

STUDY ON ANCIENT RHINO BONE FOUND IN AZERBAIJAN

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From the moment of Earth formation – 4.6 billion years ago, the process that prepares “the birth of life” begins to emerge. No longer than 700 million years after the Earth was born we can say that life exists on the blue planet. Fully formed animals appear after 3.2 billion years of evolution – simple animal - Precambrian Period. No more than 560 million years must pass, divided in three Eras in order to arrive in the Pleistocene Era. Ice core from the Antarctic indicates that at the end of Pleistocene era there was a glaciation. In the Pleistocene the majority of animals such as woolly rhino, woolly mammoth, cave bear, cave lion had already adapted to cold. The presence of woolly rhino (*Coelodonta antiquitatis*) in the current place of Azerbaijan, indicates the existence of this type of animal in the south part of Eurasian continent during the Late Pleistocene and places them in the Eurasian belt distribution. AMS (Accelerator Mass Spectrometry) analysis “says” that the rhino lived around 44.000 years ago, in the middle of the last Ice Age (110.000-10.000 years ago). Micro XRF analysis reveals a large amount of S, Fe, Ti, As, Sr. The large concentration of SO₂ is due to oil which was found in that area, that indicates a big vegetation in that period.

Keywords: woolly rhino, glaciation, Late Pleistocene.

INTRODUCTION

Time. A term that brings many questions around us. The moment for planet formation is much disputed but we have approximate age - 4.6 billion years. Life. It seems that life does not to wait too long to “colonize” the newly formed planet, so after only 700 million years the first cells are appearing (prokaryotes). After this “spark” it took 3.2 billion years of evolution for the emergence of the first animals – simple animals. Figure 1 shows how Earth looked when the first animals started to appear.

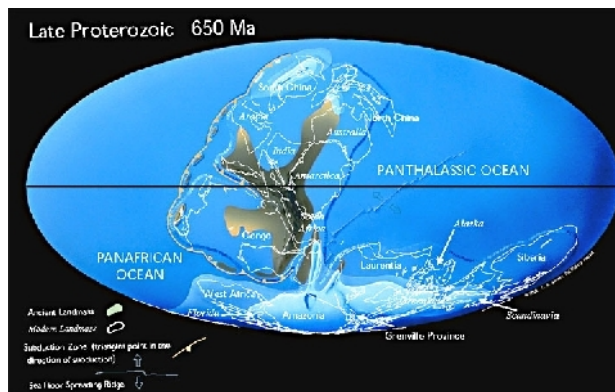


Figure 1. 650 million years ago, first animals start to appear

It is possible to see that the position of continents was different from what it is today. Because our planet is a dynamic one, the position of continents has continued to

change, the process continues today; Figure 2 illustrates very well the evolution of continental surface.

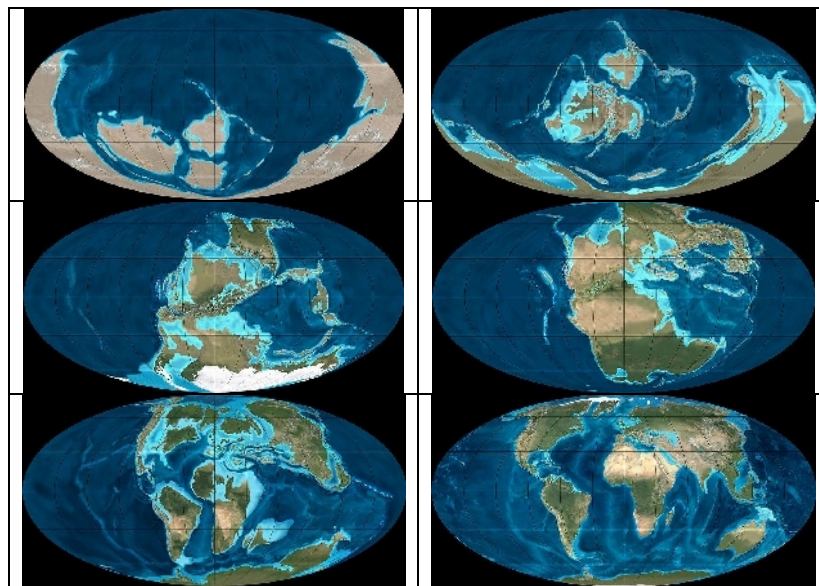


Figure 2. Continental surface evolution

It is well known that climate has changed over time. Latest studies indicate that every 12,000 years a glaciation occurs, which lasts an average of 100,000 years. The atmosphere CO₂ concentration is directly linked with temperature variation. It was established by the researchers that a concentration smaller than 230 p.p.m.v. (parts per million by volume) starts the cooling effect of the atmosphere. The information provided by the ice core taken from the Antarctic reveals that 110,000 – 10,000 years ago, at the end of Late Pleistocene, the level of CO₂ dropped under 230 p.p.m.v and in that period the 8th Ice Age took place. Figure 3 displays the variation of CO₂ concentration in Earth's atmosphere.

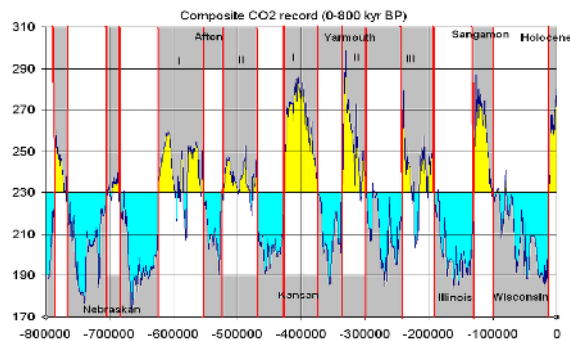


Figure 3. CO₂ concentration in Earth's atmosphere recorded in ice core from the Antarctic

EXPERIMENTAL

Animal type determination - comparing the skull with the skulls of known animals. Bone sample was taken from the National Museum of History of Azerbaijan National Academy of Sciences.

C¹⁴ radio date - approximate period of animal life – made with AMS (Accelerator Mass Spectrometry) - Radiocarbon and Tritium Laboratory of Rudjer Boskovic Institute, Croatia.

Optical microcopy analysis - aspect of bone at microscope level – made with Leica stereomicroscope - INCDTP- ICPI, Bucharest, Romania.

RESULTS

After long studies about the skull found in Azerbaijan - Figure 4 - and after it was compared with different rhino skulls – Figure 5, it was established that it is a rhino.



Figure 4. Skull found in Azerbaijan



Woolly Rhinoceros



Sumatran Rhinoceros



Modern Rhinoceros

Figure 5. Different rhino skulls

Optical microscopy of skull bone – Figure 6 – displays a good health of bone, without visible signs of struggle or disease.

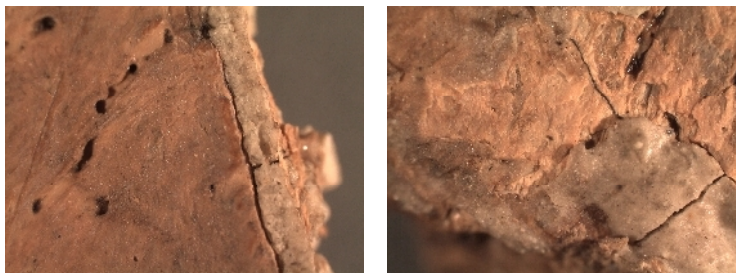


Figure 6. Optical microscopy of skull bone

After this assumption it was necessary also to determinate the period when this animal lived. The most used method for dating is C^{14} radio date. C^{14} radio date was possible to do using AMS (Accelerator Mass Spectrometry) technique – principle described in Figure 7.

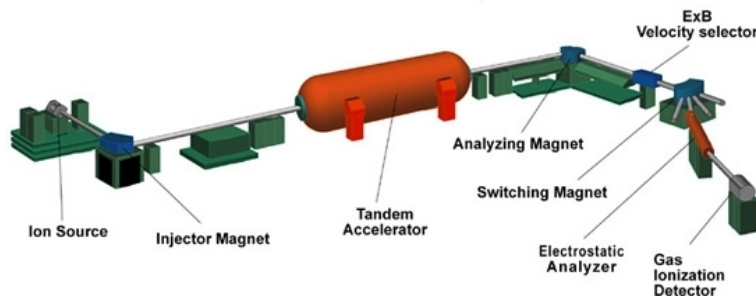


Figure 7. Accelerator Mass Spectrometry principle

AMS technique measures long-lived radio nuclides that occur naturally in our environment. AMS uses a particle accelerator in conjunction with ion sources, large magnets and detectors to separate out interferences and count single atoms in the presence of 1×10^{15} (a thousand million million) stable atoms.

The radio nuclides are used for a wide variety of dating and tracing applications in the geological and planetary sciences, archaeology, and biomedicine.

AMS analysis “says” that the animal has 43.960 years.

By AMS analysis an oil/petroleum trace was identified on the bone, information that tells us that the rhino lived in a place with many trees which in time transformed into oil/petroleum or after some time the petroleum reached the surface and contained the bone.

In terms of “Earth evolution stages” this value is placed in the Pleistocene Era - 2.588 - 0.0117 million years ago, more precisely in the Late Pleistocene (0.126-0.0117 million years ago).

In the Late Pleistocene (110.000 and 10.000 years ago) the 8th Ice Age took place and so, the 43.960 years indicate that this animal lived in the middle of the last Ice Age. Figure 8 illustrates the possible appearance of the woolly rhino.



Figure 8. Woolly rhino

Azerbaijan is in the area where it was predicted that the woolly rhino lived – Figure 9. This area starts from France, engulfing all the Europe and extending to all Russia and the most part of China, remains are found even in the Tibetan Plateau.



Figure 9. Woolly Rhino distribution on Eurasian land in the Late Pleistocene

In the same period also lived many cold adapted animals, like woolly mammoth (Figure 10), cave bear (Figure 11). Contemporary with this animals, another animal was present that began to climb the evolution ladder at the start of Pleistocene Era - 2.5 million years earlier – Modern Human.



Figure 10. Woolly mammoth



Figure 11. Cave bear

CONCLUSIONS

Due to comparative studies on skull found in Azerbaijan, it was established that it is a rhino skull.

The health of the rhino was good, due to the aspect of bone (skull) that did not present any deformation because of struggle or disease.

C^{14} radio carbon dating showed that the skull is 43,960 years old.

This age places the existence of this animal in the Late Pleistocene (0.126 million years ago - 0.0117 million years ago) which is a part of the Pleistocene Era (2.588 million years ago - 0.0117 million years ago).

At the beginning of Pleistocene Era, the race for surviving and colonizing the Earth had started for another animal – Modern Human.

Information obtained from the ice core extracted from the Antarctic indicates that the 8th Ice Age occurred between 100.000 and 10.000. This indicates that animals of that time were completely adapted to the Ice Age conditions.

Geographical position of Azerbaijan confirms the extended area of woolly rhinoceros, which contains all of Europe and North-West of Asia.

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