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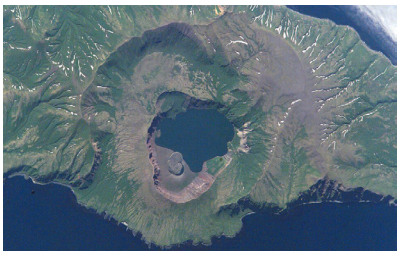

ALEXANDER NIKOLAEVICH ZAVARITSKY
MATERIALS FROM THE ARCHIVE FOR 1908–2007

№ 18 • 2025

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EMPRESS CATHERINE II
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Abstract

Zavaritsky Alexander Nikolaevich (1884–1952). Born in Ufa. Graduated from the Empress Catherine II Mining Institute in 1909 with his name inscribed on the golden plague. Geologist, petrographer, specialist in ore deposits and volcanology, Doctor of Geological Sciences, Academician of the Academy of Sciences of the USSR.
Zavaritsky became one of the first authors of the Journal of Mining Institute as a student (1908), and his article (1909) formed the basis of his diploma thesis.
The three-volume monograph by A.N. Zavaritsky "Magnitnaya Mount and Its Iron Ore Deposits" (1922–1924) entered the pantheon of world geological classics.
A.N. Zavaritsky created a major school of petrographers and researchers of mineral deposits, among whom were Yu.A. Bilibin, D.S. Korzhinsky, D.S. Sobolev, V.P. Baturin, P.M. Tatarinov, A.P. Bekhtin.
The new mineral "zavaritskite" (an oxyhalide compound), the volcanic pipe in the Podkamennaya Tunguska region, Zavaritsky Volcano in Kamchatka, a glacier on the Kuril Islands, and rocks on the southwestern shore of Hall Island in Franz Josef Land are named in his honor. The Institute of Geology and Geochemistry of the Ural Branch of the Russian Academy of Sciences in Yekaterinburg bears the name of A.N. Zavaritsky. The name «Akademik Zavaritsky» is also painted on the side of a refrigerator ship belonging to the Latvian Shipping Company.

The digest was compiled for the showcase "Alexander Nikolaevich Zavaritsky. Life and Work" of the National Museum of the Republic of Bashkortostan.

Content

Articles by A.N. Zavaritsky

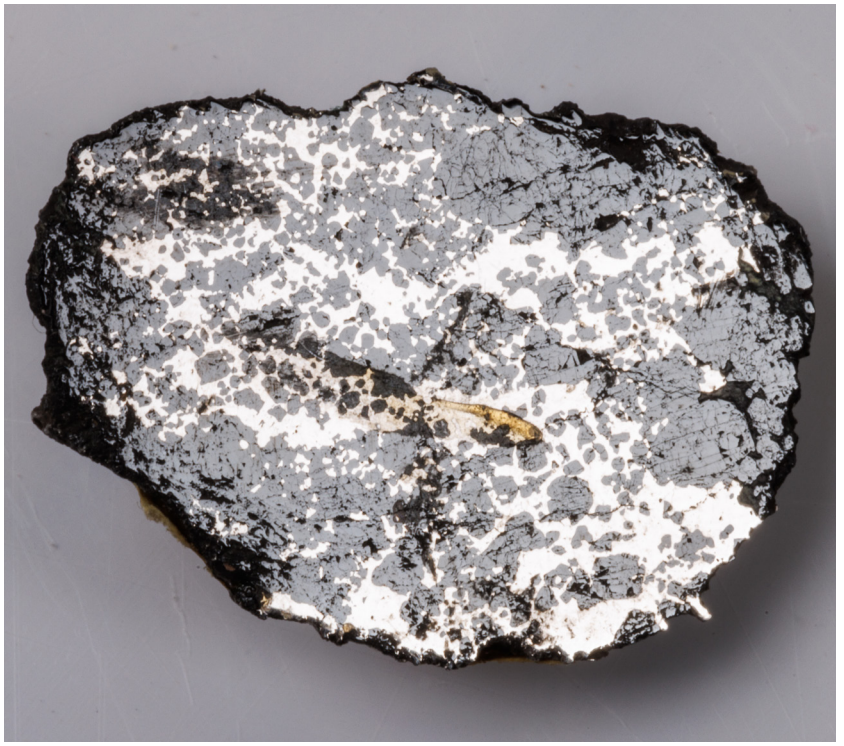
Zavaritsky A.N. Some of the rock samples from graphite deposits belonging to the mineralogical collection of the Mining Museum // Journal of Mining Institute. 1908. Vol. 1 (4). P. 295-301. https://pmi.spmi.ru/pmi/article/view/15321

Abstract. The studied samples are graphite-hosting rocks from various graphite deposits: the Mariinsky mine at the Botogolsky Golets (Aliberovskoye deposit), the Barrowdelsky mine in Cumberland and two Ural deposits – one near the Sysertsky plant; the location of the other deposit is unknown – probably from the Ilmen Mountains.

Graphite. From the collection of the Mining Museum

Zavaritsky A. Report on research in the platinum-bearing region of the N.-Tagilskii district in 1908 // Journal of Mining Institute. 1909. Vol. 2. (3). P. 189-212. https://pmi.spmi.ru/pmi/article/view/15369

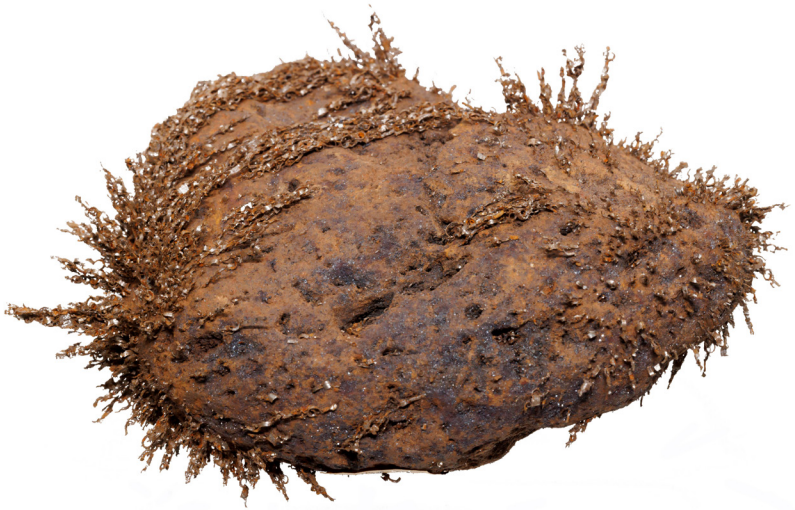
Abstract. The work that was carried out this summer in the platinum-bearing area was aimed at finding out in which direction exploration for primary platinum should be carried out. The only goal in our work was to collect material for the petrographic characterization of the area. Samples were taken from outcrops mainly along neighborhood clearings, roads and ravines. The results of processing the collected material represent the bulk of this work. In another part I will focus on the discovered platinum deposits.



Platinum, coarse segregations in chromite, Nizhny Tagil, the Urals. From the collection of the Mining Museum

Zavaritsky A. Vesuvianite-garnet rock from Magnitnaya Mount // Journal of Mining Institute. 1909. Vol. 2 (3). p. 252. https://pmi.spmi.ru/pmi/article/view/15373

Abstract. The presence of vesuvianite, this characteristic contact mineral, together with garnet, makes the rock particularly interesting from the point of view of the genesis of the Magnitnaya Mount ore deposit. It is hardly possible to attribute a hydrochemical origin due to weathering processes to such a rock as described; on the contrary, we see clear traces of contact metamorphism in it.



Magnetite, boulder ore, oxidized natural magnet.
From the collection of the Mining Museum

Zavaritsky A.N. Petrographic observations in the vicinity of the Miassky plant // Journal of Mining Institute. 1912. Vol. 3. P. 59-84. https://pmi.spmi.ru/pmi/article/view/15478

Abstract. In summer 1909 I undertook several petrographic excursions in the vicinity of the Miassky plant, mainly to become familiar with the alkaline rocks developed in this area. The collected material was subjected to microscopic examination, which provided some data that, perhaps, will be useful for determininh the petrographic composition and structure of this area.

Zavaritsky A.N. Some rocks from the vicinity of the Tsarevo-Alexandrovsky mine in Miasskaya Dacha // Journal of Mining Institute. 1912. Vol. 3. P. 124-126. https://pmi.spmi.ru/pmi/article/view/15488

Abstract. Regarding the petrography in the vicinity of the gold deposits of the Tsarevo-Alexandrovskaya distance of the Miasskaya Dacha, which became famous especially due to the discovery of the largest of the Russian gold nuggets (2 poods 7 funts 92 zolotniks), the information available in the literature is very scarce; for the most part it is only brief instructions. A geological map of this area, quite schematic, is given in the article by mining engineer Kulibin. The rocks are highlighted on it, but without their description. The author mainly lists the gold-bearing veins known at that time and dwells on some nuggets.

Gold nugget, 33.7 g, Tsarevo-Alexandrovsky mine.
From the collection of the Mining Museum

Zavaritsky A.N. Barite from Zigazinskaya dacha (Southern Urals) // Journal of Mining Institute. 1912. Vol. 3. P. 173-175. https://pmi.spmi.ru/pmi/article/view/15499

Abstract. I found this mineral in its entirety in slightly rounded pebbles up to half a fist in size, consisting of barite with a small inclusion of leaded sheen, in the bed of the Narataya River, two miles southwest of the Narataevsky iron mine. The barite of these pebbles forms a medium-grained to coarse-grained aggregate, which is indivisible, often located, being elongated in one direction, so that a somewhat layered composition is formed.

Zavaritsky A.N. Changes in the side rocks of the Zyryanovskoe field // Journal of Mining Institute. 1912. Vol. 3. P. 176-185. https://pmi.spmi.ru/pmi/article/view/15500

Abstract. All available samples contain inclusions of ore minerals in greater or lesser quantities: pyrite, zinc blende and partly lead luster. This clearly indicates that they were taken in the immediate vicinity of the ore sequence. The spatial location of these samples is clear from the attached diagram. As is known, the Zyryanovskoe deposit is a rather irregularly branched jelly-like mass.

Zavaritsky A.N. A note on Bekke's method for comparing the refractive index values of neighboring mineral grains in thin sections // Journal of Mining Institute. 1912. Vol. 3. P. 319-320. https://pmi.spmi.ru/pmi/article/view/15513

Abstract. This method, proposed by Bekke in 1893, has become widespread. As is known, it is based on observing the movement of a light strip that appears when using strong lenses at the boundary of neighboring mineral grains, if you move the microscope tube, focusing it either on the upper (upper setting) or on the lower surface of the section (lower setting).

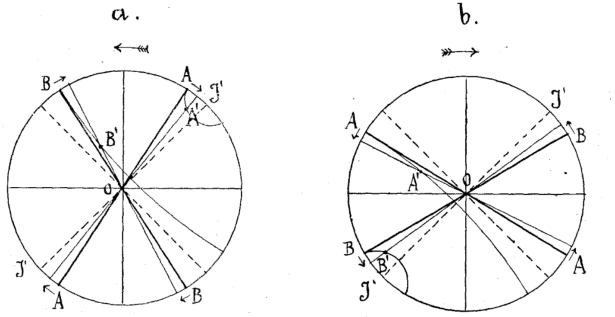
Zavaritsky A.N. About the study of the Magnitnaya Mount in 1911 // Journal of Mining Institute. 1912. Vol. 3. P. 362-372. https://pmi.spmi.ru/pmi/article/view/15521

Abstract. The study on the Magnitnaya Mount, carried out by me last summer on behalf of the Board of the Joint Stock Company of the Beloretskii Iron Works, is the beginning of work, which practical goal is to determine the iron ore reserves of this deposit. In addition, these studies were supposed to clarify the features in the structure of the deposit, with which must be taken into account when drawing up a rational development plan. The work consisted of drawing up as detailed a geological map as possible; in determining, in accordance with the data obtained as geological research progresses, the location and type of exploration work necessary to determine reserves, and in the organization of these works.

Magnetite, individual crystals of octahedral habit. From the collection of the Mining Museum

Zavaritsky A.N. One of the ways to determine the optical sign of a crystal on a universal stage // Journal of Mining Institute. 1912. Vol. 3. P. 398-399. https://pmi.spmi.ru/pmi/article/view/15529

Abstract. Two provisions are considered: 1. Property of crystals with an angle of optical axes 2V=90°C. 2. Determination of the optical sign of a biaxial crystal on a universal stage, when no optical axis is visible. It is possible to determine the position of the obtuse and acute bisector of the angle of the optical axes, and therefore the optical sign of the crystal.



Zavaritsky A.N. On the optical study of minerals in convergent polarized light // Journal of Mining Institute. 1913. Vol. 4 (3). P. 192-227. https://pmi.spmi.ru/pmi/article/view/15445

Abstract. This article proposes an attempt to deduce the main principles underlying the use of converging light, based on the basics of the theodolite method. This particular path is the most appropriate if you follow the requirement to go from simpler to more complex. As will be seen from what follows, the logical development in this the direction of the main provisions of the theodolite method leads to almost the same ideas from which Becke proceeded when explaining the phenomena detected by a crystal in converging light. In addition to some theoretical interest that the presentation of these techniques may have, based on the ideas underlying the theodolite method, it seemed to me useful for the purpose of comparatively assessing the limits of application of each of these two different methods of research.

Zavaritsky A.N., Nikitin I.K. Some preliminary results of the study of melted rocks // Journal of Mining Institute. 1935. Vol. 9 (1). P. 41-44. https://pmi.spmi.ru/pmi/article/view/15313

Abstract. We studied random samples of thin sections of melted rocks, which were given to us by A.V. Vvedensky. We did not pursue the goals of a systematic study of this random, although quite extensive (about 200 thin sections) material, and in this note we limited ourselves to only some data, characterizing the more common types of these “artificial rocks”. The vast majority of the studied thin sections represent glasses that have just begun to crystallize with the formation of spherulites or various kinds of skeletal formations. Only in a few thin sections could one find individualized minerals in such a form that they were amenable to optical examination. Therefore, the main task of the study was the study of structures, and much less work was the study of minerals.

Zavaritsky A.N. About one important petrochemical regularity // Journal of Mining Institute. 1935. Vol. 9 (2). P. 1-12. https://pmi.spmi.ru/pmi/article/view/15331

Abstract. By “petrochemistry” we should understand the totality of our information about the chemical composition of rocks, consisting of “many” (in the mathematical sense) chemical analyzes of rocks, and the conclusions that can be drawn from this information. Developing those methods of calculation of chemical analysis that were used by Michel-Levy and Ozanne, the author of this article has shown in other works that the main features of the chemical composition of igneous rock, data in its analysis, can be especially conveniently reflected in the form of such series of ratios, the sum sets of which uniquely reflects the set of chemical analyzes and is equivalent to it. The diagram clearly shows the desired correlation between the lengths and directions of the strokes, depending, obviously, on their position on the diagram. This shows an important correlation between the characteristics of the salic and femic components of an igneous rock.

Zavaritsky A.N. Lavas and associated rocks of the Somma and Vesuvius and a diagram expressing the features of their chemical composition // Journal of Mining Institute. 1939. Vol. 12 (2). P. 1-22. https://pmi.spmi.ru/pmi/article/view/15080

Abstract. This article provides an example of the application of the method of depicting the chemical compositions of rocks using vectors to the study of the phenomena of magma differentiation and magmatic evolution. As such an example, I took the only one of its kind, the most well-studied case, namely the famous volcano Vesuvius in the history of mankind. In the depths of igneous bodies – plutons – processes occur under conditions significantly different from those in which we directly observe magma reaching the earth's surface in the form of lava. Compared to other volcanoes, Vesuvius, thanks to its study, has the advantage that here we even have some data on the progress of the process over time. Regardless of this or that hypothesis, the presence of a shift in the line of differentiation of lavas with each new cycle of volcanic activity can be considered established for the chemistry of rocks. This displacement turns the line of differentiation into a strip of points or vectors. This arrangement of elements, depicting the chemical compositions of rocks in the form of a strip, is a characteristic feature of almost all such diagrams. The general arrangement of these geometric elements, the position of some of the axial lines of their stripes provide a clear general characteristic of the chemistry of the volcanic and plutonic formations presented in the diagram. But this is only the first step towards studying their chemistry with the help of a diagram.

Volcanic lava ("rope lava"). From the collection of the Mining Museum

Crystalline sulfur. From the collection of the Mining Museum

Zavaritsky A.N., Vasnetsova O.P. How to make drawings of thin sections of rocks // Journal of Mining Institute. 1939. Vol. 12 (2). P. 23-31. https://pmi.spmi.ru/pmi/article/view/15081

Abstract. One can get a thin section drawing in different ways. It goes without saying that only someone who knows how to draw well and who also knows enough petrography can draw a picture observed under a microscope without using any auxiliary equipment. These two qualities are not so common are combined in one person, and besides, this work is so tedious and requires such attention that in practice it is hardly worth using, therefore it is necessary to use some auxiliary devices. There are three main ways: drawing using a drawing device; drawing by projecting an image onto a table; drawing from a photograph. The method of obtaining a thin section pattern outlined in this note is by no means new. It was not only applied, but also described. The purpose of our work was to test its applicability in the conditions with which most of our petrographers now have to deal. One can hope that the use of these simple techniques will lead to an improvement in the quality of petrographic drawings in our publications. It goes without saying that the same techniques can be used to obtain line drawings and other objects, for example, polished opaque sections and even individual outcrops/shapes, etc.

Biographical articles about A.N. Zavaritsky

Rudenko S.A. Feldspars of ceramic pegmatites of the Southern Karelia // Journal of Mining Institute. 1952. Vol. 27 (2). P. 159-196. https://pmi.spmi.ru/pmi/article/view/14240

Abstract. Recently, a discussion has developed regarding the genesis of pegmatites. The beginning of this discussion was laid by D.S. Korzhinsky in 1937. In 1944, A.N. Zavaritsky demonstrated the inconsistency of the physicochemical substantiation of the pegmatite process proposed by Vogt and Niggli and accepted by A.E. Fersman. Later, in 1947, he put forward a new theory of the genesis of pegmatites, contradicting the idea that pegmatites are a product of direct crystallization of residual melt (A.E. Fersman's theory). According to A.N. Zavaritsky, the main structural features of pegmatites are created as a result of recrystallization of certain igneous rocks. Next, V.D. Nikitin, who studied ceramic and mica pegmatites (1946-1951), based on a detailed analysis of the relationships between individual minerals and structural components of pegmatites, developed ideas about the genesis of pegmatites of this specific type, which are basically consistent with the theory of A.N. Zavaritsky. However, much effort is still needed to more fully resolve issues related to establishing all the features of the transformations that both the deposits as a whole and the individual minerals that make them up undergo during the complex and lengthy process of pegmatite formation. This article highlights the main features of the evolution of feldspars in ceramic pegmatites of Southern Karelia.

Mokrousov V.P., Tolstikhin O.N. Tectonics of Southern Kamchatka and the Kuril Islands // Journal of Mining Institute. 1959. Vol. 35 (2). P. 168-174. https://pmi.spmi.ru/pmi/article/view/13006

Abstract. The most complete schemes of the tectonic structure of Kamchatka were made by M.F. Dvali and B.F. Dyakov. F. Dyakov. A numerous group of volcanologists headed by A.N. Zavaritsky paid much attention to the issues of disjunctive tectonics of Kamchatka and the Kuril Islands. The works of the team of geologists and geophysicists of the expedition vessel "Vityaz" were of great importance in understanding the tectonic structure of the Kuril Islands. In addition to these works of regional importance, the issues of tectonics of certain areas were covered in various geological studies.

Volcanic sand, impregnated with exhalations. From the collection of the Mining Museum

Shafranovskii I.I. Crystallography, mineralogy and petrography in Journal of the Leningrad Mining Institute // Journal of Mining Institute. 1959. Vol. 40. P. 47-50. https://pmi.spmi.ru/pmi/article/view/12861

Abstract. The Journal of the Leningrad Mining Institute during the fifty years of its existence occupy a prominent role in the history of the development of Russian mineralogy and crystallography. From the beginning of the foundation of the journal and to the end of his life one of the most active workers of the Notes was the famous professor and director of the Mining Institute, the greatest Russian crystallographer, geometer, petrographer, and mineralogist E.S. Fedorov (1853-1919). From 1907 to 1917, 144 of his works appeared in the pages of the Notes. Of these, 65 are related to crystallography proper, 4 to mineralogy and 5 to petrography. The remaining articles treat mainly questions of new geometry, intensively developed in those years by the scientist. However, in these seemingly purely geometric works E.S. Fedorov paid special attention to the practical use of his theoretical conclusions in the field of crystallography, mineralogy and mining. Thus, for example, in the article "Precise representation of points of space on the plane" (1907, Vol. I, Issue 1) various ways of representing points of three-dimensional space on the plane with the help of circles (vectoral and ordinary) and parallel vectors are proposed. In the article "Representation of Crystal Structure by Vectorial Circles" (1908, Vol. I, Issue 4), the mentioned methods were successfully applied to represent elementary particles composing spatial crystal structures on the plane. This remarkable method was recalled by A.N. Zavaritsky and demonstrated its efficiency on examples of the image of real crystal structures.

Porotov G.S. Relation of magnetite mineralization with magmatism in the Turgai Trough // Journal of Mining Institute. 1977. Vol. 72 (2). P. 9-24. https://pmi.spmi.ru/pmi/article/view/11223

Abstract. Skarn-magnetite deposits owe their appearance to magmatic processes. However, the forms and nature of manifestation of the connection of deposits with magmatism are diverse. The dominant hypothesis, developed by P.P. Pilipenko, A.N. Zavaritsky and their followers, about the formation of skarn-magnetite deposits in the contact zone of intrusive massifs with carbonate sediments.

Rudenko S.A. Conditions of formation and formations of granitic pegmatites // Journal of Mining Institute. 1983. Vol. 95. P. 41-49. https://pmi.spmi.ru/pmi/article/view/10742

Abstract. Many problems of genetic mineralogy, petrology and geochemistry were developed on the example of pegmatites. A.N. Zavaritsky, D.S. Korzhinsky and N.M. Uspensky, prominent scientists – representatives of the geological school of the GeolCom – All-Russian Geological Institute – made a very significant contribution to the development of these problems, for the first time in the domestic science paying attention to the leading role in the formation of pegmatites processes of recrystallization and metasomatosis.

Pegmatite. From the collection of the Mining Museum

Dolivo-Dobrovolsky V.V., Marin Yu.B., Strona P.A. Problems of petro- and ore genesis in the works of Academician A.N. Zavaritsky // Journal of Mining Institute. 1985. Vol. 104. P. 3-8. https://pmi.spmi.ru/pmi/article/view/10587

Abstract. The name of Academician A.N. Zavaritsky, one of the greatest scientists of our country, is associated with a significant stage in the development of Soviet petrography and geology of ore deposits.

Portnov G.S. Criteria for the location of skarn-magnetite deposits in the structure tiers of paleovolcanic apparatuses // Journal of Mining Institute. 1985. Vol. 104. P. 51-56. https://pmi.spmi.ru/pmi/article/view/10593

Abstract. In A.N. Zavaritsky's works the questions of geology of sorcery and contact-metasomatic deposits occupy a great place. Suffice it to mention the works on the establishment of interrelationships of sorcery deposits with volcanism and a fundamental monograph on "Magnitnaya Mountain and its iron ore deposits".

A mineral named in honor of A.N. Zavaritsky

Murzinskaya O.A., Nepochatova A.V. Modeling of crystals and structures of rare minerals: zavaritskite, betechtinite, saffronovskite // Journal of Mining Institute. 2007. Vol. 173. p. 14-16. https://pmi.spmi.ru/pmi/article/view/7541

Abstract. Brief description of three rare minerals, zavaritskite (BiOF), shafranovskite ($K_2Na_3(Mn,Fe,Na)4[Si_9(O,OH)_{27}](OH)_2 \cdot nH_2O$, $n \approx 2{,}33$) and betekhtinite ($Pb_2(Cu,Fe)_{21}S_{15}$), are given. Digital models of their crystal forms and structures are simulated with application of the Shape v.7 and Atoms v.5 software packages. Basic structural patterns which may determine physical properties of the studied minerals have been revealed.

Zavaritskite. From the collection of the Mining Museum

Scientific edition

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G.D. Gorelik (Showcase at the National Museum of the Republic of Bashkortostan),
NASA Johnson Space Center (Zavaritsky Volcano.
Image taken from the International Space Station (fragment))

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