

Jerzy Siwek

## RESEARCH ASPECTS OF CARTOGRAPHY

The concept of the cartographic method comprises both the sphere of map elaboration and that of its use. "Map use" has usually denoted any activity carried out on the basis of maps. Some of these activities, described as the "cartographic method of research" (Salishchev 1982, Berlant 1988) are of particular importance from the scientific point of view.<sup>1</sup> Their common feature is the use of well-considered, sometimes very sophisticated methodology aimed to draw as much information as possible from the map, which leads to optimal solution to research problems under investigation. The views of some cartographers, as well as the name of the method, indicate that it is regarded as a certain kind of research procedure. But this conviction is not based on satisfactory arguments, so it may raise doubts. They stem from the analysis of the concept of "scientific investigation" in view of its meaning in scientific methodology and its reference to cartography.

E.Nagel (1961) writes that "the distinctive aim of the scientific enterprise is to provide systematic and responsibly supported explanations," and the explanation is the fundamental and specific aim of science. According to D.Harvey (1976) "it will be regarded, therefore, as any satisfactory or reasonable answer to a 'Why' or 'How' question."

This conception of the meaning of scientific investigation allows us to confine the problem of existence of cartographic method of research to the consideration of the problem: Does the cartographic method of research explain? The advocates of cognitive theory in cartography (i.a. K.A.Salishchev and A.M.Berlant) would be closest to the positive answer to this question with their concept of cartographic method of cognition.<sup>2</sup> However, a positive answer does not seem likely from the general scientific point of view.

In the traditional dichotomic subdivision of sciences based on the division into formal and empirical sciences (Fig.1, according to Such 1987),

---

<sup>1</sup> The term "cartographic method of research" was first used in cartographic literature by K.A. Salishchev (1948), when he formulated theoretical foundations of map use for analysis and cognition of geographical phenomena.

<sup>2</sup> "Cartographic method of cognition" indicates the process of a topographic survey, preparation of maps and their use for investigation of the various aspects of reality.

explanation is attributed only to empirical sciences, but cartography can hardly be called an empirical science. Although literature concerning methodology of sciences does not mention cartography in making a division of formal sciences into logic and mathematics, it is among the latter that cartography should be placed. It is generally held that formal sciences do not have explanatory features because they "do not describe the world, but solely provide exact forms (e.g. language or method) of its description" (Such 1987). Should we follow this line of thinking we ought to admit that cartography does not explain, thereby being unable to have its own method of research.

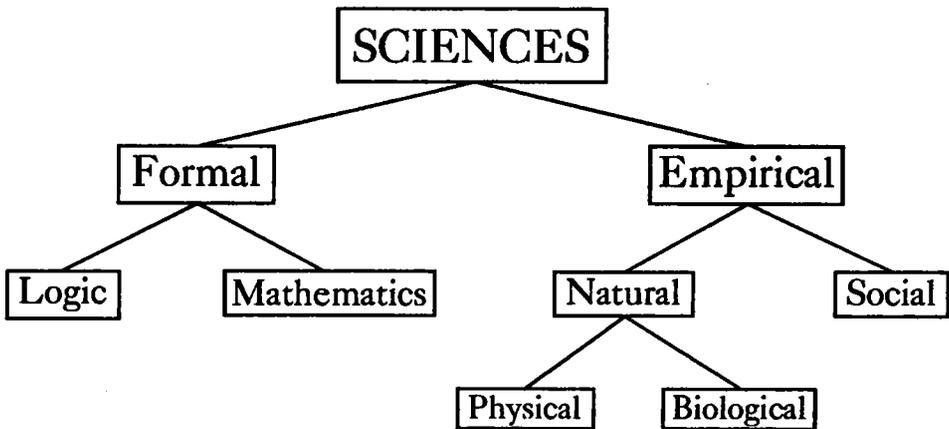


Fig. 1. Dichotomic subdivision of sciences

The statement that cartography does not explain, does not mean that it has not its share in explaining. Its role in the process of scientific investigation, that is also in explaining, may be presented as follows:

1. The map is the principal and best (though not the sole) tool for studies on spatial phenomena.

2. Cartography formulates principles of the map use. The knowledge of them is indispensable to the research process due to limitations on the part of the map scale, projection and generalization. The knowledge of these principles is a precondition for proper map use in research work and authenticity of research results.

3. Cartography works out the procedures permitting the study of the map contents. It is one of the most important tasks of cartography though its meaning has been underestimated so far. In the absence of original cartographic methods this task consists of adaptation of methods used in other branches of science. Mathematical methods are specially frequently transferred to cartography, for example for the needs of cartometry or studies on correlation.

The question arises whether these adapted procedures may be regarded as cartographic. It seems that they may. Adaptation makes them conform to the rules binding in cartography, thus serving acquisition and processing of spatial information. Similar situations can be found in other scientific disciplines. For example, many methodological problems in physics can be reduced to certain mathematical problems; however, methodology of physics is not treated as a branch of mathematics (Wójcicki 1982).

It should be noticed that these procedures can be encountered in science very often. Moreover, they are among the principal means thanks to which science may develop. Most research procedures are more widely applied in branches to which they have been transferred than in those in which they emerged (Beveridge 1961).

4. The quantity of cartographic information (coming from the map) depends on preparation of the map users and on the ways of map reading. The simplest mode of reading is the visual perception, although the information thus acquired may be insufficient both as regards its scope and precision. The use of procedures discussed under point 3 enables extension and definition of knowledge of the phenomena under investigation. This procedure may be illustrated by any measurements made on maps as well as their further processing.

In some cases one can even speak about the acquiring of a new knowledge which corresponds to the gain of information (Ratajski's concept known from the theory of cartographic communication, 1977).<sup>3</sup>

The above considerations lead to the conclusion that although there is no cartographic method of research, there is certainly a **cartographic method of assisting research**. It allows us to include cartography in this scientific investigation which uses spatial information.

In conclusion we must comment upon the fact of classification of cartography under formal sciences. The very subdivision of sciences into empirical and formal already raises some doubts, since the latter describe "real ... structures of the phenomena or activities (operations). Therefore, to call them formal may arouse justified reservations ... as it suggests that they are deprived of any contents component..." (Such 1987).

As regards cartography, we may, too, have reservations whether it is an entirely formalized discipline. These reservations are mainly rooted in the analysis of the process of map preparation which shows strong links between their contents and form. Fragility of the border between "the formal"

---

<sup>3</sup> L.Ratajski writes as follows: "... it might be simplest to describe the gain of information as a difference between the amount of knowledge acquired from map reading and the amount of information encoded in this map...(...). The gain of information occurs in three stages: 1. direct, stemming from situation of signs and their meaning; 2. indirect, resulting from confrontation of the reader's own knowledge and the amount of information included in the map, and 3. derivative, when additional operations of cartographic analysis are applied..." (underl. J.S.).

and "the empirical" is specially easily seen during preparation of the map legend (e.g. during the process of designing cartographic signs) and during generalization.

The sphere of map use raises less doubts regarding the formal character. It stems from a relatively small influence of the map contents on procedures used for its investigation. They depend on methods of cartographic presentation rather than the map content itself.

The paper shows the place of cartography in scientific investigation and emphasizes its possibilities as a research tool. The practice shows that these possibilities are not well used. This results from underestimation of the map as a source of knowledge and from a relatively modest methodological base for gaining and processing cartographic information.

#### REFERENCES

- Berlant A.M., 1988, *Kartograficheskiy metod issledovaniya*, Moskva, Izd. Moskovskogo Universiteta.
- Beveridge W.I.B., 1961, *The Art of Scientific Investigation*, Melbourne, W.Heinemann.
- Harvey D., 1976, *Explanation in Geography*, London, E.Arnold.
- Nagel E., 1961 *The Structure of Science. Problems in the Logic of Scientific Explanation*, New York and Burlingame, Harcourt, Brace and World.
- Ratajski L., 1977, "Straty i zyski informacji w przekazie kartograficznym" (Losses and gains of information in cartographic communication), *Polski Przegląd Kartograficzny*, Vol. 9, No. 3.
- Salishchev K. A., 1982, *Kartovedeniye*, Moskva, Izd. Moskovskogo universiteta.
- Such J., 1987, "Klasyfikacja nauk" (Classification of sciences), in: *Filozofia a nauka. Zarys encyklopedyczny* (Philosophy and Science), Wrocław, PAN Ossolineum.
- Wójcicki R., 1982, *Wykłady z metodologii nauk* (Lectures in methodology of sciences), Warszawa, PWN.