INTERPRETATION OF SOME ARTEFACTS AS SPECIAL SIMULATION TOOLS AND ENVIRONMENTS

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INTRODUCTION

Simulation plays the essentially more significant role in the human history and culture than it is usually assumed. On some examples it can be demonstrated that modern computational simulation has ancient prototypes and some artefacts can be interpreted as special simulation tools and environments. As typical examples of ancient simulation tools the “life/world tree” on mammoth bone and megalithical “models of the world” are presented. These artefacts were interpreted earlier as calendars, observatories or “ancient computers”. The proposed hypothesis considers the following interpretation as the most exact and appropriate: “special computational simulation tools and environments with real-time functions (calendar) and real-world interface (observatory)”.

The history of modern study of archaeosimulation begins from researches of Gerald S. Hawkins on Stonehenge more than 30 years ago (Hawkins and White 1966). Hawkins was not only the first who used a modern computer for the analysis of the ancient construction, but also he has declared the existence of "stone computers". Other megalithic monuments, which were probably used as an observatory and original analog computer for registration and forecasting of the astronomical events, were investigated and described late (see, for example, Wood 1978). Almost all described structures can be interpreted as simulation tools.

As well as for modern science for ancient people the various forms of computational simulation were the most powerful means of research and understanding of complex dynamic processes of the real world.

New results described in the given work permit to interpret some other well known ancient artifacts as special tools for simulation.

“LIFE / WORLD TREE”:
THE EARLIEST KNOWN SIMULATION TOOL?

In the Hermitage in St. Petersburg a small plate of mammoth bone with spiral figures of many dozens of dots is stored. It was found in 1929 in village Malta near the western part of the Baikal lake (Siberia). The age of the plate is more than 15 thousand years.

While stored in the Hermitage the plate was periodically investigated by various scientists. One of the first was a German mythologist Karl Hentze. Hentze interprets spirals of a plate as symbols of the moon phases and even as the image of whole cosmos, but without any quantitative analysis. The most careful analysis of the semantic system of the plate was made more than 10 years ago by Russian professor Larichev (Larichev 1989). His conclusions were the following: on the plate advanced knowledge about the visible movements of the star sky is fixed, which was the result of exact long-term observation of the sun, moon and visible planets. The precision of registration and representation of the information is quite enough for the sure prediction of the lunar and solar eclipse! Larichev has detected the following main elements on the plate:

- solar year: 243+62+45+14 = 365 days;
- lunar year: 243+57+54 = 354 days;
- four-years cycle: (242+63+45+14+11+54+58)x3 = 365.24 x 4 = 1461 days;
- sidereal form of the saros: 242x27,21=6585.35 days =18.61 solar years = 19 sidereal years;
- synodic form of the saros: (54+57+63+45+4)x29.53 = 6585.35 days;
- synodic cycle times for planets:
  Venus: (54+11+14+45) x 29.53 = 5 cycles;
  Mars: (62+57) x 29.53 = 4.5 cycles;
  Jupiter: (63+45) x 29.53 = 8 cycles;
  Saturn: (57+54+11) x 29.53 = 9.5 cycles.

Additional analysis of the plate as special simulation tool has allowed to determine the following:

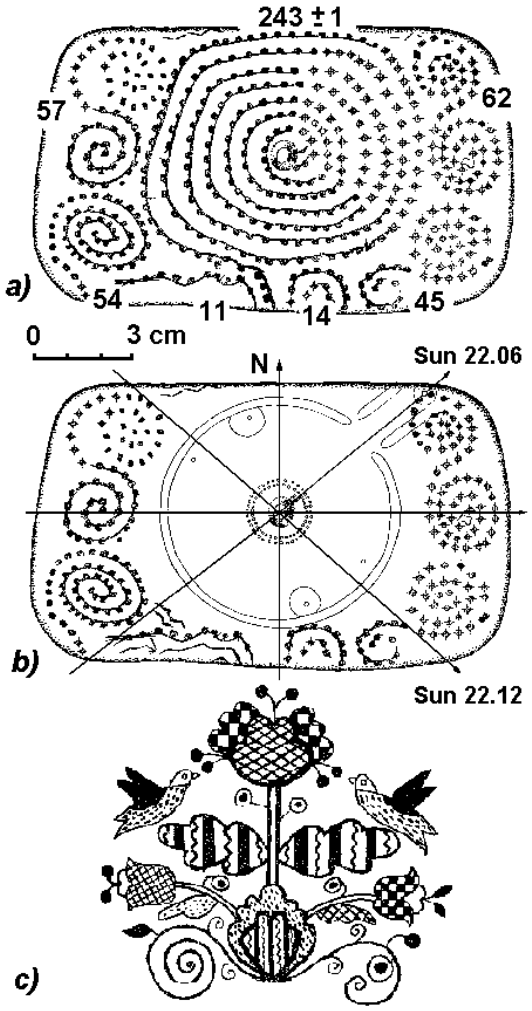

Figure 1. a) Quantitative characteristics of the “life/world tree” elements on the ancient plate from Siberian Malta; b) Plate as microobservatory (in compare with Stonehenge); c) Typical Ukrainian image of the mythological “life/world tree”

1) The Malta plate model permits besides an exact “scientific” simulation of motions on the sky sphere also a simplified pragmatic “calendar” simulation for wide use:

- ≈1/6 of the solar year: 62 days;
- ≈1/8 of the solar year: 45 days;
- ≈ double sidereal month: 54 days;
- ≈ double sinodic month: 58 days;
- ≈ synodic cycle time for Mercury (four internal points of an element “14”): 4 x 29.5 = 116 days;
- ≈ synodic cycle time for Venus (ten external points of an element “14”): 10 x 29.5 x 2 = 590 days.

Then the plate can be interpreted as “model of the world” or “world tree”.

2) The element "14" can be easily used for observation of the female reproductive cycle:

Stage 1: 10 “external” days of barren period followed by menstruation.

Stage 2: (4+4) “internal” days followed by ovulation.

Stage 3: 10 “external” days before menstruation.

Stage 4: If menstruation does not come in time, then it will be necessary to make testy pass of the whole cycle (10+4+4+10).

Stage 5: In case of delay of the menstruation the cycle must be corrected.

Stage 6: If during the test pass of the cycle the menstruation was not, then go to central spiral “242”.

General term of pregnancy is 10+28+242=280 days.

Then central part of the plate can be interpreted as the “life tree”.

3) “Malta plate” was probably widely used as the special computational tool in the ancient society, and it can be interpreted as the specific simulational prototype for the famous mythological concept of “life/world tree” (Fig. 1c).

4) Baikal is located on the same latitude as the Stonehenge. Main solar and lunar directions for the Stonehenge and for the “mammoth plate” coincide. The plate could be used also as a "the personal Stonehenge" or a microobservatory (Fig. 1b).

5) Such form of fixing and transfer of the information allowed at the initial stage of the history of civilization (more than 10 000 years ago) to accumulate, apply and transmit knowledge without alphabet and another forms of writing.

2. MEGALITHS AS “MODELS OF THE WORLD”

It is possible to assume that a long history of accumulation and application of knowledge in the form of special computational models allowed defining real parameters of the Earth and solar system. By creation of various models and their verification long before the beginning of the Greek antique science such parameters as the sizes of the Earth, Moon and Sun, as well as distance between them and visible planets could be determined.

Now there is a possibility to prove that some of the today known megaliths were special simulation tools or environments. The most famous is the Stonehenge, but there are some other examples (Fig. 2). Windmill Hill (3100 BC) and Durrington Walls in England, Cairnpapple (2000 BC) in Scotland and others (Müller-Karpe H. 1966; Hawkes J. Ed. 1974; Burl A. 1995; Ruggles C. 1996) can be interpreted as scaled models ($1{:}10^9$ or $1{:}10^{10}$) of the solar system with the Earth, Venus and Mercury orbits.

A good example of computational simulation environment is the circular shrine (30 m in diameter) in Sarmizegethusa (southern Rumania). Sarmizegethusa was the Dacian capital in about 100 BC until its destruction by the Romans in AD 106. The circular shrine (Fig. 2c) consists of the outer ring of andesite blocks with a ring of small andesite pillars immediately inside. This inner ring is composed of runs of six taller and more slender pillars separated by one that is shorter and thicker. There are 30 of these runs of six, and it seems that total of 180 stand for one half of the Dacian year. This circle E can simulate the orbit motion of the Earth with two days interval between dots. The rings V and M can simulate he orbit motions of Venus and Mercury respectively (with three days interval between dots).

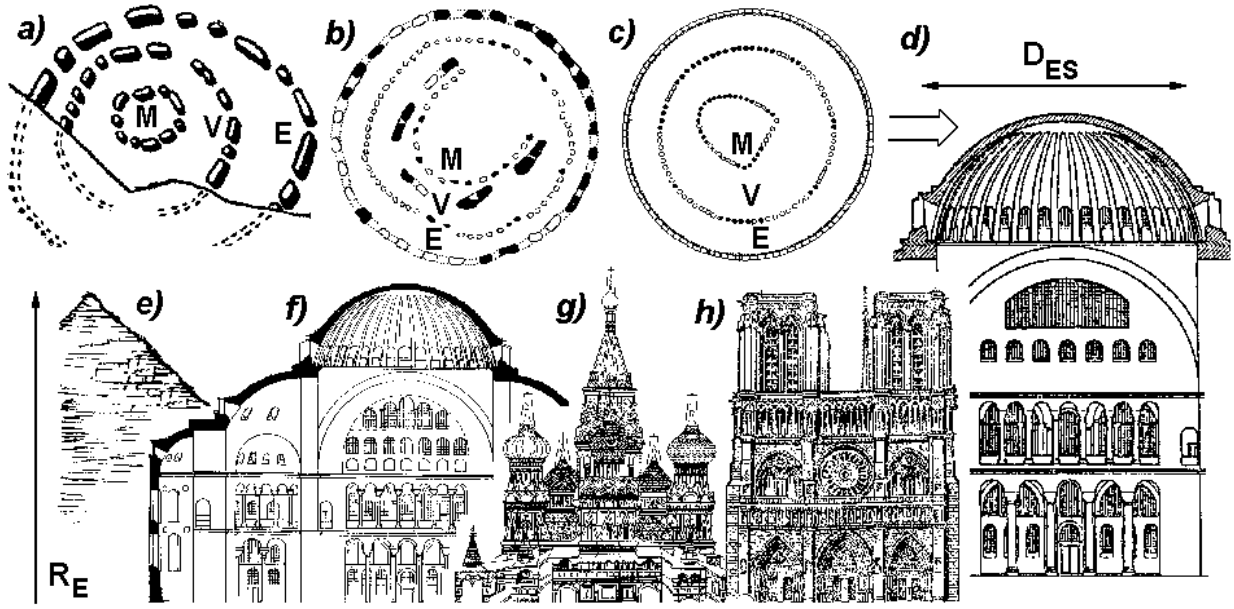

Figure 2. Megaliths and churches: a) Windmill Hill (300 m in diameter); b) Stonehenge-II (30 m in diameter); c) The Sarmizegethusa circular shrine; d) Hagia Sophia (Istambul); e) Mycerinus (Menkaure) pyramid; f) Hagia Sophia (Istambul); g) Basileus Cathedral (Moscow); h) Notre Dame Cathedral (Paris)

As well as other examples, the three great ancient pyramids of Egypt can be interpreted as special simulation environments (Fig. 3).

We have now a large collection of hypothesizes about pyramids, the majority of which are unacceptable for the modern science and society (Jenemann 1996). Considering pyramids as the scaled “model of universe” permits to explain many: why they were built at all and why they were built just so.

On the basis of the analysis of the initial period of ancient Egypt in context of archeosimulation the following hypothesis can be formulated:

1. In ancient civilization, as well as now, the exact knowledge and tools for their production and distributions played the leading role in development of society. Myths and symbols occurred in the popularization process of the intelligent achievement in the field of natural sciences. The pyramids can also serve ss such characteristic example.

2. A key word for understanding of the Great Pyramids is "parallax". The correct understanding of the Great Pyramids is possible only in interrelation with the system of ancient measures, which also can be interpreted as the model of cosmos. The main items of information on the sizes of solar system during construction pyramids were already known (considerably more precisely, as is attributed for antique science), and one of the purposes of this system was the current check and refinement of this parameters. It was impossible without exact knowledge about daily and year parallax, which was reliably fixed at the proportions of pyramids (Fig. 3): R_E - earth radius (daily parallax), D_S - solar diameter, R_{ES} - distance from Earth up to sun (year parallax). It is necessary to note that factors 1.08 and $\sqrt{5}$ have acquired the sacral significance in ancient world.

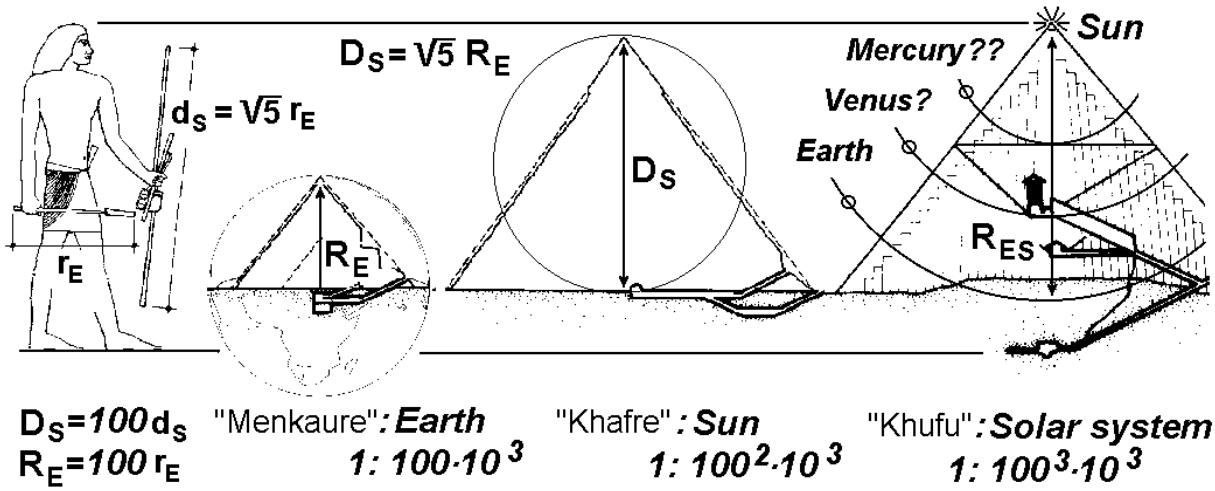

Figure 3. The three great ancient pyramids of Egypt can be interpreted as scaled “model of universe”

The items of the information received as a result of their use were practically unknown to majority of mankind, but their vestiges can be found in all subsequent culture. It is possible to note, in particular, their influence to architecture and main sizes of the most known churches (Fig. 2f, g, h).

CONCLUSIONS

- The described artifacts can be used as good indicators of the real intellectual development of the mankind.

- The history of computational simulation can be lengthened to more than 15 thousands years.

- Exact knowledge and tools for the quantitative simulation and the knowledge distribution played in the ancient civilization, as well as now, the leading role in the development of society. Most of myths and symbols, for example, were created in the popularization process of the achievements from the field of natural sciences.

- It is possible to generalize that the computational simulation was used as one of the major tools for intellectual and cultural development of the mankind during all history of the civilization.

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