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GEOLOGICAL ASPECT OF THE PROBLEM OF DATING THE GREAT EGYPTIAN SPHINX CONSTRUCTION

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ABSTRACT. The problem of dating the Great Egyptian Sphinx construction is still valid, despite of the long-term history of its research. Geological approach in connection to other scientific-natural methods permits to answer the question about the relative age of the Sphinx. The conducted visual investigation of the Sphinx allowed the conclusion about the important role of water from large water bodies which partially flooded the monument with formation of wave-cut hollows on its vertical walls. The morphology of these formations has an analogy with similar such hollows formed by the sea in the coastal zones. Genetic resemblance of the compared erosion forms and the geological structure and petrographic composition of sedimentary rock complexes lead to a conclusion that the decisive factor of destruction of the historic monument is the wave energy rather than sand abrasion in Eolian process. Voluminous geological literature confirms the fact of existence of long-living fresh-water lakes in various periods of the Quaternary from the Lower Pleistocene to the Holocene. These lakes were distributed in the territories adjacent to the Nile. The absolute mark of the upper large erosion hollow of the Sphinx corresponds to the level of water surface which took place in the Early Pleistocene. The Great Egyptian Sphinx had already stood on the Giza Plateau by that geological (historical) time.

In the recent years one could observe the growth of interest in dating the construction of the Great Egyptian Sphinx (GES), which is determined, to a considerable extent, by new ideas about geological factors which could influence its safety. In view of another interpretation of the geological and nature-geographical data the historical-archaeological method for determining the GES age (about 5000 years old) can prove to be unfounded. The authors of the report have another point of view in considering the problem. We have taken the GES age such as it was indicated by theosophist Yelena Blavatskaya in one of her basic works (1937). She wrote: "Notice the indestructible witness of evolution of Human races, from Divine, and especially Androgynous race, the Egyptian Sphinx, that mystery of centuries". According to Blavatskaya the time of GES erection should exceed 750000 years. Are there some geological indications which are evidence for such an old age of the Sphinx? Consider the brief prehistory of the problem.

The sand abrasion which resulted in formation of deep horizontal hollows all over the monument parameter (Fig. 1-2) is considered conventional in estimating the factors which influenced the GES. Maximum depth of those hollows reaches 8 feet (above 2 meters). Geologists who studied Sphinx are sure that the hollows had formed at the expense of comparatively loose mountain rocks, while the protrusions between them are more hard rocks resistant to the influence of winds. They think that the period of 5000 years is sufficient for creating such large hollows by Eolian process. But they cannot answer the question, about the absence of such forms of weathering on the front part of the head.

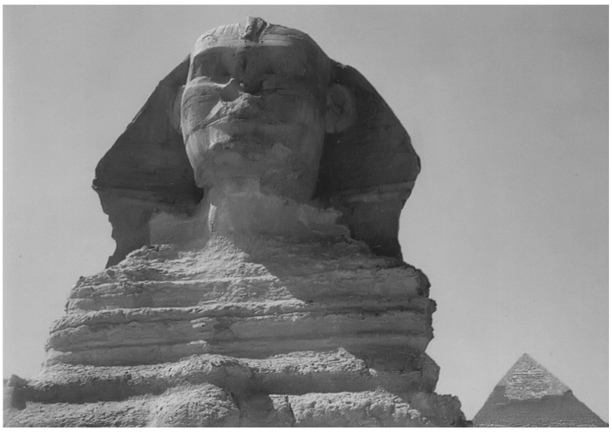

Fig. 1. Horizontal hollows of Sphinx (*Drevnii Egipet*, 2005)

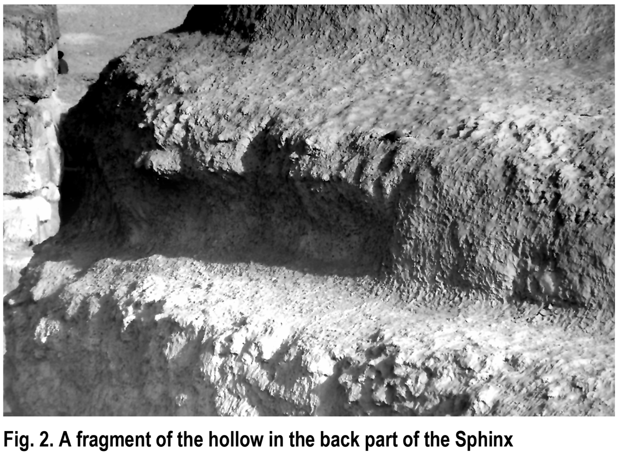

Fig. 2. A fragment of the hollow in the back part of the Sphinx

A new point of view, concerning the age of the Sphinx, has appeared recently. It belongs to geologist R. Schoch (2005); he has found traces of water on the surface of the GES. He supposes that the problem is in the rain water. Climatic conditions characterized by high humidity and pouring rains may have taken place 13000 years BC. But even this age border, is not the date of construction, since the Sphinx had already been standing in the Giza Plateau by the beginning of the period of pouring rains.

In order to study the geological situation and to specify the role of possible factors for the destruction of GES, one of the authors of this report has made a visual investigation of the monument on the spot (in the Republic of Egypt). After a detailed analysis of the GES surface morphology and after reading the literary sources we have come to a conclusion that the statement about the influence of sand abrasion on the root rocks of the monument is exaggerated.

In our geological field expeditions in different mountains and littoral zones of the Crimea and Caucasus we could often observe the forms of Eolian weathering which morphology differs considerably from the weathering taking place on the GES. Most natural forms of weathering are of smoothed character, independent of lithological composition of the rocks.

Our personal experience in scientific investigation of geology of the sea coasts gives reasons to draw an analogy with the GES and to suggest another mechanism of its destruction. Specialists-geologists, who work in the field of sea-coast geomorphology, know such forms of relief as wave-cut hollows (*Morskaya Geomorfologiya*, 1980). They can be one- and multi-storey. They are arranged horizontally to the sea water surface, if the coast makes a vertical wall (cliff). Especially deep wave-cut hollows are formed in precipitous cliffs built by the strata of carbonaceous rocks. Such forms of the coast relief are well-known and studied in detail on the Black-Sea coast of the Caucasus and Crimea (Popov, 1953; Zenkovich, 1960). General model of formation of the wave-cut hollows in the rocks of the Caucasian flysch is given by Popov (1953, 162; Fig. 3).

In dynamics of the process of wave-cut hollows formation one can notice such a characteristic feature that the wave energy is directed to the rock stratum at the level of water surface. Besides, both saline and fresh water can dissolve the rocks.

Tseiner (1963) noticed that underwashing of the coastal walls with formation of hollows is an important erosion indication which may be used for defining the old shoreline. The hollow altitude relative to the sea level in the time of formation varies depending on the water surface level. The hollows altitude can also correspond to the upper water mark. Under natural conditions the levels of water-cut hollows can be both above and below the water surface. The water-cut hollows are formed, as a rule, under transgression, i.e. under sea tide. The transport of the horizontal sea water surface occurs both gradually and discontinuously, and the hollow formation lasts for hundreds and even thousands of years. An analogy with wave-cut hollows gives reasons to think that the formation of the GES hollows took place under its long-term submersion in high water. The Nile seasonal floods could not play any considerable part.

Limestones, dolomite limestones with small interlayers of clay (Rushdi, 1965) of Eocene age prevailed in the geological structure of the GES. These rocks possess different degree of resistance to the wave effect. If the hollows formation were due to sand abrasion only, the hollows had to correspond to the strata of a certain lithological composition. The GES hollows are formed in fact within several strata, or occupy some part of the stratum of homogeneous composition (Fig. 4).

The formation of wave-cut hollows in the massif of rocks composing the GES was a process directed from the bottom to the top, which means the adjustment of the highest deep hollow to the maximum level of the monument submersion (Fig. 5). The back part of the head and the body surface were in the zone of the least effect of waves but the waves left their traces even there (rain traces, according to Schoch).

The absolute mark of the territory in the Giza Plateau region (149 m above the present sea level from the data of physical-geographical map of Egypt, 1965) as well as the mark of the upper deep hollow from the GES foot being allowed for; it would be about 160 m above the present sea level. In this connection there arises a question, when could have the GES been submerged and what kind of water body it was. Geologists of the Republic of Egypt (Rushdi, 1965) and other countries have established, when studying the sedimentary series adjoining the Giza Plateau, that from the end of Pliocene the lacustrine deposits represented by alluvium often occurred there. They had considerable thickness in geological cross-sections and covered vast territories.

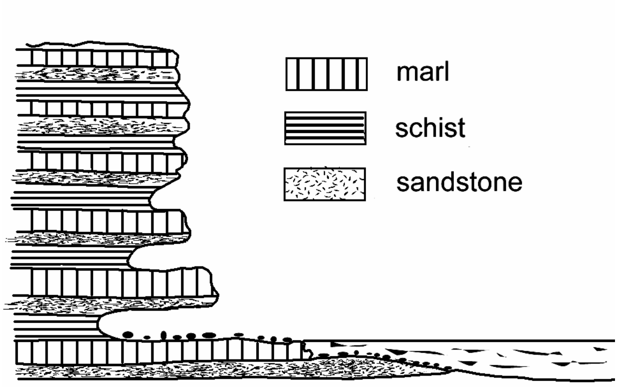

Fig. 3. Scheme of development of wave-cut hollows in the rocks of the Caucasian flysch (Popov, 1953)

Fig. 4. A fragment of the Sphinx surface composed by the rocks of various lithological compositions

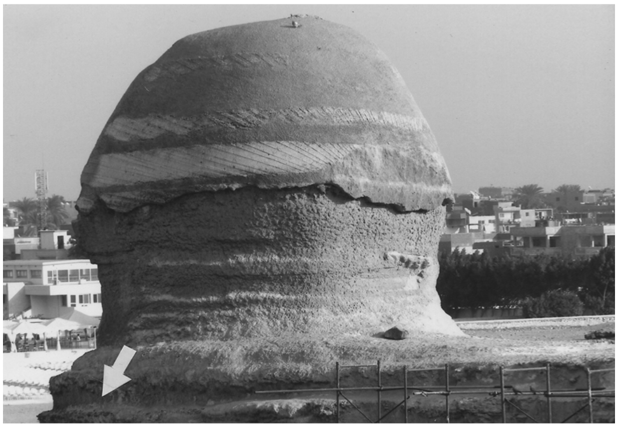

Fig. 5. The upper hollow of the Sphinx (white arrow)

It follows from the investigations of the substance composition of rocks in geological cross-sections that they were deposits of fresh-water reservoirs, lakes supplied with the Nile waters. The Nile ran at a higher level at that time. The Pleistocene lakes occupied the territory of the present Birket-Karun Lake at least ten times (Rushdi, 1965, 89). Tools of ancient people were found in these lacustrine deposits.

Chumakov (1965; 1967) in his works dedicated to the Pliocene and Pleistocene deposits of the Nile Valley also comes to a conclusion about the broad development of lacustrine deposits. He notes that in the Late Pliocene the sea waters began penetrating the Nile Valley and its level rose. That led to formation of lacustrine deposits which are at the mark of 180 m above the present level of the Mediterranean Sea. The lacustrine deposits are also known in the Fajum depression.

In his large generalizing work Tseiner (1963) presents results from the analysis of measuring the levels of the coastal terraces of the African coast of the Mediterranean Sea, regularly distributed in time from the Pleistocene to the Holocene. Based on the obtained data, the author has made a plot with distinguishing certain phases, which corresponded to absolute marks of Sea levels and time intervals (Fig. 6). As is seen from the figure, the highest mark of the Mediterranean Sea level took place during the Calabrian phase and was above 160 m relative to the present sea level.

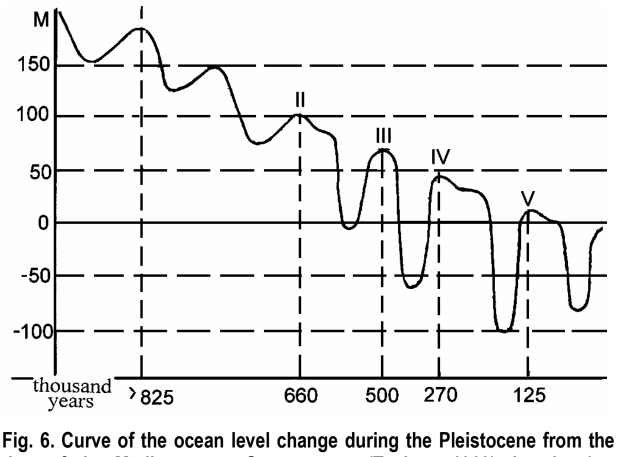

Fig. 6. Curve of the ocean level change during the Pleistocene from the data of the Mediterranean Sea terraces (Tseiner, 1963). Levels: 1 – Calabrian, II – Sicilian, III – Milan, IV – Tirranian, V – Monastery. Conventional signs: along the vertical axis – meters; along the horizontal axis – thousands of years

All the following phases differed by wavy lowering of the sea level marks. It is the sea level during the Calabrian phase which is the closest to the present mark with the highest GES hollow at its level. High level of sea water also caused the Nile overflowing and created long-living water-bodies. As to time it corresponds to 800000 years.

After the completion of lacustrine (fresh water) stage in the GES life other natural processes superimpose the vertical GES profile formed by water, especially at the stage of desert climate development. The sand abrasion (Eolian in a broad sense) was directed to smoothing the contrast forms and led to even greater destruction of the monument.

The suggested hypothesis concerning the relative dating of GES erection is based on the analogy with natural processes known in marine geology and explains the formation of hollows in the Sphinx as wave-cut ones. Further necessity of studying the substance composition of the GES rocks with the purpose of a detailed lithological-mineralogical research can be suggested.

If the world geological science will succeed in studying all the disputable GES aspects connected with the time of its construction and in proving an earlier age of construction, than the Old Egypt civilization, it will lead to new comprehension of history, and as a result, to reveal true motive forces of the intellectual development of civilization.

Conclusion

A comparison of the formation of wave-cut hollows on the sea coasts with erosion structures in the form of hollows observed on the surface of the Great Egyptian Sphinx permits a conclusion about the similarity of the formation mechanism. It is connected to water activity in large water bodies during the Sphinx submersion for a long period of time. Geological data from literary sources can suggest a possible Sphinx submersion in the Early Pleistocene, and its initial construction is believed to date from the time of most ancient history.

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