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METHODS OF CARTOGRAPHIC RESEARCH AND STAGES OF THEIR FORMATION

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Abstract

Cartographic science and cartographic studies were formed directly with the development of geographic science itself. Historical sources played a great role in the formation of geographical science. Each map was created for the purposes of scientific or practical research. Geographical knowledge, formed in all ancient civilizations and societies, nevertheless they did not spread their presence beyond the surrounding area. The article considers periodization and stages of development of cartographic methods of research.

Keywords: maps, map projections, cartographic science development, the Middle Ages, a new era, the development of atlases, color maps, maps, routes, a map of the starry sky.

The history of ancient and ancient civilizations gives us a representation of that time about the geographical picture of the world that was formed as a result of travels, scientific representations of scientists and philosophers of the ancient world. The most famous of them is the ancient Greek explorer and scientist Herodotus and the philosopher Aristotle who represented our Earth in the form of a sphere, the Alexandrian scholar Eratosthenes was one of the creators of the first systematic work on geography and for the first time used the word "Geography" to denote knowledge of the Earth. To the galaxy of scientists of the ancient world is the ancient Greek scientist Strabo, who based his travels created a multivolume work [4].

"Geography" and the ancient Egyptian astronomer, mathematician and geographer Claudius Ptolemy. Maps were needed to fix the boundaries of hunting grounds and land allotments, which was especially common in the development of new territories, for example in the Roman Empire, later church possessions, etc. Cartographic drawings are also known in the slave societies of antiquity that inhabited the valleys of the Tigris and Euphrates Rivers , as well

as in Egypt. In these countries, irrigation agriculture was developed, which required the erection of an extensive system of irrigation and drainage facilities.

The development of cartographic knowledge in Greece was promoted by the colonization movement, which was especially strong in the 8th-6th centuries. BC. It led to the formation of Greek colonies in a vast space.

The development of cartography in ancient Rome was deeply influenced by the use of maps for practical purposes, to meet the demands of the military and administrative apparatus. The image of roads on the map could give a valuable manual for military, administrative and trade needs, and such maps were created. Remarkably the adaptation of Roman road maps for use on the road. One such card, known as the Peitinger's Table, copied with some late additions from the original IV century, has survived to this day.

In the era of the slave society, geography and cartography formed a separate focus of early and productive development in China. Although in written sources of Chinese culture of that time there are references to cartographic activity prompted by military objectives, the discovery of archaeological excavations in southern China in 1973, three color maps that in their content and form surpass those of the topographic maps that appeared in Europe several centuries later.

In the countries of the Arab Caliphate in the IX-X centuries. there was a rise in geographical culture. Detailed descriptions of provinces, settlements, roads and roads formed the notion of geography as a "science of paths and states, and later as a science of latitudes and longitudes." A completely original Arab tradition was manifested in the so-called "Atlas of Islam", combining the cartographic works of a number of geographers of the tenth century. It includes 20 maps of Muslim countries.

Later in the Middle Ages with the extensive development of maritime trade abruptly, the need for maps for navigation increased; Especially high accuracy in the image of the shoreline reached the portolana. They were created since the XIV century. first of all in Italy and covered the Mediterranean and Black seas. The peculiarity of the portolans was the compass lines drawn on them from a number of points, which enabled them to lay courses for ships, including those in the open sea, with the help of the compass invented by that time. The greatest flourishing in marine mapping, of course, came during the Great geographical discoveries of the XV-XVI centuries.

Just before the portolans, so-called monastic maps appeared in Europe. The main purpose of the monastery maps was to illustrate theological works. For example, on the map accompanying the commentary on the Apocalypse, Beat showed the division of the Earth after the flood between the three sons of Noah. Such maps were picture drawings, which only in the most crude form transmitted the well-known in the Middle Ages world. The cartographic images of the world were of interest to their authors only to the extent that they

corresponded to their religious views or explained the theological concepts shared by them "[2,3].

The heyday of cartography of the Middle Ages is connected with the name of the Flemish cartographer Gerard Mercator, who lived in 1512-1594. The cylindrical equiangular projection of the world map that he created bears his name and is used in marine mapping today. In this projection, G. Mercator compiled a map of the world known by that time, and also gave recommendations on how to use this map.

In Russia, maps in relatively large numbers began to be created and used by the beginning of the 16th century, which is related to the needs for the development of new territories included in the Russian state and the need to protect its borders. Evidence of this is the inventory of the archive of Ivan IV (1575), which mentions a number of drawings necessary for the conduct of the king's policy of relations with the outside world. The same purpose was served by the "Great Drawing to the whole of the Moscow State," covering the territory from the Dnieper to the Ob River.

The process of developing Siberia also required its mapping and study. The works of S. U. Remezov (1642 - after 1720) represent a historical and geographical encyclopedia of Siberia of the XVII century. S. U. Remezov, with the participation of his sons, prepared three atlases of Siberia. The main advantage of his maps is "reliability of information and rich geographic content. In this respect, the cartographic works of the Tobolsk researcher greatly exceeded the later maps of Siberia by Petrine geodesists.

One of the widest areas of use of maps in the late XIX - early XX century. There was cartometry used to calculate the areas of provinces and counties of Russia, the lengths of rivers, the length of roads, etc. An outstanding scientist who managed to identify a number of geographical patterns on the basis of cartometric work was Lieutenant-General, Corresponding Member of the St. Petersburg Academy of Sciences AA. Tillo (1839-1899 / 1900). His hypsometric maps of European Russia in scales of 1: 2 520 000 and 1: 1 680 000 served not only to the author who substantiated the orography of this region, but also to his numerous followers. AA Tillo showed the existence of the Central Russian and Volga heights and gave them existing names. AA Tillo conducted a comparative analysis of different magnetic maps for the study of magnetic fields in European Russia, which made it possible to identify the Kursk-Belgorod anomaly, anticipating the discovery of iron ore deposits.

P. Semenov-Tian-Shansky made a great contribution to the field of socio-economic mapping, not only famous for his travels, but also for organizing the first population census in Russia (1897), the results of which served as material for numerous population maps. Under his leadership there were published reports "Geographic and Statistical Dictionary of the Russian Empire" and "Russia. A complete geographical description of our fatherland ",

illustrated by various maps. The theory of continental drift and modern new global tectonics originate from the work of AL Wegener (1880-1930), who noticed in the analysis of maps the similarity of the contours of the coasts of Brazil and the Atlantic coast of Africa.

Great contribution to economic mapping and the use of maps in socio-economic geography NN Baransky. His bright, imaginative language, the ability to focus attention on the essence, depth and versatility of knowledge attracted to him many students and followers. The words of NN Baransky served and serve as epigraphs and titles of articles and books. Can we say more clearly and clearly, expressing our attitude to cartography: "Map - alpha and omega of geography, the initial and final moment of geographical research. Map-a tool to identify geographical patterns.

A.F. Aslanikashvili (1916-1981) made a significant contribution to the theory of cartography, the theory of cartographic generalization, the creation of the Atlas of the Georgian SSR, and complex mapping. They repeatedly considered the role of the cartographic method in geography and other sciences. The theoretical substantiation of AF Aslanikashvili's views on the cartographic method is considered in the book "Metacartography. Main problems".

I.P. Zarutskaya (1908-1990) showed the role of a number of atlases created with her participation in complex geographical studies. A great connoisseur of nature, she aspired to the unbroken merging of the cartographic method and specific geographical sciences.

The realization of the cartographic method in its modern sense belongs to KA Salishchev (1905 - 1988). Published in 1955, the article "On the cartographic method of research" served as a starting point for his research.

Modern cartographic methods of investigation are based on the analysis of maps as space-time models of reality. To study the phenomena of their images on maps, various analysis techniques are used, among which are visual, cartometric, graphical and mathematical methods. Visual analysis is the most common method of research on maps, based on the essence of maps as figurative-symbolic models that reproduce in visual form spatial forms, relationships and structure. The result of visual analysis can be a description of the phenomena studied, for which the consistency and consistency of the presentation is necessary, the selection and systematization of the facts, their analysis, generalization and final conclusions. The pre-designed schema of the description, as it were, forms an algorithm for visual analysis. With the general development of the cartographic method of investigation, visual analysis expands its field of application. It applies to new types of maps

Cartometric receptions. On maps of large and medium scales, the lengths of straight and broken lines are measured using a circular meter and a transverse scale with an accuracy close to the limit for the given map. Difficulties arise when measuring the lengths of meandering lines: rivers,

coastlines of seas and lakes, contours, contours. To calculate such quantities, a curvimeter is used, but its accuracy does not always satisfy the research objectives. For more accurate measurements, different calculation techniques are used.

When working with hypsometric, geological, hydrological, climatic and other maps, it often becomes necessary to calculate the volumes of any objects. If the object is depicted on the map in isolines, then its volume is important to represent as the sum of the volumes of individual layers enclosed between the planes of the section. The volume of the vertex is calculated as the volume of the cone with the height of the delta z , then the total volume is calculated as the sum of the individual layers and the volume of the vertex.

Methods of mathematical analysis are used to create spatial mathematical models of phenomena studied by maps. The fundamental possibility of using this group of techniques lies in the fact that many phenomena and processes depicted on the maps are either related by functional dependencies among themselves, or can be represented as functions of space and time. These dependences are extremely diverse, complex and not always sufficiently studied; nevertheless, it is often possible to simplify them, abstracting from complicating properties and meaningless connections, to reveal the main laws and approximate them by known functions.

Methods of mathematical statistics are designed to study the maps of spatial and temporal statistical aggregates and the statistical surfaces that they form. Statistical aggregates are called mass, qualitatively homogeneous sets of random variables or phenomena.

On the maps of statistical aggregates, statistical surfaces are formed, which are usually represented by isolines or cartograms. Statistical surfaces have maxima (ridges), minima (hollows), slopes, i.e. have some kind of statistical relief. The methods of information theory are used to assess the degree of homogeneity and mutual correspondence of phenomena studied on maps. In close connection with the creation of new maps and atlases is the problem of improving the methods of analysis and transformation of the cartographic image [1].

The cartographic method of investigation has all the properties of the scientific method. It has a clearly delineated range of tasks, a system of specific and interrelated methods of analyzing and transforming a cartographic image. The period of rapid development and improvement of the method began relatively recently, but it has repeatedly proved its reliability and effectiveness. The development of the method goes in several directions. The main prospects are related to the progress of complex thematic mapping, the creation of maps and atlases of a new type, including those specially designed for conducting scientific research on them.

References:

- [1] Berlyant A.M. Cartography: Textbook for high schools. - Moscow: Aspect Press, 2002.
- [2] Gakayev R.A., Khadaev T. Sh. Formation of geographic and historical knowledge of students by the combined use of cartographic material [Text] // Pedagogical skills: materials VI intern. sci. Conf. (Moscow, June 2015). - Moscow: Buki-Vedi, 2015. - P. 5-8.
- [3] Gakayev R.A. Statistical methods of mastering the geographical disciplines of bachelors in the field of preparation "Geography". Pedagogy of the higher school. 2015. № 2 (2). Pp. 31-35.
- [4] Salishchev K.A. Cartography: A Textbook - 3rd ed. - Moscow: Izd-vo MGU, 1990.