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Chapter 3

Farewell to maps Reformulating critical cartography in the digital age

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3.1 Introduction

For decades, representations of space have been the subject of analyses that decipher their construction and their socio-spatial effects from a political point of view. *Critical cartography*, a research trend that emerged in the 1970s and 1980s, was thus decisive in the adoption of a denaturalizing approach to maps. Today, however, the changes brought about by the digital transition have not yet been sufficiently integrated into this analytical framework. The time when maps were only approached as mediators of relations of domination seems to be over, in favor of diversified approaches that question the complex interactions between cartographic production, the forming of territories, processes of spatial visibilization/invisibilization, etc. The thesis of this chapter, however, is that the changes brought about by digital technology have disrupted the objects and questions of critical cartography to such an extent that the concepts, methods and objects to which attention is given must evolve in unison. Although, as early as the 1990s, many researchers were quick to perceive that the world they were studying was changing, political analyses of the new digital issues have remained scattered and fragmentary. Our purpose here is therefore manifold: it will be to draw up a reasoned assessment of the new conceptual and methodological challenges of digital technology for critical cartography (first section), to point out some of the historical shortcomings of the discipline that have made the analysis of the new phenomena more difficult (second section), and finally, to propose methodological *aggiornamento* avenues that can better account for the new ways in which power

and representations of space interact today (third section). In short, we propose to reformulate critical cartography in the digital age.

3.2. Farewell to maps: when the digital world disrupts the objects and questions of a research current

Even before posing new questions for critical cartography, which we will see at the end of the chapter, the digital world disrupts the questions that could be described as "conventional" within this movement.

3.2.1. The main issues of conventional critical mapping

Critical cartography has retained from its beginnings the simple idea that maps serve power. In a general context of questioning the objectivity of science (Jasanoff 2004), the founding work of British geographer and map historian John Brian Harley truly launched the critical cartography movement in the 1970s and 1980s (Harvey 1989). By distancing himself from functionalist approaches and emphasizing the cognitive scope of maps, he invited the social sciences to rethink them as forms of socially constructed, subjective and ideological knowledge. In France, it was undoubtedly Mark Monmonier's *Comment faire mentir les cartes: du mauvais usage de la géographie* (1991), which contributed most to popularizing this first stage of critical cartography. In the 1980s and 1990s, a historian movement strengthened around the study of the map as an instrument for the formation of the modern state (Kain and Baigent 1992; Wood 1992; Touzery 2007; Debarbieux, chapter 5 of this book).

To the seminal question "how can maps be used to exercise power?", critical cartography has gradually brought considerable nuance. As John Pickles (2004) suggests, the Foucauldian and post-modern turning point of the 1990s complicated the vision of cartography as a mere "repressive" or authoritarian exercise of power, in favor of an approach in which the map became part of a "power-knowledge". He argues that "mapping as a power-knowledge also functions as productive power with to constitute objects, identities and practices that are part of (and constitutive of) our world" (Pickles 2004: 114). More subtle forms of domination and control, circulating, internalized by individuals and no longer imposed from the outside by force, are then highlighted.

This second stage of critical cartography thus opens up two research programs, which are similar but not identical: on the one hand, it is a question of understanding cartography as one of the techniques for the territorialization of power, in an explicitly Foucauldian vein. On the other hand, it is to analyze it as a vector of

dissemination of hegemonic visions within the population, which could be described as "acculturation". Without clearly distinguishing between the two, Pickles shows this dual agenda of post-modern critical cartography in his 2004 book. He argues that maps and cartographic institutions are to be seen as "archetypes of power-knowledge", i.e. "a discourse, a practice, and a set of institutions that delimit potentialities through the control of time, space, and action, and thus produce certain kinds of subjects, actors, and places" (Pickles 2004: 111). The idea of territorialization is fundamentally geographical, but here again, it is more on the side of history that the first and most thorough and striking essays are written. In 1988, Tongchai Winichakul defended his thesis on the role of cartography in the formation of the state that would become Thailand, *Siam Mapped: A History of the Geo-Body of a Nation*. His central idea is that the cartographic enterprise shaped the Siamese territory and nation, and that "maps operated as technologies of territoriality" (Pickles 2004: 117). In sum, the map precedes the territory¹.

The idea of acculturation, on the other hand, is approached in many ways and by various disciplines. In France, we can mention the research of Serge Gruzinski on the acculturating effects of the circulation of Spanish maps among the Nahuatl elites, who were incorporated into the Spanish empire during the 16th century (Gruzinski 1987; 1993). Even if this defeated nobility was able to mobilize maps made according to Spanish norms to exercise a form of resistance to their new masters, the simple fact of having recourse to the representations of these "Others" contributed to profound changes in their culture and social organization. In the same vein, the controversy surrounding the so-called "Peters projection" (Crampton 1994) had already initiated this questioning of acculturation. In 1974, this historian's proposal to discard the Mercator projection for its "racist" character (Pickles 2004) was already clearly part of this trend, carried in this case by post-colonial activism: it was a question of denouncing this widely used projection, which artificially minimizes the surface area of the lands colonized by Europe, as a means of acculturating the populations of the "Third World" to the representation of the world of their oppressors².

¹ What would become the antiphon of Foucauldian-inspired critical cartography found one of its emblems in Winichakul's work. In 1991, Benedict Anderson explained in the preface to the second edition of his famous book *Imagined Communities* (Anderson 1991) that it was his discovery of Winichakul's work that led him to incorporate a specific point on the map in chapter 10.

² This example is based on work that, prior to the formal advent of a field of knowledge clearly labelled as "critical cartography", was already practicing similar approaches. For example, there are many expressions that could be classified as critical cartography, but which predate the work of Brian J. Harley. This is what Crampton and Kryger (2006) point

3.2.2 What the digital world does to critical mapping: Russian-doll-like difficulties

The digital transition that has been accelerating since the late 1990s has brought about a number of interrelated difficulties that complicate the analysis of map production and representations of space from a political perspective. The first is the material change of the cartographic objects themselves, which shatters the map into multiple informational artifacts (from virtual globes to GPS tracks, from geographic databases to geolocation applications, etc.): it is therefore now difficult for critical currents to clearly establish *what they are talking about*. The second difficulty is the circulation of these objects. Promoted by the Internet, these are more difficult than in the past to follow, since they are made up of multiple digital objects that can aggregate or disintegrate *ad infinitum*: under these conditions, identifying *who does what* in the contemporary cartographic factory poses formidable methodological questions for anyone interested in power relations, for which it is necessary at the very least to identify the various stakeholders. As a consequence of these first two difficulties, it is nowadays difficult to grasp precisely which dimensions of power are affected by these new forms of cartographic production: if the objects are difficult to grasp, and the actors multiple and vague, how can we succeed in establishing the way in which power is instituted and circulates?

Explosion of objects and categories

The persistent focus of critical cartography on the *map* object makes it difficult to understand recent developments, and in our view the very term *cartography* brings about more problems than solutions for relevant policy analyses. Indeed, everything seems to indicate that we are no longer systematically dealing with maps in the strict sense of the word in the context of the digital transition, but with more complex and shifting objects. Virtual globes, for example, such as *Google Earth*, are above all puzzles made of images. Firstly, critical cartographers only began to study these new products, which were initially considered uninteresting because they were produced outside the sphere of patent experts and intended for the "general public", at a very late stage. Secondly, they did not say openly enough that their practice was gradually shifting towards critical approaches to a multitude of representations of space, including the map, which was no longer exclusive. Nor did they explain sufficiently what this implied in terms of methodological *aggiornamento*: traditionally, the political criticism of maps identifies an author or a person responsible for a cartographic production, questions their intentions and

out. We refer the French-speaking reader who wishes to learn more to the third chapter of Gilles Palsky's (2003) dissertation.

representations, and analyzes the way in which their maps carry these and will interact with other actors. However, when maps are composed on geographic information systems from digital *layers* produced by different actors who do not know each other and who have worked separately with different objectives, it is understandable that the analysis of the representations and intentions of which the maps are the bearers is made more complex: each layer may implicitly "embody" a specific representation, which will have political effects, regardless of the intentions of the person who makes a map with it. A simple example of this situation: it is now common to create maps of tropical countries using forest vegetation layers produced at the continental scale by international agencies or nature conservation NGOs (on this topic, see also Chapter 6 of this book). These vegetation layers are not a neutral representation of forests, but the product of technical choices with strong political consequences. For example, classifying agroforests as *primary forest*, and therefore requiring specific protection, may lead some governments to drive rural populations that depend on this environment out of their territories. However, as long as this type of layer is included in a map without being subject to specific criticism, the final map *embeds* or *inherits* implicit political biases.

The digitization of geographic data thus complicates, if not makes impossible, the constitution of clear corpora according to the conventional categories of policy analysis. As has recently been pointed out, digital data have become *malleable*, in the sense that they are easily modified by people other than those who created them (Joliveau *et al.* 2013). Associated with this *malleability*, their reproducibility, which has become extremely easy at generally marginal costs, explains why data can have very multiple lives outside their original cradle. The founding categories of research in information and communication, that of *producer* and *user*, are thus potentially turned upside down. A growing number of digital data users will modify them so that they better correspond to the uses they want to make of them, combining them with other data sets, and in turn becoming producers of these data (hence the term "*produser*"). Digital technology has thus blurred the boundary between the notion of *production* and that of *circulation* of information. Whereas in the past, information was generally produced within a stabilized framework and then circulated without being altered too much, today this framework explodes and circulation becomes one of the ways in which information is produced.

Another effect of the digital transition is the increasing porosity between two previously relatively sealed worlds: the public and the private. For it is increasingly common for data sets to associate several producers of different status (Joliveau *et al.* 2013). The democratization of individual positioning tools (GPS) has also changed the situation by multiplying the number of contributors to geographic databases in certain fields (amateur naturalism, road applications, etc.). The large

national and global databases are therefore partly made up of data collected by individuals not affiliated with a public institution, which gives them a different status from conventional databases, made up solely of data collected by specialists. Some of these databases, such as Geonames ³for toponymy or OpenStreetMap ⁴for cartography, are no longer administered by public entities but by groups that are keen to make these digital commons live beyond institutional frameworks.

Another example is interoperability, a computer function that is increasingly present in geographic database management systems: it allows, from one interface, for consulting, viewing and often downloading data located on other servers and created by other institutions. The result of long research and negotiation to define common standards, interoperability has, in the last ten years, become a reality that is fully integrated into the daily life of cartographers and other geomatics specialists. It allows, for example, web platforms to *harvest* remote databases, and thus to aggregate data from different sources. This function therefore questions the outlines of a geographic database, since these can vary according to the requests made by the user at the *harvesting* interface. Lastly, when data are shared on the Internet, when they are freely accessible, the identity of the receiver is questioned, potentially extended to any person equipped with a means of access. The fact that people can take hold of this information even though they were not targeted by its formatting profoundly changes the analyses of its reception. This new "regime of digital truth", analyzed by Rouvroy and Stiegler (2015), has hardly been worked on in the field of critical cartography.

Difficulties in understanding the effects of territorialization and acculturation

From the previous section, we can see that it is difficult to clearly identify "who influences whom" when the objects that mediate power relations (maps, geographic data layers, etc.) are difficult to grasp. This indeterminacy also makes it very difficult to clearly identify how the processes of territorialization and acculturation take place. Take, for example, the question of cartographic sovereignty, i.e. the conditions that allow an actor to be autonomous in the representation and qualification of their territory. Since at least the 19th century, this sovereignty has been a major element in the construction of national identities, under the leadership of the State, which disseminates its official maps in the public space. The conjunction of satellite technologies, digital technology, and geopolitical relations means that it is now possible to map foreign territories and resources from a distance, while most territories are now "photographed" and mapped by others.

³ <http://www.geonames.org/>.

⁴ <https://www.openstreetmap.org/>.

Understanding how these cross- and distance-readings influence the geopolitical game and national representations of territories and their issues is a puzzle for critical cartography. As has been shown for environmental issues (Gautreau 2018), politically analyzing these processes would require monitoring the software used to measure the environment, the logics of their dissemination, the role of commercial wars between the companies that provide them, the strategies for training bodies of geomaticians by international cooperation agencies, etc. The diversification of actors capable of producing environmental information at a distance increases this imbroglio a little more. The major emerging countries are setting up space programmes, with varying degrees of success in their plans to equip themselves with their own earth observation satellites, while large private companies are themselves setting up environmental mapping programs⁵.

This deregulation from above (by actors operating at the national or even supra-national level) is accompanied by deregulation from below, carried out in a diffuse manner by actors with diverse profiles, acting at the local level, and who mobilize geographic information to turn the power of maps upside down and seize them to make their demands. This counter-mapping is not new, but such initiatives – led by environmental activists, indigenous communities or even groups of committed artists – tend to multiply by taking advantage of the opportunities offered by digital technology. Challenging the cartographic authority of states, this double deregulation opens up an era of post-sovereignty cartography (Noucher 2020) that can appear both as a symptom and as an agent of the crisis of nation-states confronted with globalization (Desbois 2015).

Given this context, it is clear that we must reformulate in new terms the old question of *resistance*, which was made explicit in the 1990s by critical cartography: what does it mean today to resist legibility by others, when these neo-cartographers are elusive hydras or are thousands of miles apart, never go into the field, and disseminate their analyses on the Web without our having any right of review?

3.2.3. *Methods maladapted to digital technology changes*

In the mid-1990s, however, critical approaches found a new resonance, but without significantly renewing this research current. Some of the researchers working on geographic information systems (GIS) and developing geomatics came together in the United States under the name of *GIScience*, and founded a research current around *Critical GIS*, which questioned the social implications of these technologies. Towards the end of the 1990s, Critical GIS became a sub-discipline of

⁵ See Amazon and its project: <https://www.globalforestwatch.org/>.

digital geography (Desbois 2015) which saw the development of different branches around, for example, participatory GIS intended to introduce geomatic techniques into participatory democracy actions (Rambaldi 2005). However, it can be argued that many of the important issues identified by this stream, such as that of the complexification of data processing chains described by Elwood (2009), have not been translated into extensive investigations of the subject. More worryingly, critical approaches to GIS still remain in the extreme minority.

Faced with these changes, critical cartography progresses by methodological trial and error: the urgency is first to succeed in identifying the new objects emerging. The difficulty in defining what is emerging is then compensated for by the invention of vague notions to which an attempt is made to give a more rigorous content *a posteriori* (GIS/2, neogeography, geoweb...). While the speed of technological developments does not help researchers to think more calmly about the world that we live in, it can also be said that the theoretical weight of the early days persists and limits new approaches. Much of the promise, but also much of the fear, of the new digital manifestations of the *map* is deeply rooted in the original paradigm (map = dominant power); these approaches perceive ongoing processes not as likely to lead us into a new paradigm, but rather as reinforcing previous ones. Jeremy Crampton's approach is emblematic of these difficulties in rethinking cartography in the digital age off the path traced during the 1980s and 1990s: when confronted with the arcana of cyberspace, he reuses Foucauldian categories in the truncated sense of power acting in a one-way fashion: surveillance of citizens, mapping of "crime", governmentality, etc. (Crampton 2003). (Crampton 2003). We can probably speak of path dependency here, insofar as this emblematic author of critical cartography, rather than questioning the relevance of these concepts to what is happening, seems to be looking in the abundance of digital innovations for examples that fit a well-established conceptual scheme.

This difficulty in thinking about the new things that are happening can also be explained by the lack of interest among geographers in tools for the *general public*, such as virtual globes, whose technical operating logic escapes them. According to Michael Goodchild, this lack of interest leads to a marginalization of critical approaches. He notes that there are proportionally far fewer researchers engaged in this path today than in the mid-1990s: "Critical GIS runs the danger of becoming almost invisible" (Goodchild 2014, p. 5). The new cartographic promises associated with big data seem, however, to be marked by a resurgence of positivism or a form of 'digital neo-positivism' (Mosco 2013) and require more than ever to be deciphered from a political angle.

3.3. The shortcomings of critical mapping exacerbated by digital technology

While critical cartography has not been without its debates, we believe that these are exacerbated by the digital transition. In this section, we point to three methodological problems that, since the early days of critical cartography, have caused it either to overestimate certain political effects of maps or, conversely, to lose sight of more subtle processes of power. While one might have expected that digital changes would highlight these problems on their own, this is not yet the case.

3.3.1 The "*Harlesian*" of reflections on the finished product

While Harley's work rightly contributed to a "broadening of the horizon of cartography" (Gould and Bailly 1995, authors' translation) which led to the denaturalization of the map by conceiving it as a *text* whose meaning had to be unravelled, it also installed for too long a critical method less interested in the process of map construction than in the analysis of the map as a finished product. Here we can see the gulf that separates "*Harlesian*" cartography from the sociology of science that established its methods at the same time. The former fixes its attention exclusively on a moment, a fixed expression (the map) of a dynamic process of representation of space (cartography). The latter, on the other hand, pays full attention to the process itself, and interprets the results of this process as often precarious forms of "stabilization" of reality, always subject to reinterpretation⁶. This prioritization of the *product* over the *process* was denounced very early on within critical cartography itself, particularly by those of its practitioners whose fields differed greatly from Harley's Britain. For example, as early as 1991, Robert Rundstrom denounced the fact that critical cartography at the time unacceptably restricted the kinds of maps and cartographic acts it chose as objects of study to Western cultures, and argued for the inclusion of indigenous cartographies where "process may be more significant than textuality" (Rundstrom 1991).

This fixation on the "map-object" is rendered partially obsolete by a multitude of processes that now affect the production of representations of space (discussed in the previous section), making them evolving and subject to multiple modifications in the course of their existence, often impossible to observe as a "finished product". On the cartographic interfaces of the geoweb, one could consider that there are as many maps as there are clicks! However, despite the fact that the focus on the map as a finished product is no longer possible exclusively in view of the concrete

⁶ This is particularly the case with work that has mobilized the actor-network theory for over twenty years from Francis Harvey and Nicholas Chrisman (2004) to Brice Trouillet (2018).

developments in contemporary cartographic production, it still persists in many works. This is notably what Matthew Edney argues in a recent book *Cartography: The Ideal and Its History* (2019). In it, he argues that cartographic research is subtly sidetracked by a set of preconceptions that form a kind of ideal. This "cartographic ideal" (Edney 2019) would, he argues, be a pervasive and masked cultural belief system that holds that there is an unequivocal category of objects called "maps," all of the same type. Whatever their form and function, these objects can be described with the same vocabulary and evaluated according to the same standards. The diversity of maps is reduced to a single function of representing spatial realities, and anything that deviates from this is removed from the official designation of "map". Edney then demonstrates that even the critical cartography he calls "socio-cultural criticism", while moving in the right direction, remains a victim of some of the preconceptions associated with the cartographic ideal and misses both certain objects (close to but different from the conventional map) and certain processes, undetected because not foreseen by the theoretical framework. From Edney's perspective, we believe that the pervasiveness of this "cartographic ideal" largely explains the blindness of many analyses to cartographic processes related to the radical novelties brought about by the digital.

3.3.2. *The taste for successful maps*

Another continuing trend in critical cartography is a strong interest in successful devices, i.e., those that enable those who master them to increase or maintain their power. Critical cartography is thus often the historian of victorious representations that have contributed to the strengthening of the powerful. This focus can no doubt be partly attributed to the logical disappearance of failed cartographic projects, both from memory and from archives, according to the adage that geography is rarely written by the defeated. More seriously, it is also possible to denounce the deliberate selection of cases that corroborate their theory by critical cartographers who want to demonstrate the effects of domination that their object generates (Palsky 2002). In doing so, this literature obscures an essential part of the career of cartographic enterprises, that marked by failures, social resistance to their deployment, and difficulties in achieving their objectives. In this respect, it is important to re-read James Scott's now classic book, *Seeing like a State* (1998). His first chapter, "*State projects of legibility and simplification*", rightly emphasizes the many obstacles to the standardization of states: Prussian scientific forestry in the second half of the 20th century simplified forest ecosystems to such an extent that it quickly led to a reduction in wood production following the spread of diseases and the decline of plantations planted on unsuitable soil. Stolypin's agrarian reform in Tsarist Russia in the 1900s, which aimed to change agricultural practices and reform the rural

taxation system by implementing a land registry, collapsed in the face of joint resistance from the nobility and the peasants. In both cases, the State's efforts to make its environment more readable by simplifying it came up against the persistence of the very great complexity of ecosystems and practices.

Even those who renewed Harlesian cartography in the 2000s continued to focus almost exclusively on what "works," as Pickles (2004) did, asking: "If maps precede and produce territories and social identities, then what objects and identities are created by the digital transition? And what forms of territorialization are at work in new digital mapping projects?" (Pickles 2004, p. 148). At no point is the hypothesis that maps might have no effect, or effects very different from those predicted by theory (e.g., producing territories and identities), considered. Yet, weak signals about the existence of maps that do not reinforce domination effects sometimes appear almost accidentally. Thus, recent theses aimed at studying the effects and uses of geographic information technologies in various democratic arenas have led, almost unintentionally, to highlighting the non-effects and non-uses of these technologies. For example, Lucille Ritschard (2017), in looking at the role of spatial representations in integrated coastal zone management (ICZM) in Brittany, has multiplied the number of case studies to end up questioning their non-use in the decision-making processes. A few years earlier, Boris Mericskay (2013) made the same observation when he sought to analyze the uses of the geoweb and the Internet in the public debate through the observation of urban planning projects in Quebec City. This salutary research, with very unexpected results in relation to its initial objectives, is unfortunately still in the minority. There is still a lot of work to be done on all the cartographic projects that have been forgotten. However, one of our hypotheses is that with the digital transition, these cartographic failures, or these *maps for nothing*, are multiplying... but this is below the radar of the critics, who should, however, in our opinion, be looking for a possible political meaning to this phenomenon.

3.3.3. A taste for great narratives

On a level close to but different from the previous critique, we can also point to the persistent focus of critical cartography on globalizing histories of great cartographic projects. In many respects, this immoderate taste for the epic still irrigates many works within the movement. In his 2004 book, Jean Lefort describes the history of the concepts and mathematical tools of cartography as "a human adventure, that of scholars and explorers, from their dreams to the adventures of their voyages, from their vision of the world to the development of their instruments" (Lefort 2004, p. iv, authors' translation). These *great cartographic*

narratives have constructed the identity of the discipline and may have given rise to vocations. It is interesting to observe that this fascination of researchers, which mainly concerned the cartographic exploits of conquerors or States, continues in relation to a collaborative and global project such as OpenStreetMap, which seduces by a discourse valuing disinterestedness, transnational volunteering, and the capacity of a collective decided to cover the globe without professional prerequisites to give a quality result. The values of pioneers, discoverers, collective effort and epic, seem to be the driving force behind contemporary cartographic research today, regardless of the authors.

Thus, even if the recent history of digital mapping and GIS is less focused on the story of great explorations, it remains fascinated by the technological advances that shape its conception. Web documentaries, such as the *Geospatial Revolution* series produced by the University of Pennsylvania⁷, are evidence of this focus on the technological feats that accompany contemporary mapping. By presenting applications in fields as diverse as logistics, crisis management and citizen science, this series highlights the widespread dissemination of geolocation techniques and the use of maps. Where the authors of this documentary see the massification of these tools as an epic, we see, on the contrary, an evolution that critics generally ignore: the map is no longer the sole domain of expert cartographers, and the diversification of stakeholders can be seen as revealing the end of the great cartographic narratives.

3.4. Reformulating critical mapping in the digital age

Following on from the various points and issues raised in the previous sections, this chapter offers some brief perspectives for an aggiornamento of critical cartography in the digital age, together with some examples of analysis relevant to current issues. Our main suggestion is that, when engaging in a political analysis of cartography in the broadest sense, we should suspend our propensity to presuppose from the outset that the map is an operator of power. In doing so, it seems to us to be much more heuristic to start from very empirical and embodied analyses, but also to be attentive to observing the effects of "maps" well beyond the actors who produce them, and the spaces they relate to. It is on this condition that their political effects cannot be overestimated, and that, on the other hand, weak signals can be detected, political effects that are not very visible but very real. This approach, which could be described as prudent or parsimonious, requires disciplinary alliances to integrate the fine mechanics of the manufacture, uses and performativity of digital geographic information.

⁷ <http://geospatialrevolution.psu.edu/>.

3.4.1. Three priority disciplinary alliances

Among the borrowings necessary in our opinion, those to be made from sociological institutionalism seem to us to be of primary importance. The work of Pierre Lascoumes and his colleagues on environmental public action, based on the notion of *instrument*, is inspired by Foucault's study of power based on its daily *techniques*. They have opened up vast perspectives for understanding informational devices, which are also *instruments*. The latter can be conceived "as normative devices, both technical and social, with a generic vocation (applicable to a set of situations) and bearing a concrete conception of the governing/governed relationship based on a specific conception of regulation" (Lascoumes and Simard 2011, p. 18, authors' translation). It is immediately clear that this notion applies particularly well to the set of socio-technical relations that surround the production of representations of space, today probably even more than before the digital era. It provides a good account of the multiple processes that make maps (in the broadest sense) have a decisive social effect in framing the problems affecting territories, and therefore also the solutions to be brought to them, an effect that is particularly clear in the field of environmental conflicts (Gautreau 2018). The other advantage of this approach is that it encourages observation of the political effects of mapping beyond or at the margin of the actors and spaces on which it focuses: what we call "instrument effects" are the "original, and sometimes unexpected, effects that clearly exceed or stand out from initial expectations" (Lascoumes 2004, authors' translation). This notion, close to that of 'productivity' used by the sociology of environmental conflicts (Melé 2011), thus encourages attention to the multiple political effects of the contemporary cartographic factory, well beyond the mere relationship between a 'producer' and a 'receiver'.

The second disciplinary alliance is with the insiders (Wood 2015, p. 16) of current cartography, i.e. the designers of these systems. Critical cartographers are in fact no longer in a position to understand the functioning of the objects they are working on today without collaborating with computer scientists and geomaticians, who alone are in a position to detail the life cycle of geographic data in detail. When we know how important the technical details of a device - the size of the pixel in an image, for example - are for understanding its political effects - such as the invisibilization of certain resources in an image - we understand why this alliance is essential. As Martin Dodge and Chris Perkins point out, with the increasing place of algorithms in the production and circulation of representations of space, it is undoubtedly much trickier to deconstruct current cartographic devices, where diverse spheres of actors and multiple technologies are intertwined, than the devices of yesteryear where cartographic power was held by a few rare experts (Dodge and Perkins 2015).

Moreover, cartographic order is now produced in part opaquely, from algorithmic black boxes, and by the invisible hands of those who feed them. To unfold this new factory and address concerns about the opacity of these algorithms (O'Neil 2016), the ethnographic approach allows us to take into account the entire ecosystem of algorithmic production and not remain solely at the analysis of computer code. Work on the proletarians of the digital economy (Casilli 2019), those "click workers" who, behind the illusion of artificial intelligence, multiply micro-tasks to drive the algorithms, has shown that the political effects of these systems cannot be interpreted solely from the intentions of their designers, but must incorporate the effects of thousands of invisible gestures. On the user side, it has also been shown that users are not simply influenced by the way the algorithm works, but also generate novel uses not intended by the designers (Bucher 2017). This approach amply deserves to be applied by critical cartography in the digital regime, as we believe it provides keys to understanding the current mutations of roles in social relations mediated by maps, and sheds light on their performativity.

3.4.2. Making political sense of what doesn't work: investigating "maps for nothing" in the digital age

In the early 2000s, the Bolivian municipalities that had obtained administrative autonomy in 1994 all adopted municipal land-use plans. With no in-house skills to produce them, and in a neoliberal context where the State had abandoned its role as official cartographer, they resorted to the "help" of nature conservation NGOs, international cooperation agencies and private consultancy firms. The maps produced were highly accurate, and provided to the authorities in paper and digital form, usually with a CD-ROM containing the geographic information layers generated by the cartographers. Ten years later, the vast majority of these maps had disappeared: either the municipal teams had forgotten the existence of such documents, or a faded paper printout of a map that no one consulted anymore remained in a corner of the office (Gautreau 2018).

Updating critical cartography in the digital age means, among other things, making political sense of such cartographic evaporation, seeking to understand why these maps are apparently produced *for nothing*. In neoliberal times, the ease with which digital developments can produce maps quickly has fostered truly unregulated markets for environmental mapping in developing countries. In the absence of a State that can standardize the production of maps and verify their quality *a posteriori*, many private and/or foreign actors have taken over this market and imposed their own standards, which are generally unsuited to the needs of municipalities. The latter, not having the means to negotiate with actors more powerful than themselves, therefore received maps of very limited use, or which the

municipal teams did not have the means to interpret internally. But this evaporation is also linked to the material conditions of information storage, in poorly equipped premises, where the non-renewal of GIS software licenses quickly made the layers received unreadable, and where political instability led to the complete renewal of teams and acquired skills at each election, particularly in map reading (Gautreau 2018).

This example clearly shows that the political dimension of these phenomena of *cartography for nothing* does not shed light directly on the relations of domination mediated by maps, between municipalities and NGOs for example. But it does shed light on processes that are just as political, in this case on the functioning of development aid in South America in the 1990s and the abandonment of the State's claims to construct national representations of its territory (Lerch 2014). Digital technology plays here on several contradictory levels that contribute, in the particular context of the exacerbated neoliberalism of that time, to slowing down the construction of a cartographic memory that the Bolivian population could capitalize democratically. It facilitates the creation of unregulated local cartographic markets, invested by a large number of uncoordinated actors not concerned with the long-term conservation of their *deliverables*, and thus the short-term disappearance of a significant volume of maps, for which international cooperation has invested large sums. Collective memory, shared representations of space, increasing competence of lower administrative levels, cartographic dependence, it is on all this that the episodes of *maps for nothing* shed light.

3.4.3. The political meaning of cartographic modesty: what do the "small maps of the web" tell us?

To shift the gaze of the large state-owned mapping companies, we have proposed the expression "small maps of the Web" (Noucher 2017), which refers to the recent emergence, on the Internet, of diffuse practices that are multiplying exponentially: thousands of maps by activists, journalists, political actors, hackers, etc., complementing, bypassing or competing with the production of official repositories. Historically, this notion thus makes it possible to signal this division that partially marks the end of the great cartographic narratives, and testifies to the passage towards an era of cartographic post-sovereignty.

At the technical level, talking about small maps of the web refers to the "small forms of the web" (Candel *et al.* 2012), these new forms of writing that have emerged on the Internet over the last ten years. Such as mashups, a characteristic Internet writing technique that aggregates content from various sites to create a new site. Among all the possible types of mashups (textual, iconographic, musical),

cartographic mashups are the most frequent, in particular thanks to the success and the ease of reuse of Google Maps. The maps that exploit these new possibilities are thus part of a renewal of the forms of geographical writing and are now fully part of the toolbox of Internet editorial writing. It is therefore advisable to analyze them not as isolated compositions but as elements of an editorial grammar whose framework of enunciation goes beyond the map alone, an observation that obliges critical cartography to take into account all the media interrelations of these maps, and not to consider them in isolation.

The expression also allows us to emphasize the political dimension of these new objects, by giving value to forms that were previously considered minor because they were produced outside the dominant institutional or commercial spheres. It is then a question of opening up the critical cartography to bodies of data that are currently ignored, of taking their political potential seriously, for example as forms of expression of minority groups. Shifting the gaze from "top-down" productions to understanding "bottom-up" map production makes it possible, for example, to make visible games of resistance or counter-hegemonic uses of cartography. This is not new, and counter-mapping projects (Peluso 1995) have long sought to subvert the power of maps. But this trend seems to have accelerated with the Internet to the point of occupying an important place in the media space, as in the case of the counter-maps that circulated in French Guyana to oppose the Montagne d'Or mining project (Noucher and Polidori 2020). It remains, of course, to measure their actual impact...

Finally, the small maps of the web also refer to new forms of cartography. The intrusion of geolocation into everyday objects has gradually given rise to the figure of the "sensor citizen" (Goodchild 2007), a connected individual who collects and disseminates, consciously or not, information about his environment or activities. Citizen science projects or the emergence of "self-quantification" testify to the success of these new ways of producing geographic information, generating personal maps (records of butterfly observations, tracks of bicycle rides, etc.). Located outside the paradigm of the map mediating a dominant/dominated relationship, these maps are not without political meaning, translating in their own way an individualistic and localist turn that can accompany certain digital practices. Thus, whether they come from militant community initiatives (counter-mapping) or from individual practices (ego-mapping), the small maps of the web force critical cartography to renew its questions and methods.

3.4.4 Circulation and policy

In an interconnected world, the circulation of geographic information has now fully integrated the very production of maps. Thus, while geomatics has long functioned *in silos* with the multiplication, in the 1990s, of sectoral geographic information systems (one GIS per territory and per theme), the interoperability that accompanies the development of the Web is now accelerating the networking of information. The simultaneous installation of numerous data infrastructures and their interconnection on a global scale allow the rapid constitution of a growing mass of information which, although scattered on different servers, can easily be gathered by a user and processed simultaneously.

Information system experts speak of orchestration to refer to the operations of controlling these data flows. These operations are sometimes taken for granted, as they are so often made invisible by automatic processes. However, it is precisely these orchestration logics that critical cartography should be concerned with today. Despite their progressive erasure from the cartographic scene, these logics act behind the scenes, both as vectors of standardization and as filters of representations deemed suitable or not for circulation.

In the space of a decade (2007 to 2017), the European Union has established a comprehensive project for the standardization of national and regional cartographic repositories (from the way metadata should be filled in to the data model, from the functioning of consultation web services to the graphic rules to be applied) with the implementation of the INSPIRE Directive⁸. In many respects, the versatility of these data infrastructures seems low, although they can theoretically accommodate a wide variety of representations of the territory (Gautreau and Noucher 2016). Yet, nothing is neutral in the choices of standardization or the criteria for selecting data flows: they are guided by principles, objectives, rules, in short, intentionalities that need to be deciphered. The circulation of geographic data thus appears to be a new form of control that homogenizes and filters representations, gradually becoming a tool for disseminating univocal representations of the territory, where alternative representations to those of the State or of the Web giants have difficulty finding their way. Henri Desbois underlines this paradox: "it is surprising to note that in our time when geomatics and the geoweb are at the origin of an inflation of cartographic

⁸ Directive 2007/2/EC, known as the "INSPIRE Directive" of the European Parliament and of the Council of 14 March 2007, aims to ensure interoperability between databases and to facilitate the dissemination, availability, use and re-use of geographical information in Europe.

production probably comparable by its magnitude to what Europe had experienced during the diffusion of the first printed atlases (Woodward 2007), we often all look at the same maps" (Desbois 2018, p. 321, authors' translation). In this way, collective visions are constructed and formatted that deserve to be discussed. Specifically geographical methods must therefore be invented to contribute to the understanding of these processes of decentralisation, which in no way erase the effects of domination creating or reinforcing hegemonic positions, of which Google is undoubtedly the most emblematic example.

While interoperability facilitates the transmission of data flows and makes it possible to spatially connect datasets (forming a *continent*), which could not previously interact and which evolved independently of each other (forming an *archipelago*), its implementation also has the corollary of plunging many datasets – small maps of the web – into Internet limbo, for reasons that must also be questioned. For example, the analysis of the orchestration of data flows between different state platforms has made it possible to highlight the political and cultural reasons for the disappearance of Amerindian toponyms during the transition from Guyanese infrastructures to French national infrastructures; these reasons being linked to issues of national sovereignty and to an imaginary world forged on the basis of past border conflicts (Noucher 2020). By multiplying this type of empirical studies in hollow, by practicing a geography of the remains of the Internet or by remobilizing the white of the maps in the era of the geoweb, it seems to us that critical cartography could go beyond its original fascinations around the finished product, cartographic successes or even great narratives.

3.5. Conclusion

As the reader will have understood, this chapter raises many more questions than it answers about the challenges posed by the digital era to the critical cartographic movement. Indeed, we felt that it was a priority to first of all identify and prioritize the changes that have taken place in the very objects of this movement, and to propose an initial assessment of the situation, an assessment that is far from complete, given that digital technology is bringing about fundamental changes, many of which are still invisible. In the same way, this chapter has not proposed any "solutions", but has limited itself to giving examples of the way in which critical cartography can be "reformulated" now that the objects, the devices, the modes of circulation and reception are changing. As we have seen, the perspectives of *aggiornamento* do not consist of a theoretical and conceptual revolution, far from it: it is much more a question of decentering the gaze, of paying attention to bodies of work that were previously invisible, of looking for allies in order to decipher a

cartographic factory that has become more complex. Today, politics is to be found in the details of multi-sited cartographic devices, in the economy of spatial representations, in apparently minor but massively used forms: it is up to the researchers to know how to spot them, abandoning certain antiphons of critical cartography, but preserving the essential achievements of a scientific movement that remains relevant today.

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