

## CARTOGRAPHY – A NECESSITY OF OUR DAYS

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**Abstract:** *Cartography is in transition. Where the changes will lead is uncertain, but change in the discipline is pervasive, and the rate of change seems to be accelerating. Many of change are the result of very rapid and substantial development in the technology available to cartography. But, equally important, a conceptual maturation of discipline itself has evolved.*

**Keywords:** *cartography, conception, map, data collection*

### 1. Introduction

People must have assistance in observing and studying the great variety of phenomena that concern them. Some things are very tiny, and we must use complex electronic and optical means to enlarge them in order to understand their configuration and structural relationships. In contrast, some geographical phenomena are so extensive that we must somehow reduce them to bring them into view. Cartography consist of a group of techniques fundamentally concerned with reducing the spatial characteristics of large area – a portion or all of the earth, or another celestial body – and putting it in map form to make it observable. The same techniques can be used to enlarge microscopic things to make them easily visualized. Although it is uncommon to refer to these activities as cartography, the resulting images are sometimes called maps.

Just as spoken and written language allows people to express themselves beyond the restriction of having to point to everything, a map allows us to extend the normal range of vision, so to speak, and makes it possible for us to see the breather spatial relations that exist over large areas or the details of microscopic particles.

Even an ordinary map is much more than a mere reduction. It is a carefully designed instrument for recording, calculating, displaying, analyzing and in general understanding the inter-relation of things in their spatial relationships. Nevertheless its most fundamental function is to bring things into view.

Since classical Greek times, curiosity about the geographical environment or milieu has steadily grown in one civilization or another, and ways to present it in a meaningful way have become more and more specialized.

Today there are many different kinds of mapmaking, and the objectives and methods involved seem very different. It is important to realize, however, that all maps have the same basic objective of serving as a means of communicating spatial relationships and forms; therefore, however dissimilar the maps may seem the cartographic methods involved are fundamentally alike.

The rapidly growing population of the earth and the increasing complexity of modern life, with its attendant pressures and contentions for available resources, has made necessary detailed studies of physical and social environment, ranging from population to pollution,

from food production to energy resources. The geographer, the planner, historian, economist, agriculturalist, geologist and others working in the basic sciences and engineering long ago found the map to be an indispensable aid.

A large map of a small region, depicting its land forms, drainage, vegetation, settlement patterns, roads, geology or a host of other detailed distributions, makes available the knowledge of the relationships necessary to plan and carry on many works intelligently.

The ecological complexities of the environment require maps for their study. The building of a road, a house, a flood control system, or almost any other constructive endeavour requires prior mapping. Smaller maps of larger areas showing things such as flood plain hazards, soil erosion, land use, population character, climates, income and so on, are indispensable to understanding the problems and potentialities of an area. Maps of the whole earth indicate generalizations and relationships of broad earth patterns with which we may intelligently consider the course of past, present and future events.

## 2. Conceptions of cartography

A subject as complex and important as cartography is bound to have many interesting dimensions worthy of special attention. Five such focuses of attention within the field are singled out for further consideration here. This selection is made on the basis of the emphasis placed on mapping costs, map accuracy, essential mapping activities, communication effectiveness and the aesthetic aspects of maps.

### 2.1 Geometric conception

The aim in this case is to create a cartographic model of reality that is primarily for metrical (measurement) use and analysis. Counts and measurements taken from the map will approximate closely those that would be attained were the same analysis carried out directly in the mapped environment.

Applications may involve tasks with rather simple aims, such as measurements of positions, direction, distance, area or volume, or counts of features. On the other hand, applications may become very involved in support of navigation or complex engineering producers, such as the siting of dams, airports, or land communications /transportation corridor. Emphasis in this conception is placed on metrical accuracy.

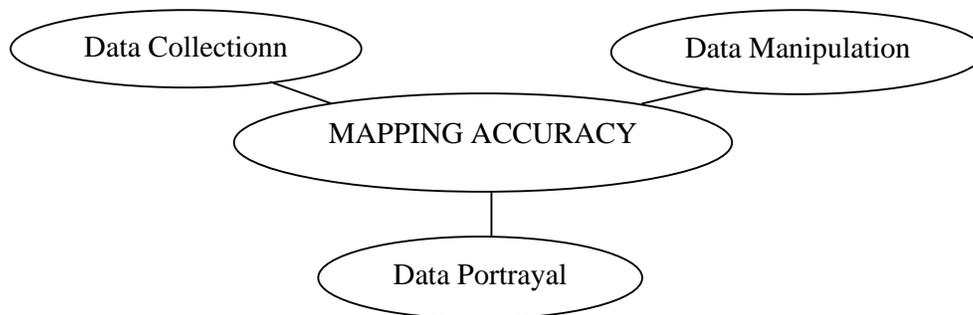


Fig. 1. Basic characteristics of the geometric focus

There is a concern for uniform and high quality in data collection, manipulation and portrayal. Indeed, attempts are often made to adhere to rigid map accuracy standards. A broad user group is summed and it is also assumed that these map users will be able to read and analyze accurately whatever the cartographer produces.

The land maps that result from the geometric viewpoint tend to be large scale and to portray distributions of the physical features of the earth or other celestial bodies. Topics mapped commonly include the landform surface, hydrography, political boundaries , transportations/communication routes and so forth.

Nautical and aeronautical charts employ a wide variety of scales to fit the situations in which they are used and the precision required in the data to be obtained from them.

Many topographic map and navigational chart series are produced by government agencies under this conception of the field. The design of these maps tends to be traditional, neat and clean in appearance. Rarely is the design experimented with or change.

Within the geometric conception of cartography social or cultural themes, such as population, per capita income, health of inhabitants and so on are de-emphasized. Quite possibly this de-emphasis is simply the result of difficulty in accurately collecting and portraying information about these kinds of distributions. With the emphasis placed so strongly on the truthfulness of the map product in analytical terms, the mapping of socio-cultural phenomena may merely be thought best avoided.

## 2.2 Technologic conception

In this view cartography is considered as a technology for producing maps and maps are considered to be a storage medium for spatially ordered information. From the perspective of this conception, cartography is viewed as a series of processes concerned with data collection, map design, production and reproduction. Research is directed at improving mapping efficiency.

Thus, attention is focused mainly on technical innovation and the streamlining of the stages in map preparation, a primary aim being to increase production speed and volume while lowering per unit costs.

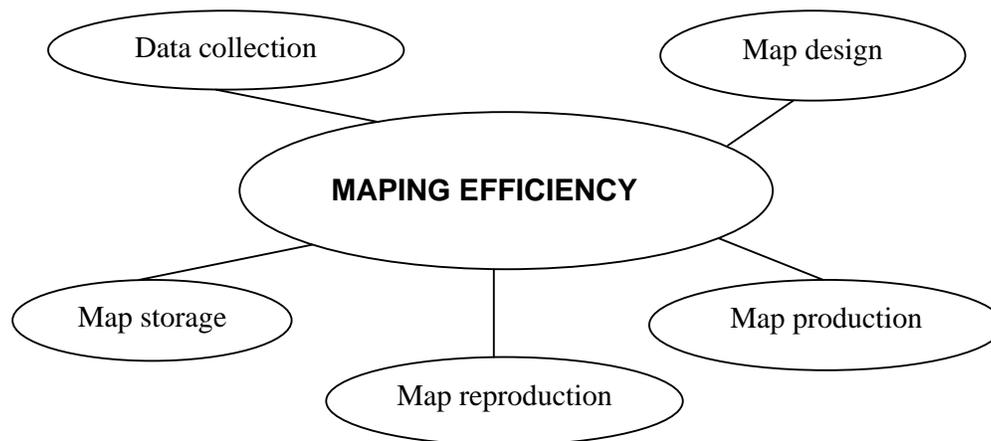


Fig. 2. Basic characteristics of the technological focus

Those, who take a technological view of cartography can point to many precise advantages in the field. Manual skills were replaced by optical-mechanical technologies and these in turn, gave way to photo-chemical technologies.

Currently electronic methods are revolutionizing the field. Thus the modern cartographer is advised to pick and choose among a wide variety of methods, making decisions on the basis of available time, labor and capital resources.

The technological conception is evident in the planning and execution of many map series. Some initial emphasis is given to the effects of data manipulations, map design aesthetics, map accuracy and map effectiveness, but once production has begun, practically no further attention is given to these topics. One result is that the symbolic systems used on the maps tend to be complex and standardized.

### 2.3 Presentation conception

The presentation focus stems from concerns about what cartographers do and the relationship between cartography and each of the other mapping sciences (geodesy, surveying, remote sensing, photogrammetry) and associated disciplines. This model emphasizes map design as the central focus or core activity of the field.

The cartographer's role is first to determine the map content and then generalize and represent this information with symbols in a well-balanced layout. The entire process of the production of the map is carefully planned.

The presentation concept is exclusive in the sense that it establishes limits to the discipline.

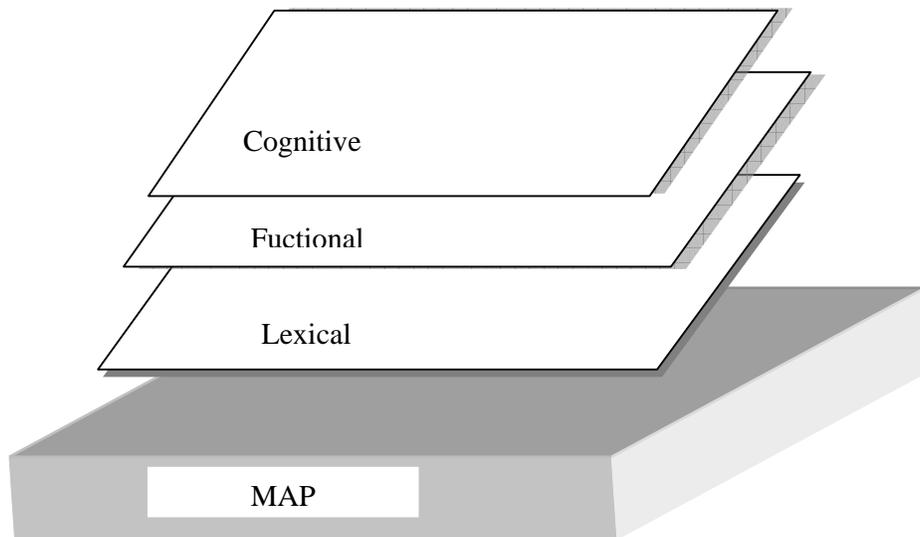


Fig. 3. The multiple levels of map representation

The characteristics of geographical data, technology, map conditions, graphic arts and visual perception receive attention only as they may be needed to fit the requirements of the map design. These topics and the information and processes that they encompass are not in a

direct way part of cartography but instead provide linkages and channels of information flow between cartography and a wide array of important support disciplines.

Indeed, this recognition of the extensive ties between cartography and other disciplines is probably the most valuable characteristic of the core activity model.

It makes clear the fact that cartography draws its strength from a diversity of sources. The physical, natural and social sciences provide the necessary raw data for mapping. The cognitive sciences create an awareness of the needs and limits of human visualization, which can be addressed through map design ideas. The engineering and technological professions and trades provide the means for executing the designed map in an efficient manner.

## **2.4 Artistic conception**

The three conceptions of cartography discussed so far are all rather clinical in nature. They suggest that the mapping process and the effects of using maps can be rigorously defined and manipulated. Although rational analysis and logical step-by-step procedures are important, by themselves they can lead to rather sterile portrayals, which may fail to convey a realistic impression of the mapped environment in spite of being technically correct. What may be missing is an artistic dimension.

The artistic conception of cartography is purposefully vague with respect to mapping rules or guidelines. The emphasis is on creative expression and whatever seems to work with the situation at hand, rather than on following established conventions. Standards of accuracy in this kind of cartography are not metrical. Rather, their quality is to be judged by the subjective responses of the viewer. Innovation and variety are characteristic.

## **2.5 Communication conception**

The communication focus identifies the principal task of cartography to be effective communication of information via the use of a map. It is based on the belief that graphics (including maps) play an important role in human thought and communication, which in many ways is comparable to that served by natural languages and mathematics/statistics.

With the communication focus the mapping process is seen as a series of information transformations, each of which has the power to alter the appearance of the final product. In data collection the environmental information is distorted through the filters of ground survey, census, remote sensing or compilation procedures.

Through generalization, mapping further modifies these data by the abstraction processes of selection, classification, simplification and symbolization. Finally, the use of the map leads to the distorting effects of map reading, analysis and interpretation.

The point here is that there are many possible maps of the same geographical information, each of which will possess certain communication advantages and limitations.

The cartographer's task is to explore the ramifications of each mapping possibility and to select the most appropriate for the intended communication. What the communication conception emphasizes, then, is that the mapping effect may in some contexts be as valuable as the metrical accuracy of mapping in geometric terms might be in other contexts.

In its view, the great power of the mapping process lies in its ability to provide fresh, insightful perspectives, sometimes even distorted ones, on our environment.

Furthermore, the effect of map is in large part a function of the user's skill, experience and perceived needs.

### 3. Conclusions

For about two thousand years, the challenge of trying to represent the round earth on a flat surface has posed mathematical, philosophical and geographical problems that have attracted inventors of many types.

The contemporary process of mapmaking had a slow beginning because exploration of the earth as a whole is relatively recent historical development.

The normal sequence is for the cartographer to select data from the data domain, to process those data into a map format, then for the user to observe and respond to or use the data. This identifies four categories of processes in cartography:

- ✓ collecting and selecting the data for mapping;
- ✓ manipulating and generalizing the data, designing and constructing the map;
- ✓ reading or viewing the map;
- ✓ responding to or interpreting the data.

It follows that five focuses or conceptions of cartography differ in terms of which of the processes each stresses. Each conception contains elements of some or all of the other processes, as well as the processes on which it concentrates.

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