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Hermeneutic and narrative methods of classical geology within the structure of modern geological research

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Abstract. This article briefly presents the characteristics of hermeneutic and narrative methods used in classical (historical) Geology and also identifies what role they play in modern geological studies, the objectives of which already go far beyond the studies of Earth's past.

1. Introduction

Many researchers suggest that the specifics of geological knowledge consist of the special characteristics of an object and the related methodologies utilized in geology [1-4]. Geology as a science studies the cover or outer shell of our planet, exploring a great range of problems: determination of the age of the planet, the emergence and chronology of development of life on Earth, the distribution of minerals, and the related research and interpretations that follow.

Geology as an academic discipline was founded in the XIX century. According to geologist David Page (1863), geology seeks to recreate all the successive phases of the earth's past. [5]. of geological structures. When Geology emerged as a science, little was known about the past or present of the Earth. Geologists in the nineteenth century tried to reimagine or recreate the events of the past in order to develop a clearer and more accurate picture of the present through the study of rock outcrops.

This leads geologists to confront the uncertainties caused by the incompleteness of information about studied objects and issues relating to understanding the limitations of experimentation in detecting the location of geological features of rocks and their structural formation. In nature, such development has occurred over hundreds of millions of years.

The problem of incompleteness of information leads researchers to another problem - the problem of the status of classical Geology. Is it correct to claim that geology is a natural science when a number of natural-science methods are not fully feasible in researching the earth's surface? It is necessary to understand the nature of the methodology used in classical Geology to determine the degree of the scientific character of Geology.

The scientificity substantiation was involved by at least two scientific schools of philosophy of geology. They are English-American and Soviet-Russian. The English-American school was primarily concerned with the investigation of the historical aspect of Geology. At the same time, the direction represented by the works of Soviet and Russian scientists was monumentally concerned with the investigation of the whole complex of Earth sciences. The historical and experimental-laboratory aspects of Earth investigations are included in this complex.

At present paper we will try to briefly present features of classical Geology methods described in English-American tradition. Also we will try to define what role do they play in modern Geological investigations, aims of which are already far beyond the scope of the Earth past investigations.

2. Hermeneutic and narrative methods as the methods of classical Geology

We can find a solution to the problem of the status of scientific character of geology in the works of the American philosopher R. Frodeman. He suggests that the essence of geological method is knowledge that is similar to methods of the humanities. The philosopher pays attention to structural similarities of geological data with a narrative (the story about consecutive events) which need to be interpreted correctly, using hermeneutical methodology [4, 6, 7] as an alternative to natural-science methodology.

Frodeman focuses on the classical method of work by geologists as a method of working with outcrops, which is best understood through the lens of hermeneutic (interpretive) methodology. "… The role of hermeneutics is not to develop a set of rules for proper interpretation, but to clarify the general conditions under which understanding takes place" [4, pp. 963]. The main principles of hermeneutic knowledge, according to the researcher, are procedures such as the hermeneutic circle and the forestructures of understanding.

The principle of the hermeneutic circle (the knowledge of the parts through the whole and the knowledge of the whole through the parts) allows the geologist most fully and most properly to give a description of geological outcrops. For example, through the analysis of bed layers and their arrangement in space, the geologist may come to the conclusion that in an area there are preconditions for detection of minerals which are of interest to him. That is, through the study of the parts we come to understand the whole. On the basis of the understanding of the geological area (whole), a geologist may better understand the composition of an area of the rock layers (parts), and therefore can predict the approximate location of new, yet undiscovered minerals and rocks (parts). "…our understanding of an outcrop is based on our understanding of the individual beds, which are in turn made sense of in terms of the relationship to the entire outcrop" [4],, - Frodeman writes.

The principle of the forestructures of understanding in geology indicates that knowledge of a geological object begins with initial knowledge of about object. On the basis of an idea by Heidegger, the American researcher, three types of the forestructures of understanding are allocated to arm the geologist before this cognitive activity.

First are "the ideas and theories that we rely on when thinking about an object" [4]. Here we mean knowledge of geological disciplines (stratigraphy, paleontology, etc.) as conditions allow one to "read" and "understand" the geological outcrops and to see the geological features of the site, to determine its origins and to speculate about possible mineral deposits.

A second type of the forestructures of understanding is "our foresight, our idea of the presumed goal of our inquiry and our sense of what will count as an answer" [4]. In other words, this kind of the forestructures suggests that we find what we are looking for. If the geological work concentrated on the discovery of gold deposits in quartz veins in a particular area, its geological model (picture) will primarily include the position and properties of all quartz veins and quartz veins in which gold was found. However, if the geologist had another purpose for the research, the researcher would have perhaps discovered other minerals that are in the same outcrops, and as a result, it would have created another geological picture of the investigated area. Consequently, "the results of our interpretation will depend on the initial objectives of the research" [8].

The third type of the forestructures is to choose the methods and means of research. Because while working with the outcrop, the geologist has before him large number of samples, it becomes important to use specific tools to collect samples, and appropriate methods for the determination of specific rocks. The tools that we use in geological research, determine the nature of the information collected. Therefore, using other instruments, we can obtain other data and, accordingly, to make other conclusions.

It is appropriate to say that interpretation is present in the analysis of physical and chemical experiments. However, for the geologist who needs interpretation for the compilation of a specific geological model of the area, it is necessary to determine the position of each geological object/element in this system and to then formulate corresponding conclusions. Therefore, without answering the questions "where", "in what conditions is" investigation of the geological body and its fragments will not benefit geological knowledge. That is, without coordinate reference to the place of

research of rocks and minerals, this research will be only autonomous petrography and mineralogy, but not geology in its true meaning.

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One more essential direction in methodology of classical geology is the narrative. The narrative methodology represents creation of the story about consecutive events, as a rule, directed to a reconstruction of the past. Working with outcrops of rocks, the classical geologist tried to recreate past events that on their basis as it is possible to make a better model of the Earth in the present. For example, the geologist on certain indications comes to a conclusion that, most likely, in the studied area there existed a cretaceous sea (such as, in the territory of Western Siberia). On this basis, the researcher may assume that Sandstone and clay are the main rocks within a large area of the ancient sea that are not local entities, but are spread throughout the plain.

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3. Classical and modern methods in geology

The principles of hermeneutics in Geology is still relevant today, and commonly used by geologists (even unconsciously). The narrative methodology has faded already into the background. Along with the rapid development of technology and the requirements of the economy there was a shift from predominant study of the past to research the present Earth. Stratigraphy, which is one of the pillars of classical Geology, also no longer carries historical meaning. Now the stratigraphic context for the modern geologist is just a certain sequence of geological strata, not the story of the Earth. Today, there are still people who care about looking for minerals, how long and in what conditions it was formed in particular beds. However, today much more important to know is the capacity of the reservoir, its lithological, and its petrophysical properties, the area stretch and its position in space.

4. Conclusions

Methods of classical Geology, directs attention toward aimed at the description of the geological structures for of the district through the understanding of the past, and, due to its low degree of precision, fade into the background, giving way to high-precision technologies. However, as it was even two centuries ago, the geologist must make the most complete geological description of the area, based upon the interpretation of various data and their comparisons. In the classical period, these data often represented a paleontological analysis; today, field geophysical surveys, logging of wells and geochemical analysis of rocks and minerals help form a much more complete picture for understanding the geological situation.

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