

SOME DEVELOPMENTAL TRAITS OF THEORETICAL CARTOGRAPHY

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Abstract

Attention is focused on the developmental diagrams of theoretical cartography, constructed on the basis of relevant cartographic publications (monographs, articles etc.), edited in this century. All diagrams interpret the development of theoretical cartography as an immediate consequence of the origin of ICA. Attention is paid to the trends, conceptions and schools in theoretical cartography, also to the map language and map semiotics, to the laws and methods in cartography, and to the cartographic definitions and terminology.

1 Introduction

Theoretical cartography can be interpreted as a spiritual wealth, as a sense-making set of opinions (judgments and logical conclusions) originating in relation to the map creation - they precede it, accompany it and they are necessary also for the use of the maps. Theoretical cartography is, therefore, not analogue of such disciplines that are concerned with theorizing in a level of idea, logic (even without direct connection with practice), on the contrary, so far it gathers theoretical knowledge that represents a superstructure of the practical cartography.

If we do not take in consideration the development of mathematical cartography - the only and specific theoretical cartographic subdiscipline that originated in antique period and in medieval age and that as a whole theory of cartographic projection was constituted before the 20th century - then the development of map theory (as a picture, expression, model, etc) is obvious only at the beginning of the present century. Perhaps the works of the pioneers of theoretical cartography from the first half of this century in chronological order will do:

- Peucker, K., 1902.** Drei Thesen zum Ausbau der theoretischen kartographie. Geographische Zeitschrift, 8, Heft 2, pp. 65-80, Heft 3, pp. 145-160, Heft 4, pp. 204-222.
- Eckert, M., 1907.** Die Kartographie als Wissenschaft. Zeitschrift der Gesellschaft für Erdkunde zu Berlin, pp. 539-555.
- Hettner, A., 1910.** Die Eigenschaften und Methoden der kartographischen Darstellung. Geographische Zeitschrift, 16, pp. 12-28 and 73-82.
- Eckert, M., 1921.** Die Kartenwissenschaft. Forschungen und Grundlagen zu einer Kartographie als Wissenschaft. Berlin und Leipzig, de Gruyter, Band 1, Band 2, 1925.
- Imhof, E., 1927, 1928.** Die Kartenfrage. Schweizerische Zeitschrift für Vermessungswesen und Kulturtechnik, 26, 27, pp. 1-60.
- Eckert-Greifendorf, M., 1936.** Kartenkunde. Berlin, de Gruyter.
- Raisz, E., 1938.** General Cartography. New York, McGraw-Hill Book C.
- Salichtchev, K.A., 1939.** Osnovy kartovedeniya. Obchtchaya chast. Moskva, Geodezizdat - etc.

But the real boom of theoretical cartography took place only in the latter half of this century.

2 Developmental diagrams

On the basis of more or less complete lists of the cartographic publications (monographs, but also journal studies) in which cartographic theoretical reasoning, that is to say, thinking, were presented, various diagrams can be constructed. A frequency graph will illustrate gradual growing of the amount of cartographic theoretical publications. If we classify these publications according to the themes we shall get various forms of diagrams, and beside other, also a flow and tree form. Flow diagram was constructed by A.M. Berlyant [2], tree diagrams fashioned according to various lists are illustrated and commented in the works of J. Pravda [11] and A. Wolodtschenko [13].

Diagrams are advantageous because they can be constructed as converging, diverging, eventually grid diagrams as done for instance by Ch. Board [4] for the "Communicating Cartographic Communication". Disadvantage of the diagrams lies in the fact that they are to certain extent subjective, they depend on the knowledge and intuition of the one, who is constructing it. But they are undoubtedly an useful analytical instrument - especially for the case when somebody, after some time, fashions more objective sources of the analysis.

Developmental diagrams constructed on the basis of growth of the amount and thematic variety of cartographic publications illustrate beside the quantitative side also some qualitative characteristics of cartographic theoretical thinking in this century, for instance, they suggest the division of this development into phases, they specify the beginning of its rapid development since the beginning of the 60-ties (origin of ICA) and differentiate in this development theoretical trends and conceptions.

3 Theoretical trends

Trend in theoretical cartography is a direction in which some, already known, branch of cartographic knowledge is being developed or in which a new branch is arising. Trend in cartography is a certain opinion or certain not too extensive system of opinions explaining some cartographic problem (as a rule from certain aspect). In comparison with theoretical conception, the trend is less elaborated, less structured, it even can be a hypothetical opinion. Theoretical trend as a rule precedes the origin of the theoretical conception, but not of all trends conceptions originate.

At the present, for instance, the following trends can be distinguished:

- various trends of relief representation (in order to distinguish the trend a theoretical justification is decisive - practical result must be considered as verification, proof),
- trends called "cartographic language", "language of map", "map language", "map symbolism", "pixel syntactics", "map semiosis" etc. - each term represents a particular sum of opinions, its own explanation of map representation essence,
- various trends of computer (digital) cartographic modelling,
- etc. (various trends of geoinformatics, GIS-technology, remote sensing data-processing ...).

As the essence of the theoretical trends is more in subjective-intuitive level than in the level of proof, some trends are recognized, some not, some trends are recognized by one group cartographers, some by other group. It is because at the estimation of the trends uncertainty, even tendenciousness can not be excluded. However, those are the properties typical for any consideration - analytical, synthetical, individual and a group one. Those are the barriers lining as a rule any way leading to knowledge.

4 Theoretical conceptions

Theoretical cartographic conception is a relatively complete whole of opinions, structured system of ideas concerning some particular part of cartography or all-cartographic conception. Sometimes it is difficult to distinguish a less developed conception from a well explained trend and so in some cases terms "conception" and "trend" overlap. A.M. Berlyant defines theoretical conception in cartography as certain system of opinions on an object and method, way of understanding and explanation of basic process of the development of cartographic science and production [3]. There is no need to stress that the Berlyant's definition concerns only such conceptions that are of all-cartographic nature. He has delimited the following conceptions:

- cognitive or model-cognitive conception at the origin of which an important role was played by "kartovedenie" of K.A. Salichtchev and in the frame of which conception of system mapping, synthetic mapping and mathematical-cartographic modelling exist.
- communication conception in frame of which there exist conception of metacartography and conception of cartology,

- language conception at the origin of which was the idea of normative cartography and cartonomy,
- geoinformation conception into which all preceding conceptions converge.

I think that the idea of convergence of theoretical conceptions in cartography is rather a wish (eventually intuition) of the author than the consequence of some objective constellation of causes. Different view of whether some higher quoted conceptions are indeed conceptions is also possible. So, for instance, "kartovedenie" of Salichtchev is above all a name of teaching subject and it suits rather the name of (educational) subject than conception. "Cartology" is Ratajski's [12] name for theoretical cartography. "Metacartography" has two interpretations: 1) it Hägerstrand's name for the "pre-maps" i.e. something that is outside cartography [5]. 2) In Aslanikashvili's version it is a gnozeological (cognitive) cartography in which the principal role is played by the map language and cartographic method [1]. After my opinion this name can be used for denoting some parts of theoretical cartography that have their origin in philosophy and logic i.e. "over" the cartography. "Normative cartography" remained in the position of an attempt [6] and "cartonomy" is only summarizing name for the part of cartography the main content of which is trend-subconception "map language" [7]. "Gnozeological conception" is a working term preferred by K. A. Salichtchev in his "fight" against a narrow formalistic interpretation of cartography outside the position of communicative conception. As a matter of fact, every science is gnozeological (cognitive), otherwise it could not be called science or theory.

In 1985 I said [10] that there exist the following theoretical conceptions in cartography (I called them then "theories"): 1) information (conception of map as information carrier), 2) communication (conception of cartographic form of information transfer), 3) language (conception as a expression with mean of map language), 4. system (conception of map as abstract system for the representing of real system of geographic sphere), 5. model (conception of mathematical-cartographic, eventually, cybernetic modelling). I have nothing substantial to add to this opinion, except that the first two conceptions can be interpreted also as two subconceptions of one information-communication conception and the last two also as subconception of one system-modelling conception. Language conception could be called also language-semiotic (or linguistic-semiotic) conception, eventually it might be interpreted as subconception of semiotic conceptions of map (if semiotic interpretation is imposed over the linguistic one). It is only a question of terminological and classifying precision.

5 Theoretical schools

If a system of opinions over some cartographic problem originates in one cartographic centre where it is developed, improved for some years, we can talk about theoretical cartographic school. An important feature of the scientific school is mainly the specificity of approach to the scientific problem and also localization into one place, as a rule centre. We know from history several "predecessors" of today's cartographic schools. It is for instance the "Golden age of Dutch cartography," or the "Swiss manner of relief representation". In the contemporary cartography this phenomenon is not so much extended and so distinct as, for instance, in mathematics or linguistics. But in spite of it if we say "Imhof's school", "Arnberger's school", or "Salichtchev's school", every cartographer knows immediately what we mean. Behind every school's name there is hidden a characteristic opinion on map and cartography, distinct geographical and temporal localization, as well as possibility of naming "pupils" or "followers". If we get used to this phenomenon and we start to use it in inter-cartographic communication we shall be probably amazed how many different school there are within cartography.

6 Laws and methods

At the Warsaw conference of ICA a paper on methods and laws in cartography was presented [9]. The question of methods, categories and laws is a delicate matter in every science, that is why everyone prefers to avoid it. Except of K.A. Salichtchev, as far as I know, nobody noticed this problem. He was also criticising the mere "amount" of the mentioned laws. Meanwhile he did not

notice that there are "only" four laws interpreted as classes i.e. law (laws) of projection, law (laws) of scale, law (laws) of generalization, and law (laws) of representation. Naturally, if the cartographers can close their eyes in front of cardinal (logical-philosophical) problems of cartography and create maps like their predecessors did for centuries, even thousands of years - on the basis of empiric knowledge and their infinite generalization. But they cannot ignore this problem for ever, one day they will have to solve it if they do not want philosophers and methodologists to solve it for them, and they do not know cartography as well as cartographers. It is obvious that the logically right maps can be made only on the basis of knowing the logical (philosophical) essence of the map. So far this essence is only felt.

Similar situation is also in cartographic methods. At the creation of the map numerous rules, principles, ways, even methods are applied. One extreme is to see methods everywhere, in each stage of the cartographer's work. Another extreme is when the cartographers avoid methodology as much as possible. For instance they rather use name "dot map", "diagram map", "choropleth map" etc., just for the sake of not exposing themselves to the risk that they are using philosophically insufficiently investigated methodology of dot, diagram, cartogram, etc. method of representation. So far used differentiation of the methods (ways, classes) of cartographic representation are so empiric that they are not capable of any further improvement. It is necessary to shift to other, theoretical (deductive-inductive) base. For instance, semiotic, linguistic interpretation is available, facilitating distinguishing instead of map classes (kinds) or methods of map representation, the so-called syntactic types (with subtypes and variants). But it is necessary to invite more cartographers into this theoretical-methodological discussion.

7 Definitions and terminology

We have numerous definitions of the map in cartography, definitions of various procedures, definitions-explanations of particular notions, but also definition of the very cartography. Compilation and publishing of Multilingual Dictionary of Technical Terms in Cartography [8] was a pioneer step. This dictionary should not be interpreted as a mere culmination of terminological activity of ICA that continues "only by "tiny corrections" in further editions. It should be interpreted as a document illustrating very diverse perceptions of cartography, maps and further cartographic categories (terms, notions) calling attention and challenging cartographers to solve the existing terminological and in terminology hidden theoretical gaps in cartography. Regardless the fact that the historically based national or regional differences must be respected, we should also remember also further development of cartography as an independent and world wide united discipline.

8 Conclusion

Thinking potential that was and is created around the trends, conceptions and scientific schools, around the laws, scientific categories and methods, around definition (axiomatic or explanative) and other terminological problems must be seen in a priority position in the scheme of theoretical cartography. These are almost all problem whose solution, we can say, is situated in superstructure level, seemingly "over" the theoretical cartography. That is why these problems can be denoted as metacartographic. It will be (after Bunge's and Aslanikashvili's "metacartography") other, the third interpretation of metacartography in entirely different level - as an integrated part of theoretical cartography.

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