Mineralogical information in the diary of D. G. Messerschmidt on the route of the future Siberian expedition of P. S. Pallas: materials for the study of scientific continuity

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Abstract. This work is aimed at detecting information from the field of mineralogy in the documentary heritage of the first scientific expedition to Siberia by D. G. Messerschmidt. The analysis was made of an expedition diary, the original of which is kept in the St. Petersburg Branch of the Archive of the Russian Academy of Sciences, – the fragments that describe Messerschmidt's Siberian route, coinciding with the future route of P. S. Pallas, who visited many of the Siberian regions that Messerschmidt had explored half a century before. Messerschmidt recorded data on several groups of minerals, including salts, metals, clays, micas, etc. The question of Messerschmidt's creation of his mineralogical collections, as well as their systematics and cataloging deserves special study. The analysis of the results of the Messerschmidt’s observations provides material for establishing the influence on Pallas of the first German scientist traveler, despite the fact that Pallas knew well Messerschmidt’s scientific heritage and made his efforts to make it public.

1. Introduction
Peter Simon Pallas (1741–1811) can justifiably be called an adept of a German doctor, scientist and traveler Daniel Gottlieb Messerschmidt (1685–1735), who was sent to the first scientific voyage to Siberia by the royal decree of Peter I of November 15, 1718. This voyage, from the moment of departure from St. Petersburg on March 1, 1721 and until return to the capital on March 27, 1727, lasted almost exactly 8 years. The research of the German scientist in Siberia acquired a large-scale character [1]. Messerschmidt collected a huge amount of information on the natural history of Siberia, its ethnography, archeology, peoples and languages, and also delivered rich natural science, archaeological and ethnographic collections to St. Petersburg [2].

2. Publication of the results of the Messerschmidt expedition
The results of the Messerschmidt expedition remained unpublished for a long time [3] and even today are not available, for the most part, to a wide range of researchers. Today, the St. Petersburg Branch of the Archive of the Russian Academy of Sciences (SPbB ARAS) is the only institution that preserves the manuscript heritage of the scientist, which has not yet been fully introduced into scientific circulation. In the 1960s–70s, the publication of expedition diaries was undertaken in Berlin [4]. This edition, however, could not be completed in full as planned, and the published text has significant
gaps. This article will provide references to the original handwritten diary, that is stored in the SPbB ARAS, with an indication of the archivesignature in parentheses; to be able to search for information in the published diaries, the date of the diary entry will be indicated.

The final part of the diary, which contains Udmurt materials and was not included in the Berlin edition, was published with a Russian translation in 2001 [5]. A fragment of the Berlin edition with a description of the way from Mangazeya to Irkutsk was also published in Russian [6]. This is actually limited to modern publications of Messerschmidt's manuscripts. In 2020, the SPbB ARAS undertook a facsimile edition of the most important manuscript of the researcher, which he entitled “Sibiria Perlustrata” (hereinafter – SP) (“Description of Siberia”) and it is a detailed final report on the results of the expedition [7].

3. The role of Pallas in the publication of the results of the Messerschmidt expedition

We have dwelt in such detail on the fate of the scientific heritage of Messerschmidt, so that the role of Pallas in the publication of the results of his works becomes more clearly visible. It was Pallas who first attracted the attention to the scientific heritage of Messerschmidt. Pallas carefully studied the archival materials and travel diaries of his colleague, constantly turned to his manuscripts when writing his works and repeatedly referred to them [8]. It was Pallas who became the first and, until recently, the only one who paid tribute to the unscientific side of Messerschmidt's activities. Only recently, these hypostases of the German scientist have been rediscovered: Messerschmidt is an artist [9], Messerschmidt is an artificer [10], Messerschmidt is a pietist [11].

Moreover, Pallas considered it his duty to publish part of the scientific heritage of his predecessor and in 1782 he was the first, who published fragments of travel diaries. In the introduction to the publication, Pallas writes the following about his senior colleague: “His compilations were a significant contribution to the natural science collection of the Russian Imperial Academy of Sciences, his diaries, descriptions, messages, although they were often used but most of the territories through which he passed were visited later by other scientists, and his notes in diaries, etc. lost relevance, and therefore were not published; however, this worthy, almost forgotten and already at the time little noticed husband deserves very much that he and his merits in the study of Siberia became known and justice was done to him. It will not be superfluous to publish Messerschmidt's zoological, ornithological and other descriptions” [12]. Such “other descriptions”, which until recently remained completely unknown, are the mineralological observations. Name of Messerschmidt was for many years almost completely silent in the works on the history of mineralogy, and only recently has the study of this aspect of his activity begun [13].

4. Part of the Messerschmidt’s route – the object of analysis

In the context of studying the scientific influence of his senior colleague on Pallas, the results of Messerschmidt's observations on those segments of his voyage that coincide (or almost coincide) with the route of the Siberian expedition of Pallas are of interest.

Having recovered from St. Petersburg in March 1719, Messerschmidt arrived in Tobolsk at the end of December and remained there for more than a year. Only on March 1, 1721, Messerschmidt moved from Tobolsk in the direction of Tomsk. It is Tomsk, where Messerschmidt arrived on the evening of March 30, 1721, that can be considered the point of intersection of the Siberian routes of the two travelers, where Pallas arrived exactly 50 years later (in 1771) after Messerschmidt visited this city. Further, the route of both travelers, although at different speeds and with different deviations from the route, ran in a similar way; the intersecting points of the route were: AbakanskyOstrog, Krasnoyarsk, Irkutsk, Selenginsk. From Selenginsk, both travelers took a trip through Dauria, visiting the Chitinsky Ostrog and the Nerchinsky factory, from where they both turned back to the west [14].

To determine the degree of influence on Pallas, it is interesting to study the Messerschmidt’s observations on intersecting segments of their routes. The main information about these observations is given by the Messerschmidt’s travel diary. At the same time, the independent observations of the traveler are most objectively reflected in the part of the diary that was written by Messerschmidt.
himself: before leaving the expedition, his companion, the captured Swedish captain Philipp Johann Tabbert, in the nobility – von Strahlenberg (1676–1747) was engaged in writing a diary. Having received permission to return to his homeland, Ph. J. Strahlenberg left the expedition after a joint three-month stay of travelers in Krasnoyarsk – at the end of May 1724. After this Messerschmidt went on a trip of the surrounding area and returned to the “common” route with Pallas – to Krasnoyarsk – on October 3, 1722. In this regard, a fragment of the diary was selected for analysis, starting from this date and up to the arrival of Messerschmidt in Nerchinsk on August 1, 1724. Mineralogical and metallurgical descriptions made at the Nerchinsky factory should become the object of a separate description and are partially presented in the publication of 2021 [15]. There is a small lacuna in this place of the diary: on November 9, 1722, the diary is interrupted and resumes from January 1, 1723. On the way back from Nerchinsk, the exit point of Messerschmidt on the “common” route can be considered the Chitinsky Ostrog, where the traveler arrived on November 10, 1724; then the road was laid to Udinsk, Irkutsk and Yeniseisk, from where Messerschmidt left on July 15, 1725 by a route that already ran north of the rout of Pallas [16].

5. Messerschmidt's notices on minerals

Thus, the time intervals of 10 months (the way to the east) and almost 8 months (the way to the west) were studied, but not much mineralogical information was found (compared to other natural sciencedata).

5.1. Rock salt

The main volume of information about the mineral kingdom during the advance to the east was recorded during the wintering in Krasnoyarsk in 1722/1723. The main interest for the scientist was minerals of economic importance. On January 9, 1723, Messerschmidt recorded a message about the monastery salterns located on the Usolka River. “The source of salt,” the traveler reports, “is very rich and is drawn from a depth of no more than 6 sazhens. For many years it has been cooked only in two pans; now there should be a lot more of it. The salt is very fine and white”.

Information about the extraction of salt was also recorded on the back way: during the wintering in Irkutsk, on January 19, 1724, Messerschmidt received (apparently by specifically asking) information about minerals of industrial importance. A local traveler (Dmitry Ivanovich Kichkin) reported that there are so many Sal rupeum, or fossile, in the mountains of Lena and Vilyuy Rivers that one pod could be bought for 2 kopecks, although in the Prikaz it was estimated at 15 kopecks. About iron, Messerschmidt wrote, that traveler did not hear anything.

5.2. Iron ores and iron smelting

On February 7, 1723, a traveler came with his iron to a local blacksmith to forge a chest, and found out that he himself makes iron from local ore (Eisenstein), which is found everywhere on the Kacha River, and I brought some specimens. However, he did not know anything about the use of additives in the melting process. The blacksmith added that the common practice in this area is the smelting from a mineral, which is called by local people “petrified wood” and to which Messerschmidt gave the terminological name Lithoxylum (Greek lithos – stone, xylon – wood), or Lithoxylummartiale, emphasizing with this epithet the ore-bearing property of the mineral. This raw material, according to the blacksmith, was quite suitable for producing iron–although it turns out to be of lower quality and mostly burned during smelting (SPbB ARAS, f. 98, l. 1, fl. 2, p. 23v–24).

A few days later, on February 15, 1723, this information was confirmed by another local inhabitant, who reported that the obtained from it iron is good, but hard, and therefore it is necessary to add a third or half of other stones (i.e. ore). Messerschmidt adds, that this raw material itself does not give good iron, but can be used instead of additives (according to him, instead of lime). “It really was a tree,” writes D. G. Messerschmidt, “which is proved by the fact, that he first he found a thick trunk, and then, digging, found branches that became smaller and smaller, and then there was nothing at this place”. It is obvious that we are dealing with apseudomorphosis of some mineral on wood. In
the absence of a more accurate description, it is difficult to uniquely identify this mineral. In the Berlin edition of the diaries, it is assumed that it was an opal (Holzopal) [17]. However, taking into account the described region, it should rather be chalcedony, agate or onyx, colored with iron oxides, possibly with goethite.

On February 15, 1723, an attendant brought Messerschmidt two specimens of a mineral, which the German traveler called Eisen=Malhn and which, according to him, produced fine soft iron. The second part of this name (=Malm), associated with the modern denomination, may mislead about the identification of this mineral. However, two days earlier, on February 13, 1723, Messerschmidt used as synonyms the names Eisen-Malmon and Minera Martis (i.e. ‘iron ore’). Indeed, at that time, the German term Eisenmalm meant nothing more than hematite.

5.3. Clay, ochre, marl
In Krasnoyarsk, Messerschmidt also recorded a block of information about fine–dispersed aggregates. On January 13 and 14, 1723, he made notes about the mineral, which he called Rubricafabrilis (‘red ochre’). The outcropping of this mineral was known – which was confirmed by several informants (probably D. G. Messerschmidt rechecked the information, as he did, in particular, when collecting linguistic material) – near the village of Kuvarshino (see records for February 15, 17 and 18, 1723). Such a specimen (‘of beautiful red ochre’) was delivered to Messerschmidt by his attendant on February 15, 1723, but the German traveler had the impression (the reason for this is not explained) that it was taken from under the Kansk Ostrog.

Interestingly, in parallel with red ochre, Messerschmidt at the same place of the diary, on February 15, 1723, mentions a reddish-colored mineral (rötlisch), which he calls Bolus, i.e. ‘clay’, and a sample of which was delivered to him. The Russian, who presented this specimen, reported that the local inhabitants use it to paint their sledges. On February 18, 1723, a Russian from the village Shivera reported that both ochre and Bolus were found on both sides in the village Kuvashinio. How Messerschmidt distinguished red clay (Bolus) from red ochre can only be assumed.

It should be noted that, describing a later visit to the Argun mines, Messerschmidt mentions Ochrafofinarum Argunica (‘Argun mine ochre’) [18]. Messerschmidt perceived all these as independent minerals and it follows in this the tradition he learned in the mineralogical works. This is clearly seen in the above-mentioned work “Sibirtia Perlustrata”. The first natural science section of the work is devoted to Regnum minerale and contains a list of minerals to which medicinal properties were attributed. The list is based on the work of Samuel Dale [19]. For each of minerals, the variants of names that were available in the scientific literature before the beginning of the 18th century are given and those, that were met by Messerschmidt on the way of his expedition, are marked (with an indication of the places of find).

This list contains Bolus (Germ.Bolus, Engl. Bole), which meant clays used in medicine (including a white one).Messerschmidt does not write anything about Bolus from Siberia [20]; obviously, because the specimen, which was met in Krasnoyarsk, was not related to the pharmacy practice. The term Rubricafabrilis meant what was called ‘Raddle, Red Oker, Marhing-Stone’ in English,‘Rötel, Roth-Stein, Reich Berg–Rötel’ in German and ‘vap’ in Russian (the same German and Russian names are indicated in the noticeof January 13, 1723). About this mineral, Messerschmidt also clarifies that this is an ordinary clay, but compressed (Bolus communis, obsignatavero). In SP, only the village Kuvashino (Kuwarshinah) near Krasnoyarsk is named as the place of find of this mineral in Siberia [21]; in other places along the way, Messerschmidt obviously did not encounter such samples. It is clear that at that time there were no methods similar to the X-ray diffraction diagnostics of minerals that exist today, and the mineralogical classification was more simplified, so the fine-dispersed aggregates differed only by external features. In particular, the above mentioned Ochra from the waters of the Argun mines has in SP equivalents: in English – ‘Yellow Oker’, in German – ‘Berg-Gelb, Ocker–Gelb’. Previously, it was described only by S. Dale as a mineral found in England. In addition to the Argun mines, the Ural settlement of Kamenskoye and the Iset River are also indicated.
in the SP [22]. It is likely that the terms *Rubricafabrilis*, *Bolus*, *Ochra* reflect different color shades and general external characteristics of clays, without being tied to their mineral composition.

On April 8, 1723, the German attendant of Messerschmidt was specially sent ‘to the field’ and, among other things (see below), brought a red marl (*Margarubra*), which was found on the Kacha River. This specimen obviously had no apothecary value, because it is not described in SP among other marls, and the expedition documents do not provide more accurate information about it.

5.4. *Other minerals: mica, salammoniac, jasper etc.*

While staying in Krasnoyarsk, Messerschmidt received information about the presence of other minerals there (the diary does not always specify whether he received samples of these minerals, although it should be assumed that in most cases he should have received them). So, local inhabitants reported that large pieces of *Phengiten* were found near the village Shivera. It should hardly be assumed that Messerschmidt understood by the name “phengite” the same thing that modern science understands. Back in the mid–19th century, the term “phengite” was used for all biaxial micas, so we will continue to use the general term “mica”. According to the information available to the traveler, the mica faults should have been on the Kan River, near to the confluence of the Barga River into it (reports from two informants on February 17–18, 1723)(SPbB ARAS, f. 98, l. 1, fl. 2, p. 29–29v). On January 18, 1723, Messerschmidt, splitting a sample of mica into thin plates and observing how they were attracted to his fingers, tried to explain this effect and called it *vis electrica in Lapidespeculare* (electric force in a mirror stone). The name “mirror stone” is a reminder of the perfect cleavage of micas, which have the property of reflecting like a mirror.

Messerschmidt worked with micas on the way back, during wintering in the Chitinsky Ostrog. Judging by the diary notes, he personally cut specimens and was engaged in their preparation for joining the collection (notes on January 7–8, February 16 and 19–21, 1725). It is noteworthy that in the entries for January 7 and 18, 1725, D. G. Messerschmidt uses the terms *Phengiten* and *Marienglaβ* (‘Mary's glass’) as synonyms. There is reason to believe that the name “Mary's glass” could also mean a transparent kind of gypsum [23]. Thus, this issue requires further study: perhaps, in different folk traditions, different minerals could be called this way.

On March 5, 1723, Messerschmidt recorded a message about a field of salammoniac (*Sal ammoniacumnativum*) on the “Burning Mountain” on the left bank of the Yenisei, near to the mouth of an unidentified river named *Kamel*. Peter Kratz was sent on April 8, 1723 on a research excursion (see above) and delivered Messerschmidt a specimen of red jasper (*Jaspis*), which is found on the Kacha River, and of black marble without streaks.

It is important to note that all this information was, apparently, the results of a purposeful search by Messerschmidt; data on one mineral was obtained from different informants, which should indicate a verification of its reliability. This is also evidenced by the diary note of February 13, 1723: Messerschmidt writes that on that day he sent his attendant with the task to find out about red ochre, mica, *Lithoxylummartiale*, hematite (*Eisen-Malmon*), “stone oil” (*KamennaeMasla*, i.e. petroleum), salammoniac (*Naschatyr*), etc. Obviously, some information had reached the traveler, and he needed to check it.

On the way from Krasnoyarsk to Mangazeya, only one message was recorded (June 16, 1723), but very curious: an informant who lived claimed that “there should be amber (Succinumfossile) on the Khatanga River, but not near the Arctic Ocean itself”. This is one of the first mentions of the presence of amber in this region, the purposeful study of these deposits began in the USSR only in the 1970s.

On the way back, after the wintering in Chitinsky Ostrog, information about minerals was recorded just once – on February 24, 1725 – the day when the traveler went from the Chitinsky Ostrog to Udinsk. The record lists minerals found by Messerschmidt during an excursion to Podkanemnaya Tunguska (Katanga), that is, not on the route under consideration. The traveler calls cobalt, selenite (or *Spat*), mica, coal. At the same time, he wrote down the assumption of a local inhabitant that there should be deposits of copper ore in this area, not far from the roadway, and mining workers should soon start searching for it.
6. Conclusion
We must state the fact that Messerschmidt, according to the extent possible and by virtue of his competence, was engaged in a purposeful search for information about Siberian minerals – primarily those that were of economic importance. His research was most fruitful during a long winter stay in Krasnoyarsk in 1722/23 and the Chitinsky Ostrog in 1724/25; it was difficult for a traveler whose specialty was not mineralogy to conduct such searches while moving from one city to another. The question of Messerschmidt's creation of his mineralogical collections, as well as their systematics and cataloging, deserves special study. Diary notices indicate the deepening of the scientist's interest in these issues and the desire to develop his professional approach. It is known for sure that the mineral specimens were received by the academic museum collection [24], but today the traces of his collection have been lost, and in the Mineralogical Fersman’s Museum RAS, where the Mineral Cabinet of the Kunstkamera was moved in the 1930s, the collection is not attributed today. This attribution is an important task not only for the study of Messerschmidt's scientific work, but also his influence on his follower – Peter Simon Pallas.

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