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PETR A. KOCHUBEI AND HIS MINERAL COLLECTION IN A.E. FERSMAN MiNERALOGICAL MUSEUM

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The article described the history of the unique mineral collection created by the Prince P.A. Kochubei in the nineteenth century.
18 color foto, 36 references.

In the autumn 1913, the «Priroda» magazine published a short information of the bill of purchasing, for the Academy of Sciences, of the Prince Kochubei large collection of minerals to have passed both chambers of the State Duma.

As was denoted in the Museum's account for the year 1913, this event took «an exclusive position not only amidst this year receipts but in the entire two hundred year history of our Museum». As A.E. Fersman wrote, this collection «had accumulated everything of the best given by the Russian nature in the last century« (Priroda, 1913). Due to this valuable acquisition, the Academy's mineralogical collection became one of the best of the European mineralogical museums, and its value increased almost twice (Collection..., 1914).

One of collecting aims may be further scientific study of the collection, in particular, looking for logical appropriateness of collected specimens. The primary selection of specimens for such a collection needs then a profound knowledge of the related branch, broad-mindedness, intuition, and inclination for the scientific analysis. Such an approach was likely inhering in the Prince P.A. Kochubei, a person who contributed much to practical applications of scientific achievements.

Prince Petr Arkad'evich Kochubei (1825—1892), the elder son of Arkadii Vasil'evich Kochubei, the Senator, and Sof'ya Nikolaevna, nee Princess V'yazemskaya[1], great-great-grandchild of the Malorossia (Ukraine) General Judge at the Hetman Mazepa, was known as an active public figure, a prominent Maecenas, a mineral great amateur, connoisseur, and collector.

Having graduated, in 1845, the Mikhailovskoe Artillery School, where mathematics and mechanics were lectured under the guidance of the Academician M.V. Ostrogradskii[2] and chemistry — Academician G.I. Gesse[3], Kochubei continued his education abroad in 1846—47. In Lö ttich[4], he studied military science, investigated percussion caps and cannon moulding. In Paris, he learned chemistry and physics from French professors Plouse, J.-B. Dumas[5], A.-V. Regnault[6]. N.I. Raevskii, his Paris schoolfellow, was later known as a pedagogue-naturalist and the author of numerous geography, zoology, botany, and mineralogy textbooks. While learning, P.A. Kochubei took a great interest in mineralogy. Having returned from abroad, P.A. Kochubei graduated Officer Classes of the Mikhailovskaya Artillery Academy and «passed to the Guards Cavalry Artillery being also attached to the General-Feldzeichmeister Headquarters and appointed as a teacher of chemistry and practical mechanics at the Artillery Academy» (Sreznevskii, 1893). He taught for a while in the Academy but was soon appointed orderly and then aide-de-camp to the Emperor Alexander II. When accomplishing one of Emperor's errands, he «undertook a journey abroad with scientific aim, to familiarize himself with chemical laboratories in Belgium and Germany; after having returned, he published a description of these laboratories with an atlas of drawings»[7] (Khvostov, 1893). This let Kochubei establishing his own chemical laboratory, where he stud-

[1] S.N. Vyazemskaya, the granddaughter of Count Petr Kirillovich Razumovskii, who gave her, as a dowry, several estates including the Zgurovka village that became P.A. Kochubei's family seat (Kochubei A.V., 1890).
[2] Ostrogradskii Mikhail Vasil'evich (1801—1861), known mathematician, Academician in Ordinary (Bol'shoi Russkii..., 2002).
[3] Probably German Ivanovich Gess (Germain Henri, or Hermann Heinrich) (1802—1850), Russian chemist, founder of thermochemistry, Academician of the Petersburg Academy of Sciences (1830). Professor at the Petersburg Mining Institute (1832—1849). Discovered (1840) the Law of constancy of heat sums (the Hess Law). Discovered several new minerals (Bol'shaya Rossiiskaya..., 2001—2002).
[4] Now Liйge, Belgium.
[5] Dumas, Jean—Baptist Andrй (1800—1884), French chemist. In 1835—1840, professor of Йcole Polytechnique, in 1829 —1852 — of the Art and Craft Central School, since 1839 — of the Medical School in Paris. In 1840, established training chemical laboratory, where the teaching was being led on the base of Ju.Liebig ideas. Foreign corresponding member of the Petersburg Acad. Sci. (1845) (Bol'shaya Rossiiskaya..., 2001—2002).
[6] Regnault, Henri-Victor, French physicist and chemist, professor of the Polytechnic school College de France. Foreign corresponding member of the Petersburg Acad. Sci. since 1848 (Brokgauz, Yefron, 2001—2002).
[7] Kochubei, P.A., Opisanie zamechatel'nykh laboratorii Germanii i Bel'gii (A Description of German and Belgian Notable Laboratories), 1854.

ied inorganic and organic matters[8]. Later, he administered his chemical laboratory for studies to the Committee of Public Health and, then, for the work of the Russian Technical Society members.

In the summer 1855, P.A.Kochubei was charged with checking the rumors of grand larcenies of powder and cartridges from the Narva Fortress. He turned to «with the inhering in him energy and devotedness to the call of duty» (Sreznevskii, 1893). After the errand was performed, Kochubei was received by the Emperor Aleksandr II. Kochubei reported the revision results as well as reforms of storing and registering at powder depots. However, no expected actions followed: some military officials were dismissed, and the system remained as formerly (Kochubei, 1890). Kochubei was disappointed very much and, despite of persuasion by his farther and uncle, retired in 1857. P.A.Kochubei settled in his estate Zgurovka[9], Poltava Province, and «devoted himself wholly to his favorite engagements: agriculture, gardening, and forest cultivation»[10] (Sreznevskii, 1893).

Since 1859, P.A.Kochubei became a public figure. First, he attempted, together with N.F. Zdekauer[11] and E.V. Pelikan[12], to establish a society for publishing a journal that would deal with the problems of public hygiene and food quality, for instance, the use of phosphoric matches, arsenic-containing paints, flour with sand admixture, and so on. This entailed establishing a commission chaired by the Home Secretary; however, most of proposals of the establishers were not accepted. These problems were being discussed at the meetings at the Kochubei's home, where many scientists were invited, for example, Academician N.N. Zinin[13], the known chemist.

In the end of 1865, the idea arose among P.A.Kochubei's friends to establish a society which aim would be contribution to development of engineering and industry in Russia. P.A.Kochubei participated actively in organization of the Russian Technical Society created in 1866 and was elected at once the chairman of the first section of chemical works and metallurgy. In 1867, he was elected the Society Assistant Chairman and in 1870 through 1890 — its Chairman. His activities in the Russian Technical Society were perfectly corresponding with Kochubei's interests. The questions were being raised during «technical talks» that always interested him very much: steel, oil processing, cloth dying, photography, sewage disposal in Petersburg, organization of courses and schools for workers, and so on. Due to his efforts, the Russian Technical Society played an active role in development of applied science and technical education. Known scientists worked in the Society: D.I. Mendeleev[14], L.E. Nobel'[15], A.N. Engel'gardt[16], A.V. Gadolin[17], N.A. Iossa[18], and others. P.A.Kochubei supported, both materially and mentally, the Society's many undertakings as if they were his own ones. He «could appreciate initiatives of his co-members whoever they were», «...everyone felt in him not only an ardent and energetic leader with a broad point of view but was imbued with assuredness in success, with his mental influence and ability to arouse energy in others too» (Sreznevskii, 1893). At the same time, P.A. Kochubei himself was often an initiator of investigation. Thanks to him new sections were established as ones of photography and its applications (1878), electrical engineering, aerostation (1880), railway techniques (1881), technical education (1884).

[8] For instance, he was first to conduct chemical analysis of leadhillite from Nerchinsk (Koksharov, 1852—1855).

[9] Now Zgurovka, Kiev oblast'.

[10] The contemporaries marked P.A. Kochubei to «turn the steppe at his Zgurovka estate into forests and picturesque gardens» (Necrology..., 1892).

[11] Zdekauer, Nikolai Fedorovich (1815—1895), known physician, in 1846—1863 professor of Medical Academy. Worked in the branch of public hygiene, contributed much to sanitary improvement of the Capital, was founder and chairman of the Society for public health preservation (Brokgauz, Yefron, 2001—2002).

[12] Pelikan, E.V. (1824—1884), physician, one of initiators of toxicology in Russia, founder of the journal «Arkhiv sudebnoi meditsiny i obshchestvennoi gigieny» (Archive of Forensic Medicine and Public Hygiene), 1865 (Bol'shaya Rossiiskaya..., 2001—2002).

[13] Zinin, Nikolai Nikolaevich (1812—1880), prominent Russian organic chemist, Academician of the Petersburg Academy of Sciences (1865). He synthesized substances that served a base to create industries of synthetic dyes, explosives, pharmaceuticals, etc. (Bol'shaya Rossiiskaya..., 2001—2002, Bol'shoi Russkii..., 2002).

[14] On the RTO errand, D.I. Mendeleev studied elasticity of gases (The Systematic Index..., 1889).

[15] Nobel, Ludwig Emmanuel (1831—1888), enterpriser, lathe constructor. He converted the enterprise founded in Petersburg by his farther, Emmanuel Nobel, into a large machine shop «Ludwig Nobel» (now «Russkii Dizel'»). In 1876, founded, together with his brothers Robert and Alfred, an oil-industry enterprise in Baku (since 1879 — Brothers Nobel Partnership) that became the largest oil firm in Russia (Bol'shaya Rossiiskaya..., 2001—2002).

[16] Engel'gart Aleksandr Nikolaevich (1828—1893), prominent scientist in agricultural chemistry and publicist. In 1866—1870, professor of chemistry at the Petersburg Agricultural Institute. Was arrested in 1870 for spreading democratic ideas amid students and imprisoned in the Petropavlovskaya Krepost'. Kochubei solicited of his release (Sreznevskii, 1893). In the beginning of 1871, was exiled to the Batishchevo village and subjected to police supervision. He created there a model farm using phosphorite meal as fertilizer. Author of a number of works on agriculture (Bol'shaya Rossiiskaya..., 2001—2002).

[17] Gadolin, Aksel' Vil'gel'movich (1828—1892), Russian scientist in artillery, metal machine processing, mineralogy, and crystallography, Full Member of Petersburg Academy of Sciences (1875), deduced 32 groups of crystal macro-symmetry, and proposed a method to represent these groups upon a sphere, which is in use up to the present time. The Petersburg Academy of Sciences awarded him in 1868 the Lomonosov Prize for the «Derivation of All Crystal Systems and Their Subdivisions from a Single Principle» (Bol'shaya Rossiiskaya..., 2001—2002).

[18] Iossa, Nikolai Aleksandrovich (1845—1916(17)), Russian metallurgist. Graduated from the Institute of Corps of Mining Engineers (1865), worked at Ural plants. Since 1871, worked at the Petersburg Mining Institute (professor since 1882). In 1900—1907, Director of the Mining Department. In 1907, Chairman of the Mining Council and Mining Scientific Committee. Since 1920, first chairman of the Russian Metallurgical Society (Bol'shaya Rossiiskaya..., 2001—2002).

Since 1867, the Society's «Memoirs» were being published. During his leadership, the Russian Technical Society organized public lectures and talks to popularize technical knowledge, opened schools at works and factories providing general education, subsidized researches, sent students abroad for education. It organized congresses for technical branches, for example, the congresses of technicians (1875) and of technical and professional education (1889), participated actively in international congresses, meetings, and exhibitions. P.A. Kochubei solicited the Government and private persons[19] for allotting money for the Society's various initiatives, and also invested his own means.

P.A. Kochubei was especially concerned with creating «Technical Museum». The idea of collecting various objects as a reflection of the human civilization history was always appealing to him. He established in 1872—73, together with N.V. Isakov[20], the Museum of Applied Knowledge. Later, he built photographic pavilion and donated there his own camera collection. He donated his own collection of lighting equipment for the historical section of lighting and oil industry, and added some new exhibits. He presented, at the exhibition, «the specimens of luminaires from most ancient and simple to the most elegant works of art» (Sreznevskii, 1893). They called sometimes the P.A. Kochubei's house «home museum». Various collections of «art and scientific rarities» were stored there including famous mineral collection.

The first mineral specimens collected not later than in 40ies of the nineteenth century. They were possibly bought in the August Krantz's mineral shop in Berlin, which the Kochubeis visited on their way to Krimnitz[21]. Later, P.A. Kochubei replenished his collection, purchasing and exchanging specimens. In the nineteenth century, mining in Russia developed rapidly, new deposits were being discovered, and their mining started. Collecting minerals was widely spread amid top aristocracy. There were a lot of known collectors among P.A. Kochubei's friends, including Count L.A. Perovskii[22], Count S.G. Stroganov[23], chemist A.B. Kemmerer, doctor E.I. Raukh, Professor A.I. Shrenk, and others. One of P.A. Kochubei friend was with the Duke N.M. Leuchtenbergskii[24] who used to visit his home and chemical laboratory. The Duke[25] presented one of topaz crystals to him. In 1848 P.A. Kochubei got acquainted with the Academician A.V. Gadolin, who lectured at that time physics in the cadet classes of the Mikhailovskoe School (<biblio>), and, later, probably in 1852—55 — with Academician N.I. Koksharov[26]. They stayed his best friends until the last days of his life[27]. In honor of his friend, Koksharov named the mineral kochubeite[28]. In 80ies, P.A. Kochubei organized «Mineralogical Fridays» at his home, where his friends, Academicians N.I. Koksharov and

[19] P.A. Kochubei, jointly with N.V. Isakov, persuaded Baron A. Shtiglits to donate one million rubles for creation of a school for technical drawing (Necrology..., 1892). Aleksandr Shtiglits allotted 5.5 million rubles (Bol'shaya Rossiiskaya..., 2001—2002).

[20] Isakov, Nikolai Vasil'evich (1821—1891), adjutant General. Graduated from the Academy of General Staff. Participated in Caucasian expeditions (1846—1848), Hungarian campaign (1849), Sevastopol' defense during the Eastern War. In 1859—1963, as warden of Moscow educational district, Isakov opened in the University chairs of world geography and state right of European countries, established pedagogical courses in the district, achieved the transfer of Rumyantsev Museum in Moscow and added there library and collections. Established «Pedagogicheskii sbornik» (Pedagogical One Shot), founded pedagogical library and Pedagogical Museum (Bol'shoi Russkii..., 2002).

[21] Situated in 80 km to the Southwest of Berlin.

[22] Perovskii, Lev Alekseevich (1792—1856), Count, Russian statesman, Infantry General (1855). Count A.K. Razumovskii's flyblow, P.A. Kochubei's relative from mother side. Graduated from the Moscow University (1811). Participant of the Patriotic War of 1812 and foreign campaigns of 1813—1814. Was a member of first Decembrist organizations, but retired from the movement in 1821. In 1823—1826, served in the Collegium for foreign affaires, 1826 —1840 — in Department and Ministry of Appanage. Minister for Internal Affaires in 1842—1852, advocate of gradual emancipation of peasants with land. In 1852—1856, headed the Ministry of Appanage, and was administrator of His Imperial Majesty's cabinet. Since 1850, headed the Commission for studying antiquities. Participated in excavatory archeology near Novgorod, at Suzdal', in Crimea. Assembled a great numismatic collection that is stored now in Hermitage, and collection of old Russian silver as well as collection of minerals. Honorary member of Petersburg Academy of Sciences (1852) (Bol'shoi Russkii..., 2002). The mineral perovskite was named in his honor.

[23] Stroganov Sergei Grigor'evich (1794—1883), Count, Russian statesman and military man. One of richest Russian landowners. Participated in Patriotic War of 1812, distinguished himself in the Borodino Battle. In 1831—1834, fulfilled the duties of military governor in Riga and Minsk. In 1854—1855, participated in the Sevastopol' campaign; in 1859—1860, was Moscow military governor-general; in 1863—1865, chairman of the railway committee. Known as Maecenas, collector, and archaeologist. Was assigned, in 1835, curator of Moscow educational district. The period of his leadership (1835—1847), by common opinion of contemporaries, was brilliant epoch for the Moscow University. He established in 1859 the Archaeological Commission whose chairman he remained to be until the end of his life; contributed to the excavations on the Black Sea beach, lifted interest for Russian numismatics, and compiled a very rich collection of Russian coins. In 1825, established in Moscow free art school (the Stroganov School) (Bol'shoi Russkii..., 2002). The S.G. Stroganov's mineral collection was purchased by the Mineralogical Museum of Academy of Sciences in 1877.

[24] Duke Leuchtenbergskii, Prince Romanovskii, Nikolai Maximilianovich (1843—1891), son of Maximillian-Eugene-Joseph-Napoleon Duke v. Leuchtenberg, son-in-law of Emperor Nikolai I. Adjutant General, mineralogist, made up a mineral collection, since 1865 the Chairman of Mineralogical Society, since 1866 the Honorary Chairman of Russian Technical Society. Author of several chemical and crystallographic studies (Brokgauz, Yefron, 2001—2002). His teachers were Academicians N.I. Koksharov and N.N. Zinin (Transactions...).

[25] The specimen is not preserved.

[26] Koksharov, Nikolai Ivanovich (1818—1892), prominent mineralogist, crystallographer, Academician of the Imperial Academy of Sciences (1866), Director of the Mineralogical Museum (1866—1873), Director of the Imperial Mineralogical Society. Geometrical constants found by him for prodigious number of minerals are considered, up to now, most precise ones. Lectured at various educational institutions including the Petersburg University and Mining Institute (Bol'shaya Rossiiskaya..., 2001—2002).

[27] P.A. Kochubei survived his friends: A.V. Gadolin for some days, and N.I. Koksharov for several hours. This impressed his contemporaries mightily (Khvostov, 1893).

[28] A variety of clinochlore.

A.V. Gadolin as well as Academician P.V. Yeremeev[29] and mining engineer Iossa met «just to talk science» (Sreznevskii, 1893).

In 1860, P.A. Kochubei entered the Imperial Mineralogical Society. He contributed minerals repeatedly to the collection of Mineralogical Society (Notes on Mineralogy ..., 1878, 1880) and to the Museum of Academy of Sciences, promoted, not sparing himself, scientific trips for searching minerals. For these merits, P.A. Kochubei was awarded, on 25 January 1872, the title of the Mineralogical Society Honorary member, and on 29 December 1876 the title of the Academy Honorary member as well (Sreznevskii, 1893).

Considerable means and wide circle of acquaintances amid mineralogists and geologists permitted P.A. Kochubei to buy extra class mineral specimens nearly at first hands. He managed to enrich his collection to great extent by means of purchasing the Count L.A. Perovskii's mineralogical collection after Count's death in 1856 (Koksharov, 1862). Lev Alekseevich Perovskii, Vice-President of the Appanage Department (1852—1856), contributed to development of mining industry in Russia, inspected supplies and working of lapidary works; many new deposits started to be mined by his initiative. At the same time, he was an ardent collector; one of his hobbies was minerals and precious stones. He used to take advantage of his rank to fill his collection. «All the best stones that went to the Appanage Department settled down in the Vice-President's collection. To get a certain specimen he used bribery and mean action. Many officials of the Appanage Department served agents for replenishing their head's collection» (Semenov, Shakinko, 1982). The L.A. Perovskii collection was notable for unique specimens of emerald and alexandrite from Izumrudnye Kopi, excellent topaz crystals from the Borshchevochnyi Range, Transbaikalia, remarkable beryl crystals from Murzinka, Urals, and Urul'ga, Transbaikalia (Koksharov, 1852—55).

P.A. Kochubei used every opportunity to fill his collection. When on the errand of the Russian Technical Society's, he visited the Paris World Exhibition to «enrich the Russian Technical Society's collection with the objects significant for techniques» (Sreznevskii, 1893). At the same time, he purchased for his «home museum» remarkable French artistic bronzes. «But P.A. Kochubei especially managed in Paris to enrich his mineral cabinet, partly by purchasing and partly by exchange for valuable specimens of Ural minerals which he had taken to Paris with this aim» (Sreznevskii, 1893).

The collection always amazed researchers with its exclusive quality of mineral specimens,. Academician N.I. Koksharov was first who applied it in and used many of its minerals for his work «The Materials for Mineralogy of Russia». Later, Academician A.V. Gadolin used the brookite crystals from the Atlya Placer, Urals, for his works. M.V. Yerofeev[30] appealed to collection of tourmalines. He studied their crystallographic and crystallo-optical properties, developing the theory of «crystal clustering» in his Ph. D Thesis[31] (Bol'shoi Russkii ..., 2001—2002). The Academician P.V. Yeremeev, N.A.E. Nordenskjold[32], A.E. Arzruni[33] used P.A. Kochubei's collection (Excerpt..., 1910) for their research.

The collection included more than 3,000 specimens that presented more than 350 mineral species known in the nineteenth century. Topaz, beryl, tourmaline, chrysoberyl, corundum, quartz, orthoclase, gold, zircon, and apatite prevailed. At the same time, collection included some rare minerals. With great love and knowledge, P.A. Kochubei selected those specimens that expressed the diversity of the mineral world as well as of each mineral. Most of them are represented with well-faceted crystals differing in combinations of faces. The collection of topazes, beryls, and tourmalines are especially outstanding as well as the crystals of zircon, vesuvianite, orthoclase, and especially twins by various laws.

Topazes are the most brilliant and rich part the collection. Petr are collected topazes from ten deposits, mainly Russian ones. In A.E. Fersman's opinion, «Russia may be proud with its topazes as they occupy an exclusive place amid topazes of the whole world by their beauty of color, clear transparency water, and size of crystals» (Fersman, 1962). However, the beauty of

[29] Yeremeev, Pavel Vladimirovich (1830—1899), mineralogist, Professor at the Mining Institute since 1866, Director of the Mineralogical Society since 1892, corresponding member of the St.-Petersburg Academy of Sciences (1875), extraordinary academician (1894). Editor of «Zapiski Mineralogicheskogo obshchestva» (Memoirs of the Mineralogical Society) and fourteen volumes of «Materials for Mineralogy of Russia» (Bol'shaya Rossiiskaya..., 2001—2002).

[30] Yerofeev, Mikhail Vasil'evich (1839—1888), mineralogist. Since 1879, Professor at the Warsaw University, then the Forestry Institute in Petersburg (Bol'shaya Rossiiskaya..., 2001—2002).

[31] «Kistallograficheskie i kristalloopticheskie issledovaniya turmalinov» (Crystallographic and Crystallooptical Studies of Tourmalines), St.-Petersburg: 1870.

[32] Nordenskjold, Nils Adolf-Eric (1832—1901), Baron, known Swedish traveler, geologist, geographer, Arctic explorer, sailor, and historian of mapmaking; bypassed Eurasia from the Northeast. Member of the Stockholm Academy of Sciences (1858), corresponding member of the St.-Petersburg Academy of Sciences (1879), Honorary Member of Russian Geographic Society (Bol'shaya Rossiiskaya..., 2001—2002).

[33] Artsruni, Andreas (Andrei) Yeremeevich (1847—1898), Russian mineralogist. Corresponding member of the Petersburg Academy of Sciences (1895), Professor at the Breslavl' (Wroclaw) University (since 1883) and High Technical School in Achen, Germany (since 1884). Establisher of mineralogo-geological section of the Caucasian Museum in Tiflis. In his honor, the mineral artsrunite, double salt of lead sulfate and copper chloride, was named (Bol'shaya Rossiiskaya..., 2001—2002).

delicate blue topaz of Murzinka, reddish-purple tint of Sanarka and Kamenka topazes, and, finally, amber-colored topazes from the Borshchevochnyi Range, — all this is the pride of Russian color stones» (Fersman, 1962). Topaz is a widespread mineral; however, good crystals occur not often. In the Kochubei's collection, topazes are from Russian deposits of the Urals: Murzinka, Shaitanka, the Il'men Mountains, Kamenka River placers; deposits of Eastern Transbaikalia: Urul'ga River (Borshchevochnyi Range), Sherlovaya Gora, and Adun-Chilong, and also from foreign deposits: Brasil (Villa Rica) and Germany (Schneckenstein). Kochubei sought to include in his collection most typical specimens as well as non-typical ones for the given deposit.

Beauty and perfectness is typical for the topaz crystals from the Urul'ga River. They are not the largest topazes, but they are marked out with transparency, multitude of faces, and diversity of crystal forms. Amid them, crystals occur of the Murzinka type with much developed pinacoid (001) and prism (120) *(Cat. #31275 — photo 4)*; barrel-like crystals of the Il'men type with dipyramid faces that narrow the basal pinacoid; crystals of the Sherlovaya Gora type without pinacoid *(Cat. #31266 — photo 3)* and with developed prisms (110), (120), (130), dihedron (011) *(Cat. #31261)*; crystals of the Korosten' type without pinacoid and with well developed prisms (110), (120) (*Cat. #31277 — photo 2)*. P.A. Kochubei was especially keen about rarely occurring faces to be present on the crystals. He wrote in a letter to N.I. Koksharov, «Recently I had got various minerals from Siberia, including a topaz from Urul'ga presenting a combination that I never met wherever. Your paper on topaz in «Materials for Mineralogy of Russia» does not, too, mention this combination»[34] (Koksharov, 1856). Fairly rare faces are seen on some crystals, as r, v, r, and others. The crystals from Urul'ga consist about one third of the whole topaz selection. Primarily, all of them were of wine-yellow color, from pale yellow to deep reddish-yellow. Unfortunately, neither of them possesses now this color as they faded at the daylight. They measure from 1 cm to nearly 10 cm. A part of these specimens passed from the L.A. Perovskii's collection. The seven crystals are described (Koksharov, 1856) and sketched by N.I. Koksharov in «The Atlas» (Koksharov, 1853)[35]. Amidst them is the biggest crystal of this collection weighing 1.2 kg measuring 10.5 x 9.7 x 7.1 cm. By the N.I. Koksharov's description, this crystal «is especially remarkable with its absolute transparency, crystallization rightness, and significant size. Its color is wine-yellow (or, more rightly, between the Brasil topaz color and smoky quartz). Pleochroism is very distinct when it is displayed to the transmitted light: in the direction of the main or vertical axis it seems to be dark reddish-yellow, in the direction of macrodiagonal axis a bluish-green tint is visible, and in the direction of brachidiagonal axis the crystal retains its normal wine-yellow color» (Koksharov, 1856). It had lost its color yet in the previous century (Koksharov, 1862), and we only can admire perfectness of its form *(Cat. #31262 — photo 5)*.

The topaz specimens from Sherlovaya Gora are the typical representatives of this deposit. They are clusters of well-shaped crystals measuring to 3 cm. Some crystals are very much transparent, they are often yellowish or colorless *(Cat. #31320)*.

The topaz collection contains a great number of specimens from the Murzinka deposit. A.E. Fersman described four types of Murzinka topazes (Fersman, 1962); at the present time, three of them are described in this deposit (Popova *et al.,* 2002):

«1) Crystals of «nearly cubical form» with basal pinacoid habit faces and almost quadrate prism 1 {120}; 2) crystals with hexagonal appearance due to the prevalence of *m* {110} prism, basal pinacoid is greatly narrowed with dipyramids, the faces are numerous; this type resembles the Il'menskii one», 3) «envelope-like» crystals with developed prism y {021} instead of disappearing basal pinacoid».

The biggest Murzinka crystals of this collection refer to the first type. Amidst them is a translucent crystal of superb blue color, about 10 cm long, intergrown with morion quartz, orthoclase, and albite-cleavelandite *(Cat. #31327 — photo 8)*. Some crystals of the same type in this collection have a zonal white-blue color *(Cat. ## 31294, 31295)*. The lesser crystals belong to the second type; some of them wear numerous faces *(Cat. #31351 — photo 1)*. Some of the Murzinka crystals are double terminated, which is rare as they normally overgrow upon their matrix *(Cat. ## 31291, 31310)*. Those crystals that overgrew with their side faces refer here too. In this case, one can also view both crystal heads *(Cat. ## 31327 and 31328)*.

The crystals from the vicinities of the Shaitanka village «are notable for their water-like transparency and development of side *f* domes, which is, combined with strong corrosion of some of them, the most distinctive features of these, fairly rare, Shaitanka topazes» (Fersman,

[34] The description and drawing of this topaz were given by Kochubei in the same letter; however, the specimen was not preserved.
[35] To the present moment, five of seven crystals are identified exactly (Cat. # # 31262, 31266, 31269, 31275, 31277).

1962). There is an excellent representative of this type *(Cat. #31302).*

A.E. Fersman described topaz two types from the Il'men Mountains: «small free crystals sitting on the surface of vugs and crevices, or large crystals, so called «syrtsy», embedded in a mass of gangue quartz» (Fersman, 1962). N.I. Koksharov remarked that miners used to name such topazes «rotten» because of being strongly cracked they «draw in them moisture and so fragment easily to small pieces even at a slight pressure of fingers» (Koksharov, 1856). One of such crystals in the Kochubei's collection wears a rare *k* face[36]. Another crystals of the collection refer to the first type. They are transparent, colorless, well formed, and some are double terminated *(Cat. ## 31306, 31308, 30309, 31311, 31312).*

There is the only topaz crystal in the Kochubei's collection from the Kamenka River gold placer. It comes from the merchant Bakakin's gold mine and probably refers to the first finds of topaz in this site. The crystal is well-formed and very beautifully colored in deep violet-red *(Cat. #31318).*

The topazes from the placers of Villa Rica are typical for Brasil: most of them are dipyramidal crystals of yellow color. However, one of them is notable for unevenness of its color: yellow at its base passes gradually in crimson at the crystal head *(Cat. #31315 – photo 7).*

For the old Schneckenstein deposit in Germany, transparent colorless or pale yellow crystals are typical. The Kochubei's collection contains exactly such specimens: prismatic crystals overgrown upon a rock, measuring about 1 cm *(Cat. ## 31331, 31332).* The biggest crystal reaches 3 cm but is not transparent.

So P.A. Kochubei managed to represent completely enough the multitude of topaz crystallographic types and colors from the principal, known in the nineteenth century deposits. One may remark similar picture, too, in other minerals of this collection. Let us linger at some of them.

Chrysoberyl comprise in V.I. Vernadskii opinion (Collection..., 1914), one of the collection best parts, which was preserved almost completely: 48 of 50 specimens. Most of them are alexandrites from the Izumrudnye Kopi, Urals. «They are notable for dark green color with distinctly expressed and conspicuous pleochroism. The crystals usually occur as nice trillings» (Fersman, 1962). Alexandrite is mainly represented in the Kochubei's collection as separate trillings (more rarely as their intergrowths) up to 5—8 cm across *(Cat. ## 30307, 30308 – photo 9, 30317, 30297).* «Single crystals and twins are very rare», marked A.E. Fersman (Fersman, 1962). Meanwhile, there is a fine twin in this collection of a heartlet shape, measuring about 1 cm *(Cat. #30331).* The chrysoberyls proper are mostly small and transparent, with well-developed faces. They represent five deposits, mainly in Russia (Izumrudnye Kopi and Bakakin's Mine in the Urals) and Brasil.

One of primary specimens is the alexandrite unique crystal cluster found in the Izumrudnye Kopi in 1840 (Fersman, 1961). It likely came to P.A. Kochubei from the L.A. Perovskii collection. The cluster consists of twenty-two dark green crystals of various sizes, translucent at the edges, the biggest one measuring 7.2 cm. There are mica scales and pale green opaque beryl prisms between them. The specimen measures 25 x 14 x 11 cm and weighs 5724 g. Its first description was made by N.I. Koksharov (Koksharov, 1857). Some crystals resemble those ones that were drawn by N.I. Koksharov in his Atlas Figs. 2, 4, 5 (Koksharov, 1853) *(Cat. #30295 – photo 12).* The first photograph of this specimen was taken by P.A. Kochubei and published by N.I. Koksharov in volume 4 of his «Materials for Mineralogy of Russia».

Excellent emeralds were preserved almost harmless up to the present time. It includes, mainly, the specimens from the Izumrudnye Kopi *(33 Cat. # of 39, the entire number),* the other being from deposits of Peru, Columbia, and Austria. In V.I. Vernadsky opinion, «many specimens should be evaluated as precious stones by their clarity and color intensity» (Collection..., 1914). The sizes of emeralds are from few centimeters to 20 cm. They are separate crystals and intergrowths of two crystals as well as various clusters, which are made up of subparallel, elongated or short-prismatic crystals diversely embedded in the mass of mica. The two crystals are notable for unevenness of their color. One of them, having had come from the Izumrudnye Kopi, wears a white stripe near its head *(Cat. #31242).* Another crystal is absolutely transparent and colorless, with a crosswise stripe of the emerald color *(Cat. #31250).*

This collection includes one of the first specimens found in 1831 at the Izumrudnye Kopi (Semenov, 2001). This is an excellent crystal of a very intense, dark green color with no yellowness, measuring 12.5 x 8.5 cm and weighing 2,225 g, with some faces being perfect and its peripheral part being transparent almost everywhere. It contains numerous inclusions, and is broken with a large crack healed with mica. This emerald once associated wrongly with the tragedy of Yakov Kokovin, Director of the

[36] The crystal was not identified.

Ekaterinburg lapidary works[37]. During a revision of 1835, many precious stones were disclosed in Kokovin's cabinet including an excellent emerald. Kokovin was accused of stealing them. The boxes with the stones were delivered to Petersburg to the Appanage Department that was entrusted with replenishing the Cabinet of His Imperial Majesty. However, the specimen appeared in the Cabinet. According to a version (Fersman, 1961), the unique emerald was stolen by Kokovin; by another version (Semenov, Shakinko, 1982), it was appropriated by the high-ranking official of the Appanage Department, Count L.A. Perovskii, an ardent collector. Both versions coincide in the emerald to be in the L.A. Perovskii's collection. Then its track is lost. The only description of the lost emerald was made by Yaroshevitskii, the councilor of State, in the revision report: «...and also one of the best virtue, of very grassy color, weighing a pound... most precious and hardly not exceeding, in its virtue, the emerald that was in the Julius Caesar crown» (Semenov, 1982) *(Cat. #31219 – photo 13).*

The emerald mess was connected with «Sketches of the Stone History» published after the A.E. Fersman's death, where the editors did not notice the error: the emerald from Kochubei's collection was named «Kokovin's Emerald», and inaccurate information penetrated in literature. A mere comparison makes obvious the difference between these specimens: the emerald from Kochubei's collection, which is now in the Fersman Museum, weighs 2225g whereas the emerald subtracted from Kokovin – only 400 g. According to catalogues, there was in the Kochubei's collection no emerald portrayed by Yaroshevitskii.

As for the beryl only half of it have survived nevertheless, it contains many fine specimens even now. The aquamarine crystals are splendid, especially those ones from the Adun-Chilong vicinities, of beautiful intense greenish-blue color *(Cat. ## 31208, 32247)*, as well as large *(Cat. ## 31204, 32046 – photo 11)* and beryl small bluish-green, well-formed crystals, some of them opulently faceted *(Cat. ## 32245, 31246),* from the Urul'ga River, Borshchevochnyi Range, fine azure-blue beryls *(Cat. ## 32251, 31212)* and heliodor from the Sherlovaya Gora, Eastern Transbaikalia *(Cat. #32250 – photo 10).* The green and yellow-green crystals from Murzinka are admirable. One of them is of a special interest being double terminated; it was studied by N.I. Koksharov (Koksharov, 1852-1855). «In P.A. Kochubei's collection are two small, excellent beryl crystals terminated with flats on both ends. ...It is remarkable that hemimorphism is seen in them, which is a fact quite new for beryl. Anyway, hemimorphism seems to be only proper to the crystals from Murzinka, as all those crystals from Adun-Chilong and Borshchevochnyi that I happened to see to be picked at both ends, are quite symmetrical and no track of hemimorphism can be seen in them. ...The second crystal... is picked at the upper end with flats of hexagonal pyramids, main one t and one of the second kind s, and terminated with fairly developed straight flat P. At this crystal lower end are straight P end flat and only three alternating flats of the hexagonal s pyramid of the second kind. All flats of the crystal are bright» (*Cat. # 32261*) (Koksharov, 1852–1855).

V.I. Vernadskii and A.E. Fersman (Collection..., 1914) saw the collection value also in the fact that it contains minerals from most different paragenetic combinations. This relates greatly to the selection of calcite, to the minerals of the apatite group, and to vesuvianite. Some deposits are exhausted long ago, but the collection gives us opportunities to see native silver from Kongsberg (Norway), amalgam from Bavaria (Germany), fine crystal group of manganite from Ilmenau (Germany), hessite from the Zavodinskii mine in Altai (Kazakhstan), and azurite from Altai (Russia).

After P.A. Kochubei's decease, the collection was stored in his Zgurovka Estate being supplemented to the slight extent only.

The next stage in the collection history goes back to 1905, when it was damaged during peasant uprisings. The Kochubei's country estate was smashed and robbed by the crowds. «The Kochubei's house was burnt down, and his collection scattered all over the garden, some specimens being thrown in the pond. Eventually, after a long looking-for, nearly three-quarter of specimens were found», – so A.E. Fersman described this event (Fersman, 1961). Having had reassembled the collection, V.P. Kochubei[38], the only son of P.A. Kochubei, transported it to Kiev. The specimens were being there sorted out and put in order by L. Kryzhanovskii[39], the assistant at the Mineral cabinet of the Kiev University, under the guidance of P.Ya. Armashevskii, Professor at the same University (Excerpt..., 1910). Then the

[37] For further details, see «The Yakov Kokovin's Tragedy», in «Ural'skie samotsvety» (Gemstones of the Urals), pp. 71-78.

[38] Kochubei, Vasilii Petrovich (1868-?), graduated from the Petersburg University, was member of Russian Technical Society, participated efficiently in activities of its Fifth Section: Photography and Its Applications. During the Civil War of 1918, was attached to Skoropadskii, Hetman of Ukraine (Vernadskii, 1998).

[39] Possibly, Kryzhanovskii Leonid Il'ich, brother to Kryzhanovskii V.I. Was trading with minerals in Ekaterinburg.

owner transported the collection to Vienna and published there, in 1908, its catalogue and «began negotiations with the European and American biggest museums for its selling» (Fersman, 1961).

The Kochubei's collection is often mentioned in literature as auctioned in Vienna (Barsanov, Kornetova, 1989). Some specimens were possibly sold by V.P. Kochubei at an auction (by L.V. Bulgak's[40] personal communication, the alexandrite crystal cluster was exhibited in the Vienna museum that belonged to Kochubei and had been purchased at the auction). However, the purchasing of the collection by the Russian (Petersburg's at that time) Academy of Sciences was dragged on for several years and has its own history.

In 1910, V.P. Kochubei «addressed Academy by a letter in which he proposed to buy his collection of minerals, setting price after it has been looked over by representatives of Academy of Sciences. In May 1910, a special commission was established in Academy of Sciences having included Academicians A.P. Karpinskii[41], F.N. Chernyshev, S.F. Ol'denburg[42], and V.I. Vernadskii. On 24 November 1910, the Academy Section of physical and mathematical sciences asked V.I. Vernadskii to go to Vienna to determine the collection's value» (Pis'ma..., 1985). This journey took place on 4 to 25 January 1911. V.I. Vernadskii wrote to his wife N.E. Vernadskaya 8/21 January 1911: «Arrived to Vienna today early in the morning and examined, together with Fersman, the Kochubei's collection. It seems to me (and Fersman thinks the same), it is not worth 20,0000 – 30,0000 rubles that Kochubei wants to get. It is worth considerably less, hardly more than 100,000 rubles» (Pages..., 1981). In the autumn of the same year, V.I. Vernadskii wrote on 5th November in the letter to A.E. Fersman: «Kochubei takes off – probably about 160,000 rubles, and we start the affair» (Pis'ma..., 1985). In addition, in another letter of 23 November he reported: «Today, the question of purchasing Kochubei's collection was settled in the Section» (Pis'ma..., 1985). The Academy had not enough money to purchase collection, so it addressed Government with petition. The question of allotting money was under consideration in the government for a long time, and the negotiations continued with the owner. Nevertheless, already in the spring of 1912, V.I. Kryzhanovskii[43], custodian of the Museum mineralogical section, was detached in Vienna for formal acceptance of the collection. Perhaps, he made a detailed evaluation of specimens. Presumably, it was he who marked the value sums in the margins of the catalogue that is stored in our Museum. He appraised the collection at 141,550 rubles as minimum, and at 228,575 rubles as maximum. The average sum, which was written red, was 165,690 rubles (Katalog..., 1908). Though there was not yet the governmental resolution of purchasing the collection, in April of the same year 1912, the boxes with specimens already came in to Petersburg except one that was lost on the railway during transportation. V.I. Vernadskii reported A.E. Fersman in the letter of 25 April: «The collection arrived, but one box is absent, and we did not accept it. The Academy's solicitation is now in the Council of Ministers. Kryzhanovskii[44] considers it as appraised too expensively but does not say this directly» (Pis'ma..., 1985). V.I. Vernadskii was always attending to the problem of allotting money. Eventually, his efforts were fruitful: V.I. Vernadskii wrote to A.E. Fersman in July 1912 from Losvida[45]: «The Ministry agrees to buy the Kochubei's collection in 1914. One should negotiate with Kochubei now, and I believe he will agree. The museum's nature would be altered at once» (Pis'ma..., 1985). A little later, in the letter of 3 August: «I wrote to Kochubei and almost do not doubt he will agree. Kokovtsev[46] is said to have urged, the government accepted the resolution» (Pis'ma..., 1985). But A.E. Fersman was in Borovichi[47], so V.I. Vernadskii had written him there as well: «I wrote to Kochubei of the government assent to purchase his collection on condition of paying off the whole sum in 1913, if only legislature would agree» (Pis'ma..., 1985). One year more was spent for the question to be under consideration in legislatures. Only on 12 July 1913, a special law was accepted to allot 165690 rubles from the State Exchequer for purchasing this collection.

[40] Bulgak, Lev Vasil'evich, scientific worker of the Fersman Mineralogical museum.

[41] Karpinskii, Aleksandr Petrovich (1847 – 1936), Academician (1896), the first elective President of Academy of Sciences (1917). President of Mineralogical Society in 1899 – 1936. One of those researchers who were the first to use microscope for studying rocks (1869). His works on tectonics, paleogeography, and paleontology are widely known (Bol'shaya Rossiiskaya..., 2001 – 2002).

[42] Ol'denburg, Sergei Fedorovich (1863 – 1934), Orientalist, one of institutors of Russian school of indology, archaeologist, ethnographer, science organizer, Academician of Academy of Sciences (1900), permanent secretary of Academy of Sciences (1904 – 1929) (Bol'shaya Rossiiskaya..., 2001 – 2002).

[43] Kryzhanovskii, Vladimir Il'ich (1881 – 1947), professor; since 1907, custodian of mineralogical section of Academy of Sciences Museum; in 1932 – 1947, Director of the Mineralogical museum of Academy of Sciences.

[44] here Kryzhanovskii, Vladimir Il'ich, is meant, custodian of museum mineralogical section.

[45] The Lyuboshchinskiis' estate near Gorodok, the Vitebsk Province.

[46] Kokovtsev, Vladimir Nikolaevich (1853 – 1943), Count, statesman, financier. In 1911 – 1914, Chairman of the Council of Ministers. Since 1918, lived abroad (Bol'shaya Rossiiskaya..., 2001 – 2002).

[47] The Proshkovo estate, Borovichi, the Novgorod Province.

After the devastation of 1905, the restored and catalogued part of collection numbered 2588 specimens. At the formal acceptance of collection by the museum, 100 numbers lacked: 11 specimens lacked yet at the collection evaluation in Vienna, 82 specimens were in the box that was lost on the way from Vienna, 7 specimens were accepted as fragments. Besides, 640 specimens were not mentioned in the catalogue, and it was possible to restore a part of them. In 1913, totally 2606 specimens were recorded in museum catalogues. Some specimens were lost in the following years during transportation from St.-Petersburg to Moscow in 1934, and several ones were written off as destroyed.

Now, museum contains 2,424 specimens from the collection of Count Petr A. Kochubei. They represent about 300 mineral species. 2,124 of them are included in the Systematic Collection, 150 in the Collection of crystals, 148 in the Collection of pseudomorphs, and two specimens in the Collection of deposits. About 350 specimens are exhibited in the museum expositions, and we may admire their perfectness.

References

Barsanov, G.P. and Kornetova, V.A. **(1989),** The Development History of A.E. Fersman Mineralogical Museum of the Akad. Nauk SSSR for 270 Years (1716 to 1986), in The Most Old Mineralogical Museums of the Soviet Union, Ocherki po istorii geologicheskikh znanii (Sketches of the History of Geological Knowledge), vyp. 25, Moscow: Nauka, pp. 9—52 (in Russian).

Bol'shaya Rossiiskaya entsiklopediya (The Great Russian Encyclopedia), http://www.rubricon.ru, Russ Portal Co. Ltd., 2001—2002 (in Russian).

Bol'shoi Russkii biograficheskii slovar' (The Big Russian Biography Dictionary), http://www.hi-edu.ru/Brok/brbs.htm, **2002** (in Russian).

Brokgauz, Yefron, Malyi entziklopedicheskii slovar' (The Lesser Encyclopedia), http://encycl.yandex.ru, Yandex, **2001—2002** (in Russian).

Collection of V.P. Kochubei **(1914)**, Tr. Geol. Muzeya im. Petra Velikogo, vol. 8, volume 1, pp. 40—61 (in Russian).

Excerpt from Transactions of Physico-Mathematical Section, 26 May 1910, No 2477, 30 September 1910, *Arkhiv Gos. geol. muzeya im. V.I. Vernadskogo* (Archive of the Vernadskii State Geological Museum) (in Russian).

Fersman, A.E. **(1962)**, Izbrannye trudy (Selected Works), Moscow: Akad. Nauk SSSR, vol. 7 (in Russian).

Fersman, A.E. **(1962)**, Ocherki po istorii kamnya (Sketches of Stone History), Moscow: Akad. Nauk SSSR, vol. 2 (in Russian).

K*atalog der Mineralien und Pseudomorphosen Sammlungen von Peter v. Kotschubey*, Wien: **1908** (in Russian).

Khvostov, A., P.A. Kochubei **(1893)**, Niva, no. 3, pp. 71, 73 (in Russian).

Kochubei P.A. **(1890)**, Vospominaniya Petra Arkad'evicha Kochubeya o dannoi imperatorom Aleksandrom II komandirovke v zimu 1856 goda (P.A. Kochubei's Reminiscences of the Emperor Alexander's II Errand in Winter 1856), St.-Petersburg: Panteleev Broth (in Russian).

Kochubei, A.V. **(1890)**, Semeinaya khronika. Zapiski Arkadiya Vasil'evicha Kochubeya 1790-1873 (Family Chronicles. A.V. Kochubei's Memoires of 1790-1873), St.-Petersburg: Panteleev Broth (in Russian).

Kokscharov, N. **(1853-1891)**, Materialen zur Mineralogie Russland, St.-Petersburg: Bd. 1—11.

Koksharov, N.I. **(1852-1855)**, Materialy dlya mineralogii Rossii (Materials for Mineralogy of Russia), St.-Petersburg: Glazunov and Co., part 1 (in Russian).

Koksharov, N.I. **(1856),** Materialy dlya mineralogii Rossii (Materials for Mineralogy of Russia), St.-Petersburg: Glazunov and Co., part 2 (in Russian).

Koksharov, N.I. **(1858)**, Materialy dlya mineralogii Rossii (Materials for Mineralogy of Russia), St.-Petersburg: Foreign Trade Depart., part 3 (in Russian).

Koksharov, N.I. **(1862)**, Materialy dlya mineralogii Rossii (Materials for Mineralogy of Russia), St.-Petersburg: Ogrizko, part 4 (in Russian).

Koksharov, N.I. **(1870)**, Materialy dlya mineralogii Rossii (Materials for Mineralogy of Russia), St.-Petersburg: Dymakov., part 5 (in Russian).

Koksharov, N.I. **(1853)**, Materialy dlya mineralogii Rossii. Atlas (Materials for Mineralogy of Russia, The Atlas), St.-Petersburg: Glazunov and Co (in Russian).

Koksharov, N.I., Reminiscences of 1818-1859, Russkaya starina, July 1890, vol. 66, pp. 526—567 (in Russian).

Kornilov, N.I. and Solodova, Yu.P. **(1983)**, Yuvelirnye kamni (Gemstones), Moscow: Nedra (in Russian).

Mineraly **(1972)** (Minerals), Moscow: Nauka, vol. 3, volume 1 (in Russian).

Necrology to P.A. Kochubei **(1892)**, *Gornyi Zhurnal*, vol. 4, no. 12, pp. 563–564 (in Russian).

Pis'ma V.I. Vernadskogo k A.E. Fersmanu **(1985)** (V.I. Vernadskii's Letters to A.E. Fersman), Filippova, N.V., Ed., Moscow: Nauka (in Russian).

Platov, A.S. and Kirpichev, L.L. **(1870)**, Istoricheskii ocherk obrazovaniya i razvitiya Artilleriiskogo Uchilishcha 1820–1870 (The Artillery School History in 1820–1870), St.-Petersburg (in Russian).

Popova, V.I. et al. **(2002)**, Murzinka: The Alabashka Pegmatite Field, Mineralogical Almanac, vol. 5. Moscow: Ocean Pictures. 128 pp.

Priroda **(1913)**, no. 10, p. 1239 (in Russian).

Semenov, V.B. and Shakinko, I.M. **(1982)**, Ural'skie samotsvety (Gemstones of the Urals), Sverdlovsk: Sredne-Uralskoe Izdatel'stvo (in Russian).

Semenov, V.B. **(2001)**, A Romance with Emerald, Ural, no. 7, pp. 170–176 (in Russian).

Sreznevskii, B.I. **(1893)**, Ocherk zhizni i deyatel'nosti P.A. Kochubeya, 1825–1892 (P.A. Kochubei, 1825–1892: His Life and Deeds), St.-Petersburg (in Russian).

Stranitsy avtobiografii V.I. Vernadskogo **(1981)** (V.I. Vernadskii: Some Pages of Autobiography), Moscow: Nauka (in Russian).

The Systematic Index of Articles for Years 1867 to 1888, Zap. Imperator. Russkogo Tekhnicheskogo O-va, 1889 (in Russian).

Transactions of the Imperial Mineralogical Society **(1878)**, Zap. Mineral. O-va, part 13, pp. 431–432 (in Russian).

Transactions of the Imperial Mineralogical Society **(1880)**, Zap. Mineral. O-va, part 15, pp. 171–172 (in Russian).

Transactions of the Imperial Mineralogical Society **(1893)**, Zap. Mineral. O-va, part 30, pp. 399–415 (in Russian).

Vernadsky, V.I. **(1998)**, Dnevniki 1917–1921 (The Diaries of 1917 to 1921), Sorokina, M., Ed., Nat. Akad. Nauk Ukrainy, Commission for Sci. Heritage, Kiev: Naukova Dumka, book 1 (in Russian).