GEOGRAPHY AND DEMOGRAPHY

Cartography

Handling and Mapping Geographic Information

Coordinated by
Claire Cunty
Hélène Mathian

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Foreword

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Within the framework of the ISTE SCIENCES encyclopedia and, more specifically, of the “geography and demography” field, four works are devoted to cartography. Cartography is a scientific and artistic discipline (Robinson 1952, 1953), and it is indispensable to any person, organization or institution that needs to process and represent geographic data to bring out its spatial characteristics. With current technological changes, the continuous increase in the use of Web 2.0 and the appearance of social networks, cartography is undergoing profound changes.

This discipline has, in fact, undergone many more or less fundamental changes over time, both conceptually and technically, the two being intimately linked, as de Rosnay (2008) writes: “Scientific progress and technological progress feed each other”. If its junction with statistics, as early as the end of the 19th century, had introduced new processes to translate localized phenomenon, the advent of the computer, and subsequently the birth of computerized cartography, could be considered a revolution. The latter was coined in an article by Tobler in 1959, simultaneously announcing the steps for the construction of an automated map and the basic principles of what would become geographic information systems (GIS).

Between this date and the beginning of the 1980s, this “new” cartography was developed in two directions: on the one hand, computer cartography, which reproduced what had previously been done manually, and, on the other hand, computer-assisted cartography, which opened up new avenues for creating innovative representations or

introducing methods of surface analysis[1]. In the early 1980s, microcomputers appeared, whose immense capacities are now available to a large number of people with minimum knowledge. “Making” maps seems to be easier, updates become simpler, and software, of varying quality, is multiplying. The availability of the Internet, and especially the Web in 1994, further simplified the diffusion of graphic documents, which multiplied.

In addition to these new features, a fundamental change involved the communication paradigm, which is essential in the field. Despite automation, the arrival of the Internet and the Web, the logic of moving from an author/producer (the one who conceives, who represents) to a reader/user, sometimes with feedback, remains predominant; the reader, the one who consults, who looks at the map and uses it, remains passive, even if, thanks to animation and especially interactivity, they can move their document around, zoom over it, fly over it, etc.; but they cannot modify it. However, with the arrival of Web 2.0, the Semantic Web and the advent of the Geoweb from 2005 to 2010, and especially 2015, a new turning point is taking place: the reader/user, whoever they may be, becomes active. They can modify the maps on the Web and can even create them. This is the beginning of a new period for cartography, which will be further developed in the works for the ISTE encyclopedia, in order to present an updated state of this science, with its transformations for the period 2010–2022.

The chosen date of 2010 as the threshold is explained by the fact that many works on cartography, both in French (Béguin and Pumain 1994) and English (Cauvin et al. 2010a, 2010b, 2010c; Slocum et al. 2009), were published in the previous years, exposing the characteristics of the field just before the “real” start of the Semantic Web, highlighting the steps necessary to produce a map, as well

as the successive choices that must necessarily be made. Indeed, the construction of a map requires at least three main steps, each of which has a very specific role. The first step is to create a localized database from the geographic information provided. The second stage ensures the processing and transformation of the data in the database, insisting either on the locations or on the thematic data, or on both simultaneously, with or without taking time into account; it leads to the determination of the representation mode adopted. As for the third stage, that of communication and diffusion, it is not only based on technical solutions, on semiotic choices, on the adoption of particular actions, etc., but also on the knowledge of elements of visual perception and cognition.

These three stages[2] are interrelated and are linked to both the challenges and the relationship between the recipient/user of the map. These three stages guided the selection of the four works chosen for the ISTE encyclopedia, because they start from the state of cartographic science at a period just before important changes. It will therefore be easier to highlight, describe and characterize the specific and original features of the years 2010–2022. One volume is devoted to each of the stages, and a fourth shows cartography from a historical aspect, thus facilitating a better understanding of the changes over time. Each volume can be read independently of the others and in an order that the reader wishes, according to his or her desires and expectations. The same is true for each chapter.

The aim of the historical volume is “to outline the history of cartography as it is done, and as it continues to evolve, by proposing a synopsis of the reflections and their modifications over the last forty years, in order to advance a history of cartography that takes into account current

reflections and research, and above all, that opens up new avenues to explore”.

The volume on geographic information and cartography focuses on data, its characteristics and its use in cartography during a period where digital techniques are gradually, but fundamentally, recomposing contemporary societies. Data acquisition is no longer an activity reserved for specialists. The sources of geodata are diversifying, citizens are directly and often voluntarily providing geographic information (GPS readings, cell phones, connected mobile objects, X (formerly Twitter), etc.); networking is immediate. The search for information for the production of maps is therefore profoundly transformed and reveals major issues in terms of digital society.

The volume on the processing and mapping of geographic information has a double objective. The first is to present methods and techniques for processing and transforming information to produce maps that respond specifically to each problem. These procedures take into account the spatial, thematic and temporal components of this information, and focus on spatial and spatiotemporal processes using indicators and models. The second objective is to highlight the importance of the interdependence of the different stages of cartographic construction, in which the processing stage is central. On the one hand, the latter must take into account the data to be processed, selected at the previous stage. On the other hand, it specifies, for the next stage, the original cartographic representations that will result from the selected processing. These two objectives are systematically concretized with examples that provide a clear understanding of the methods and their contribution to the understanding of the phenomenon under study.

The volume on communication, however, deals with the transmission of the map, because the latter is not a document that we produce so that it can remain in our pocket. It must become visible, and eventually audible and sensible, by appealing to graphic variables or others types of variables, possible actions and presenting display device properties. This volume will certainly be the easiest for detecting the specificities of the current period, with the role of choices at all stages, the interweaving of these stages and the collaborative work.

With the same tools and the same means, specialists and non-specialists will produce maps by taking what is at their disposal but with distinct training, which induces risks. Indeed, the new cartographic processes that are constantly emerging have many positive aspects: ease of use, diversity and attractiveness. However, like all new developments, their advantages have a downside; each of these processes has specific properties that are important to know at least in order to apply them wisely and avoid mistakes. The four books presented here show that we are moving toward new logics, new ways of conceiving, translating, processing and cartographically transcribing geographic information, without necessarily having to reject what already exists. The world of maps does not escape the general evolution in which we are all participating, with our wealth and our worries. May these books help everyone to be aware of what they produce and to use all these tools with discernment.

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Notes

1 This approach largely corresponds to the analytical cartography introduced by Tobler (1976, 2000).

2 A similar pattern is found in the latest version of Robinson’s reference book from 1995.

Introduction

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> *Mapping is perhaps the most formative and creative act of any design process, first disclosing and then staging the conditions for the emergence of new realities.*
>
> James Corner, 1999

I.1. Maps and mapping

The map is more than just a “simple” representation of space and must be seen as a succession of cartographic operations (Besse and Tiberghien 2017). It is both the graphic result and the set of cartographic operations that led to the resulting product.

> To operate is to transform a material by following a certain number of formal rules (rules that are not necessarily determined a priori, but which on the contrary can be invented or redefined in the course of the operation itself), in order to obtain a result, an object, a product. Every operation is a “formation” and a transformation […] (Besse and Tiberghien 2017, pp. 14–16).

Formally, the transition from geographic information or geographic data to maps involves several stages of data “transformation”, operating at different levels. Cauvin et al. (2010) define a categorization of these different “transformations”: entity transformations, thematic and geometric attribute transformations, cartographic

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