

**CRITERIA FOR ASSESSING THE SCIENTIFIC
SIGNIFICANCE OF PALEONTOLOGICAL COLLECTIONS
ON THE EXAMPLE OF THE MINING MUSEUM (ST.
PETERSBURG)**

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ABSTRACT

The mining museum in St. Petersburg keeps numerous paleontological collections and materials on stratigraphy and historical geology. The story of its accumulation started at the first half of XIX century with the beginning of the earliest geological study of the European part of Russia (including the Russian journey of R. Murchison). The museum paleontological and stratigraphical fond includes the collections of scientific expeditions, personal geological excursions of scientists, acquisitions of the buying or exchange from abroad, collections, the study of which have not been published by the authors. Among the authors of the collections are some world-known paleontologists and geologists like Ch. Pander, A. Keyserling, G. Helmersen, K. Eichwald et al.

It is obvious that the greatest value has collections containing originals to books and articles on paleontology. These materials are well known among paleontologists thanks to Museum cataloges and references to samples in publications. However, most of the paleontological collections, numbering more than one hundred thousand samples, is unknown and is not in demand among specialists. Attribution and cataloging of these collections require a comprehensive analysis of their structure, including the definition of criteria for assessing their scientific or educational significance. Experience with paleontological collections in the Mining Museum has shown that the following criteria determine the greatest scientific value of the collections.

First: the origin from the classical sections described in the geological literature, which may be stratotypes or be in stratotypic areas. These samples can serve as a reference in the study of paleontological species, first described by the materials from these sections, if necessary, among them can be selected neotypus. Secondly, the value of the collection can be determined by its origin from the lost sections. The study of such materials allows learning about the stratigraphic interval and faunistic characteristics of these deposits, which is especially important in the case of unique locations for the study area. Third: collections from hardly accessible regions. These are materials from areas where special paleontological and stratigraphic studies are not currently being carried out and which are difficult for specialists to visit for geographical or political reasons. Fourth: the value of paleontological collections may increase depending on how fully they characterize a particular geological formation (or geological region in which several formations are developed). From this point of view, the most valuable are the materials of long-

term systematic studies. The proposed article considers the examples of the collections of the Mining Museum in Saint-Petersburg the most interesting from the point of view of all of the proposed criteria or their combinations.

Keywords: *paleontological collections, natural-science collections, paleontological museum, Mining Museum, geological heritage.*

INTRODUCTION

The problem discussed in this article is formulated as a result of work with paleontological collections in the Mining Museum in St. Petersburg. The Museum has a long history and keeps numerous samples of very different taxonomic composition, geological age and geographical origin. These facts result in many difficulties relating to the attribution, systematization and cataloging of these collections. The Museum is almost 250 years old and about 200 years ago it began to accept paleontological collections for storage systematically. During this time, the Museum has gone through very different stages. Some changes related to the working conditions in the Museum: in different periods, the number of employees including qualified paleontologists changed significantly which affected the detail of the collection records. Some changes were related to the history of the country: the revolution, the arrests of leading experts, the war, preparations for evacuation, the siege of Leningrad and the bombing affected not only the maintenance and preservation of records, but also the storage of samples, the integrity of collections and the conformity of labels to samples. The scientific approach to the systematization of collections was also different: the collections received from different authors, which were the integral results of a particular researches, used to be recorded in the books of the income as a whole. However, later they could be used to form expositions on stratigraphy, regions or taxonomy that often led to the loss of information about the exact geographical and stratigraphic reference and attribution to a particular author.

Currently, the Museum faces a number of challenges. The first is the attribution of a huge number of samples, the clearing of their geographical and paleontological reference (if possible), the maximum possible restoration of the author's collections. The second is the cataloging of samples so that they become known to paleontologists. Planning of this work required the identification of the most important collections, the cataloging of which is advisable to carry out in the first place.

Since the author assumes that the described problems can be typical not only for the Mining Museum but also for some other natural science museums, the article tells about the criteria for assessing the scientific significance of paleontological collections formulated on the example of the Mining Museum.

MATERIAL AND METHODS

Paleontological collection of the Mining Museum includes about one and a half hundred thousand samples. That part of them, which is the originals to monographs and articles on paleontology (about ten thousand samples), well-attributed and cataloged [1]. The proposed criteria are based on the analysis of the rest (most) of

the collections and museum archives over the past two hundred years. We can say that most often the scientific value of these collections increases due to the factors listed below.

The origin from the typical and long-known sections described in the classical geological literature. This paragraph is more about the collections of the XIX century – the time when the chronostratigraphic chart was created, ideas about the systems were formed and the foundations of paleontological taxonomy were laid. During the XIX-early XX century Mining Museum actively acquired a collection of fossils that characterize the most famous geological formations in Europe. At the same time, the Museum received the materials of the first studies of sedimentary formations in Russia. In 1820th-1830th it was mainly collections from the outskirts of St. Petersburg, and later from more distant territories. It should be mentioned that the Museum holds specimens collected by N. I. Koksharov who accompanied R. I. Murchison in his journey in Russia in 1840-1841 [3], collections of the author of the fundamental work "Paleontology of Russia" (1854-1861) E. Eichwald, one of the founders of Russian paleontology Ch. Pander and many others.

The importance of these collections for paleontology since the authors of the XIX century did not always indicate the holotypes for the species that they established. Sometimes the collection of originals for the monograph has not been saved or a type specimen has been lost. Then, collections about which it is known that this author worked with them, accompanied by his labels and originating from the same sections receive the main value. It is reasonable to choose a sample that will serve as a neotype among them.

Speaking of the importance of these collections for stratigraphy, the most obvious is to mention the possibility of using the huge material collected throughout Europe and Russia in stratotypic areas or other classical sections for the study of these sections by specialists and students. But in this case, we will talk more about the methodological (or educational) value than about the scientific one. The scientific value may be due to the fact that they were collected in the XIX century. The modern experience of studying of the sections, known to the general public for a long time, shows that the picture of their faunal characteristics may differ significantly from that which develops in the study of historical collections. This is due to the handmade impoverishment of faunal complexes in sections due to long-term collecting. In addition, the study of modern collections often does not allow us to accurately understand about the fauna itself: for example, in many collections of the fauna of Ordovician of the Leningrad region, we can find much more representative samples, large with well-shown species characteristics. At the same time, the once-famous sections themselves are often not rich in such samples. Therefore, it is necessary to get acquainted with the Museum collections, when working with such classical sections, not only with the collections of the originals to the monographs, which consist of the most typical single samples, specially selected by the author, but also with the materials of numerous collections that give the most complete idea of the faunal characteristics of the section.

The origin from the lost sections is the next feature that significantly increases the scientific value of paleontological collections. An example of such collections is the numerous materials from the outcrops of Ordovician on the Pulkovka river South of St. Petersburg. A series of outcrops on the river Pulkovka has been described by W. T. Strangways in 1821 during his travels around St. Petersburg [5], [6]. In 1830 it was studied by Ch. Pander [4]. During the XIX century it continued to arouse interest among geologists. To date, these sections have been lost largely due to landslide processes, in part probably due to road construction. The Museum has a large collection of fossils from these sections, collected in 1866 by an unknown author (the exact attribution of these samples is not possible due to the lack of records about them in the Museum archive, but there is reason to attribute them to G. Helmersen). The study of Ordovician brachiopods from this collection [7] made it possible to draw a conclusion about their taxonomic composition from the point of view of modern paleontology and to clarify the stratigraphic interval of Ordovician deposits that were exposed in these sections. Thus, it seems promising to study samples from the river Pulkovka in the collections of the Pander, Helmersen, Kutargi and Eichwald.

The study of the collection of Ordovician outcrops on the Popovka river is of the same interest. These outcrops, which were of interest not only from the point of view of paleontology and stratigraphy, but also from the point of view of neotectonics, practically disappeared due to landslide processes and private constructions.

Currently, in the Mining Museum materials from a number of such lost sections in the Leningrad region have been identified, but further study of collections from other regions will probably reveal many more such collections from Russia and all around the world.

Collections from hardly accessible regions. The arguments for the high scientific value of collections originating from hard-to-reach regions generally coincide with those for lost outcrops, but here we are not talking about individual sections, but about large areas that are not available for study for an indefinite period due to geographical or political reasons. With regard to the Mountain Museum, we must first mention collections from the Arctic (Novaya Zemlya, Severnaya Zemlya, Franz Josef Land), sparsely populated areas of Siberia and Russian Far East, some areas of Central Asia. The study of stratigraphy and paleontology of these areas by private initiative researchers is impossible because of the need for expensive organization of expeditions and technical support. Special projects for the study of geological formations that allow working on the sections for a long time are very rare [2]. In this case, samples of earlier collections can help the author. They, of course, will not replace a full detailed study of the section, but can serve to clarify the geographical distribution of the species or its morphological variability. The advantage of these collections in the Mining Museum is that most of them are collected in the second half of the XX century and therefore have an accurate geographical and stratigraphic reference.

Collections that fully characterize a particular geological formation or geological region. This paragraph is about the value of the collection, which is often

not equal to the sum of the values of the samples. The scientific value of one sample can be determined by its safety or the accuracy of its reference to the section and layer. But most often a single fossil has a high scientific value, if it is a paleontological rarity. Such a sample will be important primarily for paleontology itself, and in some cases (and in the presence of accurate reference) for stratigraphy. But such paleontological rarities are few. As for ordinary samples, which can be massively found in some formation, their value in the museum is usually small. However, the value of the collection consisting of these samples increases significantly if we are dealing with the results of collections from one cut described "with one eye". The same applies to the collections of one expedition purposefully explored a particular area. Here we have to say about the importance of these collections for biostratigraphy, faunal characteristics of the region, and from the point of view of paleontology itself about the possibility to study species variability, evolutionary features or area of distribution.

THEORY

The proposed analysis was an attempt to identify those features of Museum collections that make them important (and sometimes indispensable) for the researcher. Most often we are talking about those situations when the materials and facts interesting to the paleontologist can no longer be observed in nature and only the Museum can provide them. But sometimes it is about a practical advantage of the opportunity of initial acquaintance with faunal complexes of interesting sections or regions.

RESULTS AND DISCUSSION

The result of the analysis was the definition and description of the four main criteria for the identification of those paleontological collections that can be most demanded by specialists and therefore should be attributed, studied and cataloged first of all. It is obvious that the greatest interest will represent the collection that respond to several criteria. The author believes that these criteria can be extrapolated to other natural science collections, and their discussion among specialists can be interesting. They can serve both for the analysis of collections and for substantiation of the need of their more detailed studying.

This article did not consider the two other important aspects that determine the value of natural science collections. It is of historical and educational importance. These topics should be the subject of a separate discussion.

CONCLUSION

The above analysis of paleontological collections that were deposited in the Mining Museum for two hundred years showed that to identify the most valuable collections in scientific terms, it is necessary to pay attention to the following features:

- the origin of collection from the typical and long-known sections described in the classical geological literature,



- the origin of collection from the lost sections,
- collections from hardly accessible regions,
- collections that fully characterize a particular geological formation or geological region.

Of course, this list is not exhaustive and each collection should be considered individually. But it allows selecting large segments from a huge mass of samples for further work.

In addition, the proposed list and its substantiation once again demonstrate that the Museum collections are not of only historical, but scientific value both as additional material, and as a necessary source of information that can not be obtained from anywhere else.

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