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THE PREREQUISITES OF THE DEVELOPMENT OF COGNITIVE-GRAPHICS THEORY

The analysis of historical development of cognitive-visual instruments demonstrated in Minoan and Egyptian hieroglyphic writing, Quipu^shri system, cartography, anatomical figures of Leonardo da Vinci, iconography is provided in the article. The linguistic functions of the unique block-diagram system of ligature hieroglyphic writing of Maya peoples are cleared out in the following investigation. It is found out that the block-diagram system was the prototype of modern cognitive-visual blocks, used in Mathematics, Physics, Computer Science and Pedagogics of today. It is revealed that the knot system "quipy^shri" of the Inca era can be considered one of the primary cognitive-graphic models of antiquity, because it was the instrument of centralized management and statistical accounting due to clearly developed visual nodal-rope account system.

The paper presents the process of two-dimensional graphics development based on the production of the first geographical maps.

The cartographic works from the simplest and primitive drawings to the serious scientific studies of Gerard Mercator and Edward Wright are taken into consideration in thepaper.

The characteristic of anatomical figures of Leonardo da Vinci as a significant contribution to the development of primary infographics is carried out.

The Orthodox icon and Tibetan tank are studied in detail as samples of primary cognitive visualization conveying complex religious and philosophical concepts and ways of moral and spiritual self-improvement with the help of certain symbols, colours and a set of signs.these symbols, colours and signs form unique religious graphical language understandable to representatives of various ethnic cultures and religions.

The further investigation of historical roots of cognitive visualization will stimulate the emergence of new cognitive-visual instruments.

Key words*: ligature, pictogram, pictography, block-diagram, cognitive-visual instruments, visualization, hieroglyphic writing, structural component.*

Introduction. Taking into account the evolution of the didactical teaching aids the improving of the quality of learning will be connected with the reinforcement of structurization, specification, meaningfulness and independence of educational activity execution due to the development of cognitive-visual instruments and their use in practice.

Proceeding from the fact that the mechanisms of sensual imagery and verbal-logical thought of reality reflection can't give such qualities of the object as the structure of knowledge image in visual form, it is clear that the cognitive processes should be based on cognitive-visual forms of knowledge reflection because they are the only ones which provide the course of mental processes at a high pace and activate training activities.

Without understanding of the historical aspect of the first cognitive forms occurrence and their gradual complication it is impossible to investigate them further and use them in practice. It also seems problematic to identify and to realize the pedagogical potential of visualization and cognitive-visual instruments.

Analysis of relevant research. It is known that in ancient times in Egyptian and Minoan hieroglyphic writing was noticed the successful use of primary cognitive-graphic models in a simplified form. The pictograms of this nature were found in Indonesia and Egypt. The investigation of the foregoing written sources was the key goal of the following scientists (S. Craft, R. Gregory, D. Hambling, L. Richapdson, V. West and others). It is necessary to assume that in any science: Mathematics, Physics, Biology, Chemistry, Computer Science, Foreign languages has been found an application for simple and complex cognitive-graphic instruments. The outstanding investigators (M. Choshanov, S. Petrenko, P. Velmander, A. Egorova, L. Shahtin, K. Blutter etc.) devote their works to learning and classification of cognitive-graphic models.

The investigation of (Dj. Mackarty, A. Molchanov, G. Neilovskiy, A. Heitman, M. Yangovych and others) are connected with the problem of identification of historical roots of primary cognitive-visual forms. The first visual model used in Maya language are studied by a number of modern scientists: A. Alohov, S. Kostuchenko, M. Lomonosova, ets. The special attention to the pictograms was given in the scientific works of O. Kubriakova, V. Parondzharov and L. Suroid.

The aim of the article is to analyze the historical development of the primary cognitive-visual forms, to define the meaning and the role they play in the process of learning.

The methods of investigation are: abstraction, analysis, synthesis, induction, deduction.

Results. It is generally known that it is much easier for the person to investigate the surrounding world with the help of graphical-visual images. The language of cognitive graphics is a universal language which simplifies the problem solving in different fields of science, takes into consideration the peculiarities of the processes of perception, thinking, cognition, explanation and understanding.

One of the key goals of this language is visualization of that knowledge for which it is impossible or it is difficult to find the appropriate text description.

It is necessary to take into account that any work with scientific information, which contains in itself a great amount of different parameters, is a very difficult and labor-intensive process. To analyze the foregoing information as a whole, you should consider and estimate it from the point of view of various parameters, but the general, full picture of this or that system can't be realized without the help of cognitive-graphic instruments: pictographics, block-diagrams, divergent maps, graphical brainstormings, frames etc.

The cognitive-visual models were demonstrated in Minoan and Egyptian hieroglyphic writing, the examples of which were found on Crete Island at the end of the IIIrd – the beginning of the IInd millennium BC, even in the middle Minoan period. This very period on Crete Island was characterized by the appearance of primary state formations with slave system, the development of culture and economics, the creation of state literate writing. The writing of Cretansand Minoice was based on Cretan pictography. Pictography (from Latin pictus – coloured and "graphy") is one of the youngest forms of writing through the images of objects, events etc., with the help of simplified conditional signs, schemes or drawings.

The pictographic writing based on pictograms (pictogram (from Latin pictus – coloured and Greek γςαμμα – written mark, line) – conditional drawing with the image of some activities, phenomena, objects etc. was used in Aztec, Mesopotamian, Egyptian, Margusian, Chinese culture. It should be mentioned that the Cretan writing has about a thousand signs which meant not only real subjects, but the ones which lived only in a person's imagination, reproduced the international content of the concepts and phenomena. It is absolutely clear that the texts, written in pictographic writing, are international because they are understandable for any person from any country [2].

The hieroglyphic writing of Maya people can also be considered the prototype of modern cognitive-graphic blocks which are used in History, Mathematics, Psychology, Computer Science, Physics and Pedagogics.

The writing of Maya people appeared in the first centuries BC in the ancient city-states of Central America to the north-west of the lake Peten-Itza. This type of writing remained without significant changes for a period of 1500 years. It should be mentioned that after the Spanish invasion of 1541–1546 the Franciscan monks trying to destroy The Ancient Indian Civilization, burnt the hieroglyphic manuscripts. As a result only three manuscripts survived: Madrid, Dresden and Paris ones. Besides, it should be taken into account that a lion share of various inscriptions on the stones of ancient ruins survived too.

The scientists of Europe and USA have been trying to decipher the writing of Maya people for one hundred years. Some signs meaning are known to the research-workers from the sources of the XVI-th century, especially from the compositions of Diego de Landa. Nevertheless it was not possible for the scientists to explain adequately the system of Maya writing.

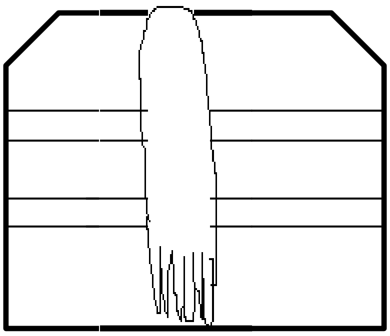
Some of modern American researchers tend to ideographic interpretation of Maya manuscripts, others adhere to hieroglyphic one. The author of the article belongs to the second group.

Maya writing is considered to be hieroglyphic that means it is of the same type as the writing of the most ancient civilization centres in the world such as China, Egypt and Sumer. It is generally known according to written sources, that the writing of Maya was considered sacred. So it was common mainly among priests. The ancient priests attributed the invention of writing to their god K'inich Axay (Sun-eyed Lord). The contents of literature were absolutely different from each other. The books could be of calendar, ritual, mythological, historical or prophetic content. The scientists suggest that epic songs and dramatic creations could also be written in Maya people writing. It is interesting to know that the paper for manuscripts was usually made from a fichus bow. The ancient scribes used a special brush made of hair. The letters were, as a rule, parallel to the coloured drawings and vice versa it was possible to see the drawings among letters.

The hieroglyphs of Maya people were formed in the logosilabic system. The hieroglyph is the name of the letter in some systems of writing. The hieroglyphs can mean as the separate sounds and syllables (the elements of alphabetical and syllabic writing) as morphemes, the whole words and concepts (ideograms). The hieroglyph is a drawing. But at the same time it is something more. Any drawing has its meaning. But for the hieroglyph this meaning is special.

As a rule, the hieroglyph had a form of a square with a certain inclination and rounded ends. It depicted the objects of agriculture, tools of production, the heads of animals, the parts of human bodies etc. Most often one and the same hieroglyph united in itself the phonetic and semantic meaning and so was considered a complex sign.

The examples of Maya hieroglyphs are demonstrated below (Fig. 1)



A skeleton,
A spine

a footprint of a human foot
a way, a road

Fig. 1. Maya hieroglyphs

It should be taken into account that a big amount of signs were written into an oval. The foregoing oval can be divided into three types: big, elongated and small ones. There can be also mentioned the figurative-oval signs and figurative signs. The total number of signs has about 270 units but not all of them are very frequently used. We can speak of mainly 170 signs which played a key role in the writing of Maya people.

Though the meaning of some signs still remains not clear in many cases it is possible without a great difficulty to establish which object is represented by this or that particular sign. As a rule the subjects are depicted on the side. It is difficult to meet the figures of people and animals in full growth. The scribes of Maya people portrayed only the head in profile which was called "facial sign". It is especially interesting that in some cases Maya scribes showed the view of the object from above. All the signs of Maya people are somehow connected with their way of life and the objects of paramount importance. Some hieroglyphs are devoted to slash-and-burn agriculture. There are the signs which have the following meaning as: field, corn, harvest, rain, fire, green, plants to gather, to grow, spikes etc. As we find out from the historical sources hunting occupied a large part of Maya people's life. So there are many signs connected with hunting: weapons, beast, to kill, to hunt, spear, spearhead and others. We can also observe many signs depicting various kitchen utensils, parts of human body. Maya scribes pay their special attention to the human arm and hand in different positions. The images of fish are rare, there is no bow image at all [2].

Mayan scribes considered the special additional elements of hieroglyphs particularly important. Their signs were complex due to the elements added. These elements could be used even separately as absolutely independent. The additional elements either explain the meaning of a sign or show how this or that hieroglyph is read.

Unique in its complexity, the exclusive primary block-diagram deserves our special attention. In the letter of the Maya peoples used combinations of two or three signs. One sign merged or fit into others. In such a way Mayan scribes got ligature – the primary block-diagram. The ligature – (lat. Ligature – connection) – a sign of any system of writing or phonetic transcription, created with the help of merging of two or more graphemes.

Some hieroglyphic signs of Maya peoples were organized into special blocks which according to the order of reading were usually placed in columns of two. It should be noted that hieroglyphic block is the whole system of different signs, written from left to right and down from the top. The blocks were also grouped together, as a rule according to the following system: two-four, sometimes: one-five.

A lot of attention to deciphering of Maya peoples' writing and ligature construction paid such scientists as: Knorozov U. V., Davletshin A. I., Lawrence Law, Landa de Diego, Popol-Vuh, Barrera Vasquez, Barthel T., Brasseur de Bourbourg Ch. E., Las Casas B., Coe Michael D., Coronel V., Marinez, Foerstemann E. W., Gates W., Kelley David H., Kingsborough E., Martines Hernandez Huan, Rosni Leon, Tompson J. and many others.

It is considered that ligature block was a part of a certain phrase or even a whole phrase. First unique primary ligature block diagrams of Maya peoples were formed in the form of a column, which resembled the letter "L" or "T". Let's give an example of rough construction of hieroglyphic Mayan block.

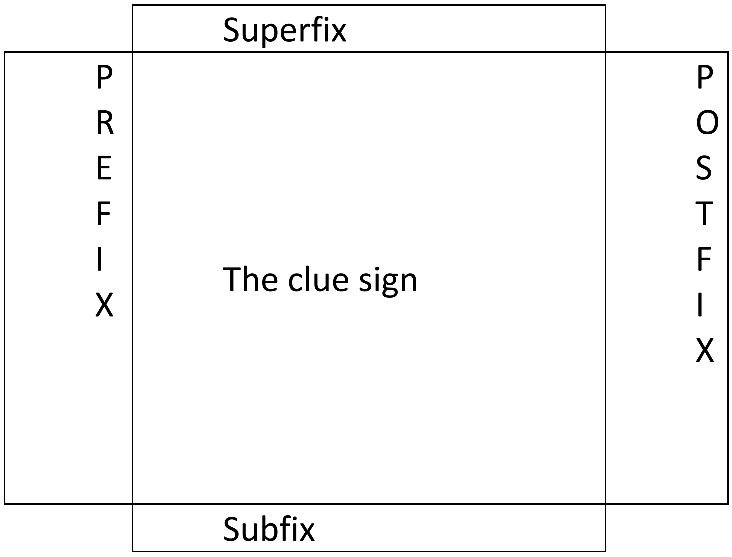


Fig. 2. Construction of the hieroglyphic Mayan block

In hieroglyphic Mayan blocks small rectangular shapes in the ratio of one or two are placed in front of, above, behind, rarer below one or some larger square signs in the ratio of one to one. The largest signs in the centre of each hieroglyphic block are called “clue signs”, the smaller ones situated on the sides are as a rule called affixes (in more detailed classification: prefixes, superfixes, postfixes and subfixes).

The signs, which combine words are usually written from left to right and top down. In some cases the Mayan signs can rotate 90 degrees or even 180 degrees.

Nevertheless, many hieroglyphs are mainly used in one and the same position. The place of the clue sign is indefinite. It can be situated in the beginning, in the middle and sometimes even at the end of the word. In every ligature the last sign to read is the one which is inscribed.

It is known, that the ligature blocks of Maya people writing showed not only the meaning of a separate word, but also a consistent expression, even a small completed sentence. The examples of such hieroglyphic blocks are given in the painting 3 and 4.

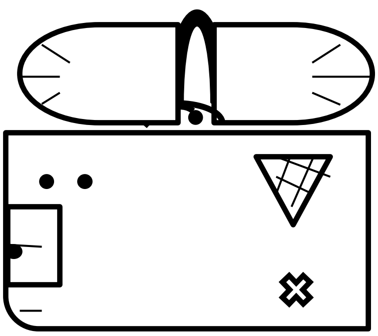


Fig. 3. New (the name of month)

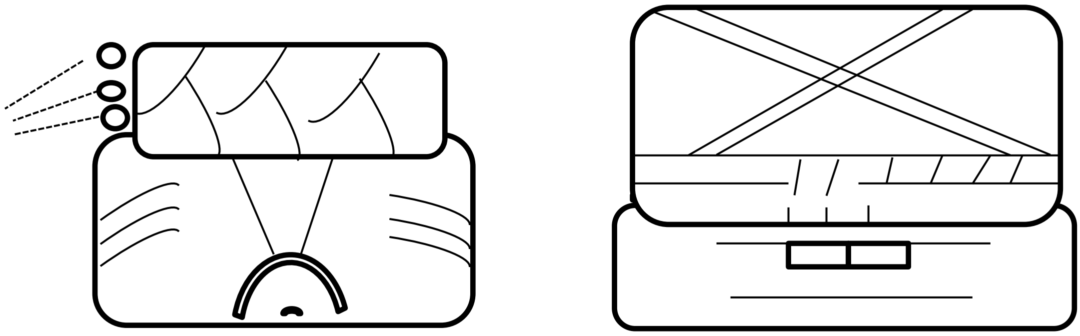


Fig. 4. A rainy sky

It should be taken into account that all the proklytic particles, encyclical particles, all the suffixes and prefixes and all the prepositions always remain in the middle of this or that ligature hieroglyphic block and are its integral part. It should be also paid some special attention to the fact that the ligature blocks of the Mayan Peoples divide the texts not on the level of the words separated from one another, but on the certain syntactical units of a higher organizational level. Each ligature hieroglyphic block is not only one but two or even three words which mean some definition and a defined object or in some cases a transitive verb with an object [1].

Summing up said above we can make a conclusion that the ligature hieroglyphic diagram of the Maya peoples executed the functions of cognitive information transfer with the help of image visualization. This is the very function which is the leading one for much more complex visual-cognitive models of today.

From other point of view of Lewi P. J. the first displays of cognitive graphic should be connected with the appearance of Quipu^shri system in the epoch of the Incas. This unique system was found out by Francisco Pizarro who worked in Peru in 1532. Not paying attention to the fact that in this system the written signs were not used, the "^shri" system was aimed at centralized management and statistical account. This system was a collection of thick ropes which were woven from thin ropes and on which the beans were placed. The beans pointed to a certain number of objects in the decimal system of calculation. The ropes "quipu" were coloured in different ways depending on the sphere of application.

The ancient Inca counting system was really complicated one. It consisted of complex rope plexus and nodules from alpaca, wool, from llama, wool or cotton. In the Quechua language khipu means "nodule", "account", "to tie a knot". You can find from some to 2500 threads of various colours in one "quipu".

The historical sources mention the most ancient "quipu"dating back to 3000 BC. It was widely spread in The Inca Empire. With the help of this system the Incas took into account the number of lamas or other domestic animals, the amount of harvested crop the number of warriors or weapons. The Incas conducted a population census, wrote the taxes and kept their calendar entries using "quipu". The whole system of reading the information was worked out. The main cord "quipu" symbolized the beginning of narration. The thin threads were attached to the main cord diagonally. The foregoing threads were used for data records. The position of nodule on the cord showed the digital order (tens, hundreds, thousands). The number of nodules defined the prime numbers [3].

Moreover, to read the nodal message everone had to understand not only the position of nodules on the cord, but to know the definition and the purpose of each colour. Most scientists believe that the red colour symbolized army, the yellow one denoted gold, the white colour was the symbol of silver.

The Incas elected the most respected and responsible people, specially trained officials from them. These officials were called "quipukamayoki". They usually fixed all the information needed land transferred it to the centre, situated in Kusko. There were not only professional officials but also the couriers – "chaski" – runners who delivered the nodal messages. The "quipu" messages possessed a significant advantage: they were very convenient for transportation. It should be taken into account that the nodal messages were very often delivered for hundreds of kilometers. If they had been made of parchment or leaves of different trees such messages would have been damaged during their transportation. But "quipu" could be crumpled and put in a special pouch so that The Inkas could use them for many times without any problems.

The copies of "quipu" of different sizes and purposes are still investigated many scientists. The messages should be not only decrypted but also saved. It should be noted that the nodal messages of natural fibers, so they need special temperature, moisture, protection against fading etc.

It is interesting to see the figure of "quipu" message from the book of Czech ethnographer Miloslav Stingl "The Inca State. Glory and death of the sons of the sun" (Fig. 5). There is a method of writing in quipu language. The nodes in the upper third of the figure mean the hundreds, in the middle third of the figure they symbolize the tens in the lower third the notes show the units. A – a cord-base, B1-B3 are separate pendants used for writing [4].

Thus "quipu" was the unique universal system for data accounting, the reproduction of quantitative data, for solving social and economic problems, for the reflection of religious rites, understanding of military issues based on the special descriptive language. Moreover we can even affirm that the "quipu" system is an example of one-dimensional visual informational communicative systems, which describe the number of objects from one point of view. So, the nodal messages of The Incas were the prototypes of modern Pie Charts and bar charts.

Speaking about two-dimensional graphics we can't but mention the development of geographical maps. Among the most ancient and the most outstanding cartographers we should call Pythagoras. He was the very scientist who suggested that the Earth was a spherical object. From ancient times, maps were one of the most important documents of any state. The rulers of many countries organized the expeditions on the study of unknown lands. The key goal of all the travellers was the drawing up of detailed geographical maps with the most significant orientation on them. The word “map” comes from Latin “charte” meaning “letter” or “the sheet or scroll of papyrus for writing”.

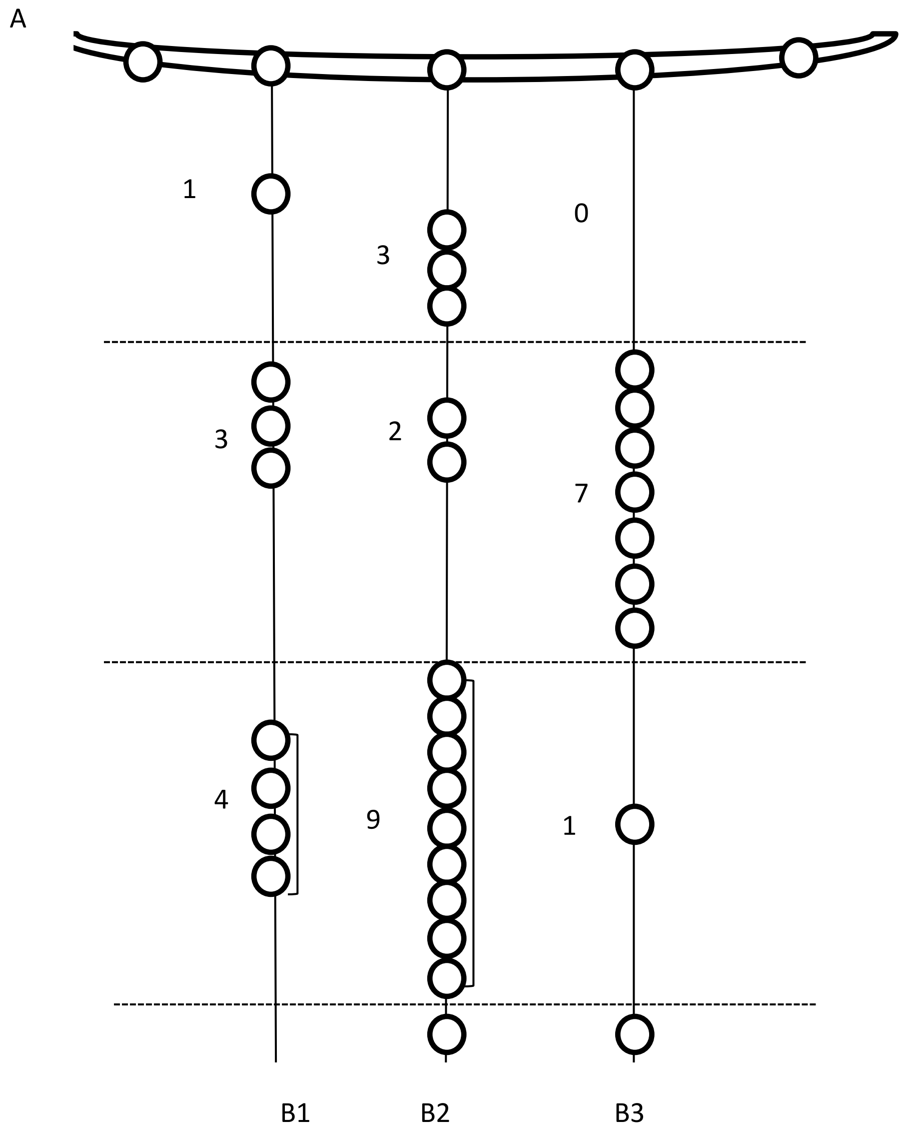


Fig. 5. “Quipu” message

Many scientists believe that the first cartographic images and primitive terrain drawings were made on stones, bone plates, wood, birch bark nearly 15 thousand years ago. The simplest cartographic drawings were known in conditions of a primitive society even before the origin of writing. It is generally known that the copies of such drawings were found in the Nanoys of the Lower Amur, the Chukchi and the Ostuli of the north-east Asia, the Micronesians of Oceania, the Eskimos of the North America.

The cartographic images of the bronze age are particularly remarkable. The modern cartographers pay their special attention to the rock carvings in the valley of Kamonica in Nothern Italy. The most significant among them was the plan showing the paths, streams and cultivated fields, irrigation canals. The foregoing plan belongs to the number of the oldest cadastral plans. The most interesting from the scientific point of view are the following surviving cartographic images: the plan of the city on the wall Chatal-Hüyük, dating about 6200 BC, a card-like image on a silver vase from Maikop, about 3000 BC, the Egyptian Goldfield Map, 1400 BC etc. [5].

Starting from the VI-th century BC the main contribution to the technology of creating maps in the Ancient World was made by the Greeks: Homer, Herodotus, Aristotle, Strabo and others. It is believed that the creator of the first geographical map was Anaximander. He was the very person who draw the map of the known world. Anaximander pictured the Earth in the form of the flat circle, surrounded by water.

In turn, the Greek astronomer Eratosthenes in the third century BC calculated the dimensions of the globe and created his own variant of the geographical map of the inhabited part of the Earth.

Hipparchus invented and used his system of meridians and parallels for cartographic projections.

It can be said with certainty that the crown of cartographic works of Roman times was "The Geography" of Ptolemy with the maps attached to it. The following maps had a degree grid, three parts of the world: Europe, Asia and Libya (the ancient name of Africa), the Atlantic Ocean, the Mediterranean and the Indian seas, the main rivers known, the lakes, the Peninsula. Claudius Ptolemy created his world maps by the method of woodcuts taking into account the curvature of the meridians and parallels [7].

One of the oldest examples of two-dimensional information display could also be found in China. The Chinese scientists were the first to use rectangular meshes. It should be mentioned that the Chinese cartography began with the foundations laid by Zhang Heng who was an inventor, a versatile person, an educated astronomer. Zhang Heng developed a geographic grid and had a great impact on the subsequent scientists. Later Phei-Hsui worked out the whole system of flexible official standards concerning the production of maps including scales and rectangular grids from parallel lines.

Phei-Hsui was the first who is mentioned in the application of the geometric grid and scale on the surface of the map to obtain greater accuracy in determining the distance between two points. The Chinese scientist outlined 6 principles that must be observed when drawing up the maps. It should be added that the most part of historians compare Pey Su with the Greek Ptolemy for his invaluable contribution to the development of the cartography.

It is interesting to note that the Chinese cartographers invented some unique forms of geographic maps with three dimensions. All the rivers and the Pacific ocean were imitated by the streams of liquid mercury, powered by the poms, hidden from the human eye. So we can even speak about the existance of the first mechanical relief map in China of 221–210 BC.

In subsequent epochs the scientists-cartographers observe the appearance of more practical relief maps made of rice, wood or clay. There was also one more type of geographical maps in China of those days. It was called "a compound map". His creator was Shay Chuan who made a 10 square feet wooden map with the picture of the mountains, rivers, streams, lakes and other reliefs of the Earth. If the map was divided into parts, different districts and separate provinces could be seen. If they were put together, then the empire was restored in its unity.

During the early Middle Ages the Arab cartography developed successfully. The Arabs improved the methods for determining the latitude of Ptolemy, they learnt to use the observation of stars instead of the Sun. These innovations significantly improved the accuracy of the maps.

From the end of Middle Ages and the beginning of The Renaissance Nicole Oresme (1320–1382) introduced the description of the movement of the object with respect to longitude and latitude. The scientist linked a geometric space with abstract physical properties (time, temperature, speed) with the help of graphics.

Publishing of the copies from Greek manuscripts from the Alexandrian Library Cosmographia is considered to be the great change in the cartography. Due to this change the relations between tabular numbers and geometric positions in space were visualized.

Nevertheless the decisive milestone in this field became the invention of the printing press in Europe by Guttenberg in 1440.

It should be taken into account that the most significant in practical geography appeared the works of Gerard Mercator and Edward Wright. G. Mercator was the first to use equal angular projection when compiling a world map on 18 pages. The term "cartographic projection" carries his name. G. Mercator was the developer of mathematical foundations of cartography. The key problem was that because of the spherical shape of the Earth its surface could not be displayed on the plane without any distortion. So it was necessary to find such a method in which images of the oceans and the continents on the geographic map could look the most accurately. G. Mercator solved the problems with the help of his invention of "cartographic projection". The outlines of the continents were distored on Mercator's maps but these distortions were not accidental. They reflected the increase in the distance between parallels with latitude, the scale varying from latitude to latitude, gradually increased in proportion with distance from the equator. The actual distances were calculated.

It was necessary to explain the meaning of this projection to the simple seamen. They didn't know Mathematics and couldn't understand how to use such maps. The English geographer Edward Wright helped them. He created the trigonometric tables that allowed to reproduce projections of Mercator. E. Wright resorted to a simple explanation: "Imagine a hollow ball covering around the equator with the inner surface of a hollow cylinder. The ball has latitude and longitude lines. Now inflate the ball. Since swelling it comes into contact with the inner walls of the cylinder, then the longitude lines will look straight on the cylinder, but the latitude lines stretching outwards together with the lines of longitude perpendicular to them, they will be at different but proportional to the first distances from each other. It is clear that "the high latitudes" of the ball will "jump out" of the cylinder walls and so the poles cannot be shown on it regardless of the degree of stretching the ball when inflated" [5, 12].

So G. Mercator and E. Wright created the applied system of projecting the globe onto a plane. The invention of geographical projection marked a turning point on the creation of diagrams on chartmaking. The mathematical methods were applied with such precision as never before. The appearance of the geographic maps was followed by the distribution of functional charts and statistical diagrams.

Speaking about the ancestors of cognitive graphics it is necessary to mention Leonardo da Vinci. He was the first one who tried to display the hidden in the accessible version, who accompanied his images with text, explaining the principle of work and the purpose of the depicted objects or creations.

Leonardo's anatomical drawings and graphic explanations of the work of different machines are of particular interest for the scientists. He was able not only create something unique and useful but managed to explain how the machine works and how to make this or that machine without carrying to great distances quite heavy and at the same time graceful apparatuses.

Such an instruction on operation and assembly became the design of the machine of horizontal rotation, created in 1495. This project introduces the machine itself, its components in a very particular way. But most importantly, it indicates the order of assembly and operation of the new machine. The instruction of Leonardo da Vinci may seem a banal thing for a modern person. We can meet such an instruction in every box with home appliances TV-sets or mobile phones. But it should be taken into account that in those years it was an unprecedented advantage, allowing creating technical devices directly at the site of their application.

The creation of anatomical drawings was a huge contribution of Leonardo da Vinci to the development of the principles of primary infographics. A drawing of the anatomy of the shoulder can be shown as an example of this complex "jewelry" work. The drawing was created in 1510. Leonardo managed to combine on one sheet the documentary sketches of the structure of the human shoulder.

Those days his work was a sensation. For the first time a person could see himself from within, not on the battlefield, contemplating injuries of wounded soldiers, but simply, schematically, on the sheet of paper (Fig. 6, Fig. 7).

Drawings of the shoulder	Leonardo da Vinci
Fig. 6	Fig.7

Another bright and outstanding example of primary cognitive visualization can be met in the world of Orthodox icons or Tibetan Tank. With the help of symbols, colours and drawings, they could convey the most complex religious and philosophical concepts, the essence of historical events and even the ways of moral and spiritual perfection to people who could not read. It should be noted that for us, these examples of ancient art are especially valuable, as the icon painters of Byzantium and Tibet were among the first to face the problems of the limited space of the icon and the absolute necessity of an extremely accessible and fairly complete account of the events displayed.

It is generally known that each of the religious schools reflected the reality in its own particular way each one had its own laws of the plot disclosure, different schools used different symbols, understandable mostly to the adherents of the religions. Noteworthy is the fact that the reverse perspective of the Orthodox icon and the absolute plane of the Tibetan Tank have a completely unique level of information transfer to a believing person and an unbeliever. Despite all the conventionality and the simplicity of the images, they allow even an unprepared viewer to see another world-spiritual one, at the same time acquainting us with quite specific historical events and biographies of real people: saints, martyrs, righteous princes, kings and laymen. We should mention that the internal organization of the space of these images is the subject to strict laws and rules of graphics. We see that the linear-vertical follow-up of biographies around the main image on the Orthodox icon and the diagonal organization of Tibet Tank, narrating about the life and affairs of the Buddhist saint, made it possible to easily decode the images pictured on the icon or on the Tank. We can't but notice that the text included in the structure of the Orthodox icon had to answer extremely clearly to the question: "What or who is drawn on this very image". Nevertheless the texts of Tibetan Tank rather resembled prayer calls to this or that particular Buddhist saint inside of which there were the referents to the events depicted. We should take into account that the specificity of simplifying forms in religious painting and reducing them to stereotypic images-symbols was necessary for two reasons: first they formed the religious graphical language with clearly stated principles of presentation of the material and secondly, both the Orthodoxy and the Buddhism had to tell the sacred History to people with different ethnic cultures and languages. This is particularly evident in the understanding of the Orthodox icon. For example, the icon painted in Byzantium was easily understood by the ancient Slavs even without knowing the language as well as the Greeks could also understand the Russian icons without any difficulty. The fact of understanding of the Tibetan Tank by the representatives of Western culture is undeniable. Despite the fact that the western man can't name the Buddhist saints but he can completely decrypt the information depicted: the birth, the death, the war etc.

Conclusions. The analysis of the historical aspect of the emergence of primary cognitive-graphic forms, demonstrated in Minoan and Egyptian hieroglyphic writing and Quipu^shri system in the epoch of the Incas suggests the existence of the structural components of cognitive graphics at the end of the third century BC.

The development of cartography and the invention of the most ancient geographic maps was the oldest example of two-dimensional information display. The creation of anatomical schemes of Leonardo da Vinci was also a significant contribution to the primary infographical principles.

It is interesting to mention that one more prerequisite of the development of cognitive-graphics theory was the appearance of the Orthodox icons and the Tibetan Tank which were similar to the storyboarding of proto films, encased in a format of board or cloth.

All of the inventions mentioned above were the prototypes of modern complex cognitive-visual blocks used in Mathematics, Physics, Linguistics, History and Pedagogy of today.

The prospect of our research is to further investigate the historical roots of cognitive visualization theory, to identify new cognitive-graphic forms of Antiquity and to understand their content and impact on the development of cognitive-visual models of modernity.

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АНОТАЦІЯ

Чуричканич Ірина. Передумови розвитку когнітивно-графічної теорії.

У статті подано аналіз історичного розвитку когнітивно-візуальних інструментів, продемонстрованих у Міноанській і Єгипетській ієрогліфічній письменності, системі Кіпушрі, картографії, анатомічних рисунках Леонардо да Вінчі та іконописі.

Лінгвістичні функції унікальної блок-діаграмної системи лігатурного ієрогліфічного письма народів Майа висвітлені в даному дослідженні. З'ясовано, що блок-діаграмна система була прототипом сучасних когнітивно-візуальних блоків, що використовуються в математиці, фізиці, інформатиці й педагогіці сьогодення.

Подальше дослідження історичних коренів когнітивної візуалізації простимулює появу нових когнітивно-візуальних інструментів.

***Ключові слова**: лігатура, піктограма, піктографія, блок-схема, когнітивно-візуальні інструменти, візуалізація, ієрогліфікація, структурний компонент.*

РЕЗЮМЕ

Чуричканич Ирина. Предпосылки развития когнитивно-графической теории.

В статье представлен анализ исторического развития когнитивно-визуальных инструментов, продемонстрированных в Миноанской и Египетской иероглифической письменности, системе Кипушри, картографии, анатомических рисунках Леонардо да Винчи и иконописи.

Лингвистические функции уникальной блок-диаграммной системы лигатурного иероглифического письма народов Майа освещены в данном исследовании. Обнаружено, что блок-диаграммная система являлась прототипом современных когнитивно-визуальных блоков, используемых в математике, физике, информатике и педагогике сегодняшнего дня. Дальнейшее исследование исторических корней когнитивной визуализации простимулирует появление новых когнитивно-визуальных инструментов.

***Ключевые слова**: лигатура, пиктограмма, пиктография, блок-схема, когнитивно-визуальные инструменты, визуализация, иероглификация, структурный компонент.*