskoye deposit of piezoelectric quartz at a depth of 13 meters has been discovered a crystal cellar with crystals in the vein No. 500. Two of those rock crystal from this nest weighed three tons each! They were shaped as short-prism, with developed rhombohedrons faces. The crystalls were called "Jubilee-1" and "Jubilee-2". By processing of one of them was produced 92 kg piezoelectric materials. The other crystal is kept at the entrance to the Museum "Gems" ("Samotsvety") in Moscow. On Astafyevskoye deposit large crystals reach a length of up to one meter with weight of 300 kg. There was mined a unique one — piezocrystal of 100 kg! Terensayskoye deposit of piezoquartz (Orenburg region) also excelled by giants. There was found the largest crystal cellar of Urals with capacity of 176 m^3. The largest crystals, extracted from this cellar, weighed from 350 to 750 kg. There was the famous crystal "Baby" ("Malyutka") among them, weighing 784 kg, which is stored in the Geological Museum of Ekaterinburg.

Morion. Large crystals of morion are typical for Svetlinskiy pegmatite quarry (Kochkarskiy district). Larinskaya Geological Reconnaissance Expedition worked there and removed from the cavities crystals weighing over a hundred kilograms. Usually it would be isometric crystals (with short prisms and developed rhombohedrons facets). In 1998 was mined crystal morion of one meter long and weighing 100 kg. The crystal was shaped as long-prism, obelisk form (Fig. 2). The head part of the crystal was perfectly clean and hardly shone in a bright beam of light.

Apatite. To the north-east of Vishnevye Mountains, in the city of Snezhinsk "Seven Keys" apatite crystal locality is known. Apati-

te crystals found in the peculiar pegmatite consisting of phlogopite, albite and apatite. Apatite appeared around phlogopite to the direction of the contact with the host rock (ultra-basic and serpentinized rocks) almost ideal crystals bottle-green with olive tinge. The largest crystal is considered to be an individual length of about 100 cm with a thickness of 20 cm. Not uncommon are the findings of crystals up to 50 cm.

Polyakovite. In the Ilmeny Mountains, at the pit No. 97 for the first time in the world was discovered and described mineral polyakovite — chrome analogue of chevkinite. In 2007, in the pits in ultra-basic pegmatite vein (richterite-phlogopite composition) were found two polyakovite crystals, which dimensions were 12×8×6 cm. They were the largest crystals in the history of the study of this mineral. Polyakovite was found in the same place in the veins of carbonatite-bearing pegmatites in association with monazite and aeschynite, but here it is only reach 6.5 cm size of the crystals (Fig. 3).

Rutile. Rutile crystals in granulated quartz veins are known to Kyshtym deposit in the vicinity of the village Slyudorudnik. Rutile crystal with length of 23 cm is kept in the Geological Museum of Ekaterinburg. This is one of the well-known large-preserved crystals. There, in the neighborhood of the vein number 126, was found accumulation of rutile crystals weighing about 10 kg, which had the largest individ crystal measuring 18×6×6 cm and found along with it cranked twins — up to 10 cm (found by the author, 1985). From rumors geologists know that there have been cases of rutile crystals finds up to 40 cm.

The longest needle crystals of rutile, representing inclusions in quartz, it is necessary to consider the discovery in 1942 at Svetlinskoye deposit of piezoelectric quartz. Needle length in excess of 40 cm pierce smoky rock crystal (Geological Museum, Ekaterinburg).

Titanite. Sphene (titanite) of South Urals is known from the pits Ilmeny Mountains. Crystals up to 15 cm have been repeatedly found there. Vishnevye Mountains spear-shaped crystal of titanite length of 15 cm were found in nepheline pegmatite vein in Svistunov log (1986). Crystal about 20 cm in size was found in a similar vein of Yushtinsk ridge to the north of the Ilmeny Mountains. White and cream titanites with sizes up to 12×18 cm with a thickness of 1 cm (Fig. 4) are known to Nicolae-Maximilian mine (village Kusinsk Magnitka).

Topaz. The largest crystals of topaz in the South Urals should be considered as samples from the Ilmeny Mountains. Here we describe the crystals of amazonite pegmatites up to 10 pounds (4 kg) weight (Melnikov, 1883). Although it is likely that it was given the weight of all the stones from the same nest. Basically, there were found the individual crystals in 1 pound. The length of the crystals up to 20 cm. Proper blue-greenish crystal weighing 720 g was found in the deposits of the Vostochniy (eastern) log on Svetlinskoye deposit of piezoelectric quartz. The largest pink topaz from the vicinity of river Kamenka has length 5.7 cm and thickness 1.1 cm (Fig. 5).

Beryl. Some large crystals of beryl from pegmatite veins reaching along the axis up to a half of meter long, have been found in the vicinity of the village Annenskiy (Kartalinskiy district). Such fractured crystals were found at opening veins of the pit No. 411 in the Ilmeny Mountains. M.P. Melnikov said that, *"Accordingly Koksharov, 5 pounds crystal stored in the museum of Mining Institute has 25 cm in length and the*

Fig. 3. Polyakovite. Crystal length of 6 cm. Mine number 97, Ilmeny Mountains, South Urals. Photo: A. Titaev.
Fig. 4. Titanite. The size of 8.5 cm. Quarry near village Stroiteley, Ilmeny Mountains, South Urals. Photo: S. Kolisnichenko.

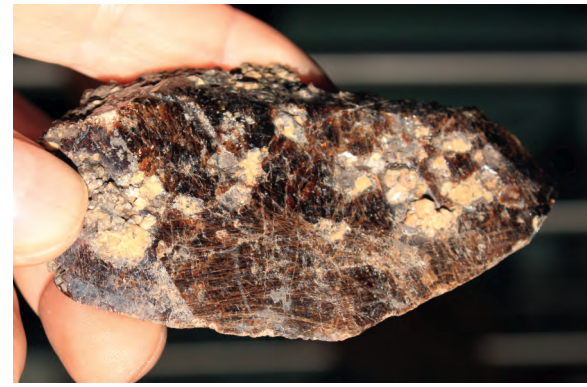

Fig. 5. Topaz, pink. Crystal length 5.7 cm. Pit of pink topaz on the former Proroko-Ilyinskiy mine, South Urals. Photo: S. Kolisnichenko.

Fig. 6. Euclase. Crystal length 7.5 cm. Bakakinskie mines, the South Urals. Specimen: Mining Museum, St.-Petersburg State Mining Institute. Photo: A. Ilyin.

same in circumference, it is bluish-green" (Melnikov, 1983). In 2011, Eremkinskaya pegmatite vein (near Plast) in the quartz core were found proper long-prizm shaped greenish-yellow crystals of beryl length of 0.75 m! The thickness of the crystals was 12–15 cm.

Euclase. The Homeland of Russian euclase is "Russian Brazil", the territory is named by academician N.I. Koksharov in 1858 because of minerals assemblage of gold placers, like the Brazilian ones. Gold placers of rivers Kamenka and Sanarka in the South Urals presented to mineralogy a rare mineral euclase. The secrets of his origin and more associated with this has not yet been disclosed. The largest crystal is about 7 cm long. It was found on Bakakinsk placers by washing the rocks for gold in 1862. This euclase is gem quality, polychrome color and has a regular shape (Fig. 6). Kept in the museum of the Mining Institute in St. Petersburg.

Spinel. The largest sample of spinel in the Urals was discovered in 1882 by M.P. Melnikov at multimineral carbonatite veins in Nicolae-Maximilian mine. It is represented by proper octahedral shape, crystal weight is 21 kg. Crystal was a conjunction with smaller spinel individuals weighing between 2 and 6 kg. These exemplars are stored in the Geological Museum of the University of Kazan.

Corundum. Corundum crystals of up to 0.5 m were found on Sinarskoye deposit. Here corundum-phlogopite pegmatites located in ultrabasic rocks. The shape of crystals is spindle and barrel-like; they are pink, white or blue. Sometimes corundum crystals are zonal – the core is blue and the border is pink. Explorated and studied of this deposit in 1944, geologists noted findings of large crystals up to 50 cm and a thickness of 20 cm (Soshina, 1944). In corundum pit No. 299 was discovered tabular sapphire crystal, 17×15 cm in size (Kolisnichenko, 2006). Barrel-like crystal corundum 2 kg was found in corundum pit, Nicolskaya Mountain (Potaninskie Mountains).

Molybdenite. The crystal of molybdenite with diameter of 47 cm is described in 1957 for one of the pegmatite veins of Berkut ridge, south of the village Slyudorudnik. Fragment is located in the Geological Museum of Ekaterinburg.

Epidote. Home to the giant crystals of epidote in the South Urals is considered Zelentsovskaya pit in the village Magnitka. Known gem crystal length of one meter. Formed in carbonate rocks epidote crystals are well dissected as by the very nature of karst and by human actions in mines. Lovely large crystals of epidote sometimes intergrown with hastingsite were not uncommon.

Large discoid crystals of yttrium-containing epidote ("yttroepidot") are described in the pegmatite veins near village Slyudorudnik. In the halls of ancient tunnels there are still visible greenish-black discoid crystals

with a diameter of 20 to 80 cm and a width of 5 – 10 cm.

Zoisite. The mineral zoisite is distinguished by a significant size of crystals in the veins of granulated quartz at Kyshtym deposit. There, near the village Slyudorudnik, one of the veins contained aggregates and single crystals of zoisite with length 35 cm and thickness of 4 – 5 cm. Color of mineral changed from light green at the base to bluish on the head.

Ilmenite. Crystals of ilmenite are often observed in cavities of alkaline pegmatite veins in the Vishnevye Mountains. One of the veins of Dolgaya Mountain contained about 5 tonnes of ilmenite crystals. The large crystals weighed about 25 – 30 kg. In the Ilmeny Mountains giant ilmenites were extracted from the Mountain Firsovaya and pits No. 154 – 155, the size of the crystals was about 30 – 50 cm, weight was up to 60 kg.

Nepheline. Good crystals of this mineral are rare, though it occurs often in Ilmeny and Vishnevye Mountains. In pegmatites of Kurochkin Log on the old pit "Shpat" nepheline forms meter-sized agregates. There are cavities with imperfect crystals of nepheline located in pegmatites of Dolgaya Mountain. The flattened crystal with size of 16 cm in diameter was found by the author in the nest with ilmenite and lepidomelane in nepheline pegmatite vein, exposed by trenching at the construction site of the Natural History Museum of the Ilmeny State Reserve in 1978.

Biotite (lepidomelane, black mica) is often found in the Ilmeny and Vishnevye Mountains as a large mass. The first mention of the discovery of a giant crystal black mica was made by M.P. Melnikov (1883): in the pit No. 8 in the Ilmeny Mountains *"...during a visit of Duke Maximilian of Leuchtenberg (1842) was extracted crystal 3 poods 33 pounds weight"*. In the pit No. 82 M.P. Melnikov noted *"black mica in the form of six-sided prisms up to 1.5 arshin [3.5 feet] wide"*. Plates of lepidomelane with diameter of more than 0.5 m are found in the work sites of the Vishnevogorsk deposit of pyrochlore.

Helvine. For the first time in the Urals this mineral was discovered in amazonite pegmatite vein of pit No. 63 in the Ilmeny Mountains. P.V. Eremeev in 1868 wrote that *"solid pieces reach the size of a human head and also it ingrowths into graphic (pismenny) granite. From other known deposits of helvine, Ilmeny Mountains mineral differentiate by its non-crystalline form, by being in large quantities and dark red-brown tint"* (Eremeev, 1868).

Fergusonite. In muscovitic pegmatites of Slyudyanogorsk deposit in the vicinity of the village Slyudorudnik there were findings of poorly-formated crystals in dark brown and black, which length was 20 cm (Belkovsky, 2010).

The sunstone and the moonstone (oligoclase or other feldspars). Sunstone occurs in the Ilmeny and Vishnevye Mountains. It is often found in feldspar pegmatite veins, where it forms crystals in large cavities. On Potanin quarry in 2006 the crystal of feldspar with the effect of sunstone has a size 29×13×9 cm and a weight of 5 kg. Crystal of moonstone there was 14×14×10 cm and weighing about 5 kg.

Scheelite. This mineral was actively mined in the South Urals during 30s to 50s of 20th century. Then new deposits of tungsten ores were discovered – Gumbeyskoye and Boevskoye where scheelite was the bulk of the ore. In literature it is mentioned that during the Second World War in 1941 – 1945 on Gumbeyskoye deposit there were rich scheelite veins, where the crystals of the "crystal cellars" acquired a size of 15 cm (*World of Stones*, 2001).

Monazite. The sample called "tabular zircon" was brought by I. Menge from the Razderishin pits in Ilmeny Mountains, the study proved to be monazite. The weight of this crystal was 362.25 g (Popov, Popova, 2006). Later in the Ilmeny Mountains such large monazite was not found again.

Gold. Gold crystals do not exceed a few centimeters. But we can courageously admit the biggest accumulation of this mineral, called prills. So, for Russia the largest prill is considered to be the "Big Triangle" (in the literature of the 19th century – the "World Monster"), weighing 36 kg. It was found in 1842 by Nikifor Syutkin, worker at Tsarevo-Alexander mine on a inflow of the rivers Miass – Tashkutarganka. The second largest nugget of South Urals can be considered "Midhadsky" weighing 1 poods 20 pounds (about 24 kg), which was found in the root of the ore vein near the Balkany village during the second half of the 19th century (Zavaritsky, 1926).

Limonite geode of gigantic size was found in the Bakal mines in the 1937 by famous miner G.G. Kitaev (Pronin, 1985). Its size is 2.5×1.5 m, weight is 9.5 tons! It is now on display in front of the Geological Museum in Ekaterinburg.

Multimineral secretion. Secretions composed by polymineral aggregate are known around village Kizilskoye. In one of the out-

crops of volcanic rocks on the left bank of the River Ural the author has discovered secretion up to 70×50 cm, composed of quartz, chalcedon, zeolite and calcite.

Thus, the South Ural with its wealth of different mineral species is characterized by the presence of large and giant mineral agregates, including the well-faceted crystals, which certainly attract the professional mineralogists and amateur collectors.

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