



Cartography III: A post-representational perspective on cognitive cartography

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Abstract

In this third report, I focus on cognitive cartography in order to examine how the historical division between empiricist and critical approaches in cartography has shifted recently. I do so by building on Kitchin and Dodge's argument (2007) that parts of the apparent disjuncture within cartography might be resolved through a greater focus on emergent approaches to mapping as a process, which is the core idea of post-representational cartography. By looking at cognitive cartography from a post-representational perspective I emphasize two major trends. On the one hand, the processual positioning of post-representational cartography simply shifts the historical line of divide, since it inherently disqualifies any cognitive studies that artificially dissociate the map from its context of use and production. On the other hand, by enabling the combination of critical positioning with empiricist practices, post-representational cartography offers opportunities to revisit in practical terms the tensions between these two approaches. It provides an original framework to envision our mental, emotional and embodied relationships with maps and with places through maps, and has the potential to bring cartography into a new arena in which the empiricist/critical divide could be transcended.

Keywords

cognitive cartography, mental map, navigation, post-representational cartography

I Introduction

The fact is that it seems to each of us that we have conscious will. It seems we have selves. It seems we have minds. It seems we are agents. It seems we cause what we do. Although it is sobering and ultimately accurate to call this an illusion, it is a mistake to think the illusory is trivial. (Wegner, 2002: 341–342)

This quote from social psychologist Daniel Wegner somehow captures both the dichotomy and the antagonisms that exist in the way

cartographers envision our mental relationships with maps. On the one hand, there are cartographers well versed in disciplines such as cognitive sciences and geo-sciences, interested in studying the 'conscious will' associated with map use through a battery of tests devised for

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improving cartographic design and understanding our mental spatial models. On the other hand, there are groups of cartographers influenced by ideas and practices from the social sciences and the humanities who are more interested in deciphering the multiple 'illusions' perpetuated by maps, as well as by their political and social sources and implications. These lines of divide between the *empiricist paradigm* and the *critical paradigm* are nothing new in cartography (see Edney, 2007), but they have been shifting a lot quite recently, creating new tensions and *rapprochements*.

In this third report, I review the main points of contemporary convergence and divergence between these two poles of the cartographic spectrum in order to contribute to the current debate within the field. Following Kitchin and Dodge (2007), I argue that parts of the apparent disjuncture between critical theory and empiricist practice might be resolved through a greater focus on emergent approaches to mapping as a process. I do so through the perspective of cognitive cartography. The choice of a cognitive angle to provide a cross-section of current research in cartography was not made a priori, but rather emerged slowly throughout the review of a long list of texts. In recent cartographic literature, the terms 'cognitive' and 'mental' recurrently appeared in association with 'cartography', 'maps' and 'mapping', not only in the expected area of cognitive cartography, but also in other more surprising corners of the discipline such as literary cartography (Rossetto, 2013) and cinematic cartography (Roberts, 2012a). This emergent pattern emphasizes a broad interest in exploring issues around our cognitive relationships with maps. This report starts with a brief historical contextualization of cognitive cartography, followed by a review of contemporary areas of research in this domain with a special focus on the multiple ways of envisioning maps for navigational purposes. This review will then turn to a critical analysis of the relationships between

post-representational cartography and cognitive cartography, to conclude with a discussion of how post-representational cartography might contribute to a transformation of contemporary divisions between empiricist practices and critical theory.

II Contextualizing cognitive cartography

The relationships between maps and cognition were first formalized in the late 1940s (Tuan, 1975), and have been explored ever since from two main perspectives, as pointed out by Perkins et al. (2011). The first, initiated by Arthur Robinson in his 1952 book *The Look of Maps*, considers how individuals engage with maps in order to improve cartographic design (Lloyd, 2000; MacEachren, 1995; Montello, 2002; Perkins et al., 2011). As emphasized by Robinson (1952), it is important for cartographers to understand the effects of design choices on the minds of map users in order to evaluate the relevancy and efficiency of cartographic decisions. This approach is often associated with 'cognitive cartography' and 'cognitive map-design'. The second, initiated in the 1960s by urban planner Kevin Lynch and his colleagues at Clark University (Wood, 2010), concerns studying how cognitive maps are formed through the acquisition and processing of information related to our everyday environment. This approach, commonly associated with the terms 'cognitive mapping' and 'spatial cognition', aims to inspire the design of better places to live (Kitchin, 1994; MacEachren, 1995; Wood, 2010).

Following Robinson's work, cognitive map-design research became very popular in western cartography in the 1970s, before becoming less attractive in the 1980s due to growing interest in emerging GIS technologies and the influence of critical theories (Montello, 2002). Not only has critical theory attracted a range of scholars who, earlier in their careers, applied cognitive methods to studying maps (see, for instance,

Crampton, 1992; Kitchin, 1994; Perkins and Gardiner, 2003; Wood, 1973), but it highlighted the ‘mechanistic, reductionistic and uncritical’ characteristics of cognitive cartographic approaches at the time (Rossetto, 2013: 9). Robinson himself has been criticized over the years for having removed the political dimensions of the map by focusing too much on the communication process (Crampton, 2010; Crampton and Krygier, 2006).

The recognition of the importance of cognitive maps in a broader socio-cultural context has contributed to the resurgence of interest for cognitive cartography in the 1990s (Heft, 2013; MacEachren, 1995; Montello, 2009). The new design challenges raised by digital maps have also stimulated this resurgence (Montello, 2002). Following the path opened up by Robinson, there is a group of scholars dedicated to continuously rethinking the design of maps as it evolves with new technologies and new practices such as online cartography (Hegarty et al., 2009; Nivala et al., 2008) and ubiquitous access (Griffin and Fabrikant, 2012; Tsou, 2011). Some of this research is based on reviews of specific topics such as cartographic interactions (Roth, 2012) and change detection on animated maps (Goldsberry and Battersby, 2009), but most of it is based on tests designed to assess the efficiency of certain cartographic choices by human subjects – most often undergraduate students – performing tasks designed around controlled stimuli (Lobben et al., 2009). These tests aim to address cartographic design issues in the digital context, often with some social considerations such as improving the symbolization on emergency response maps (Bianchetti et al., 2012; Moore et al., 2013; Opach and Rød, 2013; Razikin et al., 2010), the use of color for users with disabilities (Culp, 2012; Steinrück and Pluümer, 2013), and our understanding of the emotional responses associated with different cartographic designs (Fabrikant et al., 2012; Griffin and McQuoid, 2012; Muehlenhaus, 2012). These examples, as well as

many others compiled in recent collections (e.g. Fabrikant and Lobben, 2009; Griffin and Fabrikant, 2012; Raubal et al., 2013), illustrate the broad range of topics addressed in cognitive cartography, among which navigation remains a very interesting area of convergence and divergence between empiricist and critical approaches.

III Navigating from cognitive cartography to post-representational cartography

Global Navigation Satellite Systems such as GPS (Global Positioning Systems) coupled with online mapping services now play a central role in our personal movements as well as in the global economy, and are changing how we interact with maps and with places through maps. In cognitive cartography, these changes have been approached from various perspectives. These include the study of the ways in which small-screen devices (Dillemuth, 2009), different background maps (Griffin and Bell, 2009), movement paths (Lautenschütz, 2012), interactive route descriptions (Corcoran et al., 2013), and the presence of map symbols on road signs (Skiles and Howarth, 2012) have an impact on our spatial decisions. The cognitive approach to the relationships between maps and navigation is also envisioned in the context of the Web 2.0 era. Richter (2013) proposes to harness the collective power of geo-crowdsourcing to alleviate the absence of ‘landmarks’ in navigational services, while Klettner et al. (2013) propose to better define how crowdsourcing affects our emotional relations to places. Speake and Axon (2012) study ‘the level of emotional response’ associated with the use of navigational technologies such as Sat Nav. These approaches resonate with the idea developed by Meng (2005) that our cognitive abilities are often correlated with our emotional abilities. This perspective leads her to argue for the integration of services in mobile maps that do not systematically

require the minimum cognitive load in order to avoid completely erasing emotional dimensions we associate to places, maps and mapping devices. In more general terms, it is now recognized that relying extensively on GPS for our locations and navigation is detrimental to our cognitive maps (Axon et al., 2012; Montello, 2009; Raper et al., 2007).

A dysfunctional cognitive map raises several issues, as synthesized by the following quote from Lobben et al.:

If we could measure the amount of gasoline used in 'being lost' or using longer-than-necessary routes because of a poor mental map or poor reading map . . . we would probably find that we are paying a high price for our limited map-use skills and our poorly developed mental maps. (Lobben et al., 2009: 168)

This argument illustrates a serious tension that traverses research in cognitive cartography and navigation. On the one hand, we are looking for cartographic applications that can bring us to destinations as 'efficiently' as possible to save time, money and the environment. On the other, when these applications rely too much on the most efficient technology available (i.e. GPS technology) they seem to contribute to the atrophy of our cognitive maps with the negative consequences described by Lobben et al. (2009).

One consequence of this impoverishment of our cognitive maps might be an increasing dependency on locational devices and on their cartographic accomplices for a growing range of activities. This growing addiction is not trivial since these technologies are deeply associated with 'mechanisms of surveillance' (Pickles, 2004: 170; see also Crampton, 2010; Kurgan, 2013; MacDonald, 2007; Monmonier, 2002), and have been extensively criticized for the crucial role they play in identifying spatial patterns of individuals for both military and commercial purposes (Crandall, 2008; Crang and Graham, 2007; Kaplan, 2006; Kurgan,

2013). Certain facets of this massive control have been subverted by artistic projects and performances, as illustrated by Pinder (2013). One of the examples discussed by this author is the cell phone application developed by the Electronic Disturbance Theatre to help illegal immigrants navigate through the desert while undertaking life-threatening journeys across the border between Mexico and the USA. Through this example, Pinder discusses the potential of this application for challenging the original military function of GPS through a subversion of state control and a support of civil disobedience.

The relationships between maps, technology and navigation are envisioned at a more conceptual level. Expanding on earlier critiques of 'correspondence theory' or the idea that there is somehow a magical resemblance between the model (the world) and its representation (the map), November et al. (2010) propose to conceive of maps in the digital context as 'navigational' rather than 'mimetic'. They argue that what is important to map is the navigation through the chain of cartographic production in order to convey clearly the fact that 'everything is on the move' (November et al., 2010: 596), both the world and the map. This shift in the way of envisioning maps has numerous disciplinary consequences, as discussed by the authors. For the purpose of this report, however, this shift emphasizes the importance of movement in the mapping process, thereby resonating with certain critiques of cognitive cartography in anthropology.

Building on previous work from anthropologist Alfred Gell (1985), Ingold (2000: 223) challenged 'the core assumption in cognitive cartography – and more specifically in orientation and wayfinding – which is that our mental spatial structures are "maplike in form"'. Ingold argued that since our interaction with places is developed through our movements and from our own point of view, it can be defined as 'indexical' (i.e. based on our own personal 'view *in* the world'). This is profoundly

different from a map, which is by definition ‘non-indexical’ since it offers a single generic ‘view of the world’ to all of its users. Although this paradox might be resolved by the increasing personalization of online mapping experiences and by the increasing access to mediated ‘views from the world’ through applications such as Google Street View, Roberts (2012b: 3) argues that this kind of perspective should be considered as ‘non-indexical’ since it represents a ‘disembodied gaze’ that cannot replace a personal positioning, nor can it resolve the indexical and non-indexical paradox. The unveiling of this paradox was accompanied by a growing interest in applying ethnographic on-site methodologies for studying our cognitive relationships with maps (see, for instance, Andrews, 2012; Brown and Laurier, 2005; Del Casino and Hanna, 2006; Speake and Axon, 2012), which have in return contributed to the emergence of post-representational cartography, as will be discussed in the next section.

These examples show the diversity of ways in which to envision the relationship between navigation and digital maps, and illustrate some ongoing tensions:

between those scholars who focus upon individuals and their cognitive abilities to understand, produce and read maps, as against those who focus upon the cultural context within which maps are created and used, and the wider meanings associated with mapping as a whole. (Perkins et al., 2011: 298)

These tensions resonate with the historical opposition emphasized by Wood (2010) between the rational work done on cognitive mapping by Lynch and others to improve urban planning, and the more revolutionary experiments done by the Situationists to challenge the established functionalistic use and design of the city. Besides the radical differences between these two approaches, Wood (2010: 195) concludes his paper by emphasizing the similarities between both approaches in terms of their

‘seriousness of intent’, their ‘remarkable degree of objectivity’ and ‘the necessity of using human beings to measure salient dimensions of the environment’. These similarities and others are redefined by the emergence of post-representational cartography.

IV A post-representational perspective on cognitive cartography

As pointed out by Kitchin et al. (2013: 483), ‘In recent years, a small number of scholars have started to rethink the ontological foundations of cartography, moving from a representational to a processual understanding of maps, from ontology (what things are) to ontogenetic (how things become)’. Following the path opened up in the humanities and in geography in particular (see Thrift, 2007), these authors argue that maps come to life only when people start using them in a particular setting for a particular purpose (Brown and Laurier, 2005; Della Dora, 2009; Kitchin and Dodge, 2007; Laurier and Brown, 2008; Rossetto, 2013). From this perspective, maps are not considered as ever finished, but as ‘continually re-made every time someone engages with them’ (Rossetto, 2012: 32), which resonates with the idea that cognitive maps are ‘always in motion’ (Hommel and Klippel, 2007: 5). Since maps are always in the state of ‘becoming’ (Del Casino and Hanna, 2006), cartography should be considered as ‘processual’ instead of ‘representational’ (Kitchin and Dodge, 2007: 343). This processual/non-representational perspective has led to ‘post-representational cartography’ (Kitchin and Dodge, 2007; Kitchin et al., 2013), which moves beyond the binary oppositions of ‘representational’ and ‘non-representational’ (Del Casino and Hanna, 2006) without rejecting the representational dimension of maps (Rossetto, 2013). Indeed, this approach does not deny the importance of cartographic forms, but rather emphasizes that these forms should not be dissociated from either their context of production (see, for instance, Kitchin et al.,

2013; Olmedo, 2011; Wood and Fels, 2008) or utilization (see Brown and Laurier, 2005; Del Casino and Hanna, 2006; Speake and Axon, 2012).

The idea that maps cannot be divorced from the practices, interests and understandings of their makers and users has already been explored (see, for instance, Turnbull, 1989), and can be seen as self-evident in disciplines such as anthropology or ethnography (Roberts, 2012b). However, the fact that post-representational cartography has been embraced recently in a growing number of academic publications either openly (Azócar Fernández and Buchroithner, 2014; Gerlach, 2014; Kitchin and Dodge, 2007; Kitchin et al., 2013; Perkins, 2013; Rossetto, 2012, 2013) or through approaches, concepts and practices that could be considered as post-representational (Brown and Laurier, 2005; Del Casino and Hanna, 2006; Della Dora, 2009; Laurier and Brown, 2008; November et al., 2010; Olmedo, 2011; Sletto, 2013; Wood and Fels, 2008) speaks to the growing need for another way of approaching cartography beyond the empirical and the critical paradigms. Azócar Fernández and Buchroithner (2014) go as far as arguing that post-representational cartography could produce nothing less than the merging of these two paradigms, since both ‘share an ontologically secure map’ (p. 128) while post-representational cartography does not (Kitchin and Dodge, 2007). Without anticipating the likelihood of this merging, post-representational cartography could be seen as an opportunity to revisit cartographic practices, including those in cognitive cartography and critical cartography, by enabling the combination of critical positioning with empiricist practices. After all, post-representational cartography and cognitive cartography share the same interest in the subjective dimension of maps (Rossetto, 2013), and both have a common goal, that of improving the design of mapping systems (Kitchin et al., 2013).

Rossetto (2013) argues that conciliation between cognitive and post-representational cartography is possible through a deeper

exploration of their interconnections. To demonstrate her argument, Rossetto mobilizes the post-modern concept of ‘cognitive mapping’ developed by literary theorist Frederic Jameson (1988), to explore the potential offered by incorporating cognitive perspectives in literary criticism. One compelling example used to illustrate this position is literary scholar Ryan’s study (2003) of the construction of mental models produced during the reading of novels. By asking readers to draw the spatial structures of settings in literary works, Ryan (2003: 228) argues that the readers not only represent the ‘storyworld’, but ‘they also tell their own story – the story of the reader’s reading’. The combination of cognitive cartography practices such as mental sketch mapping exercises with a post-representational reading of the processes and practices involved, can serve to address a range of geographical issues beyond literary geography, such as boundary perception (Ben-Ze’ev, 2012) and the intimate, embodied experiences of places (Giesecking, 2013).

Wood and Fels (2008) propose rethinking map design as ‘cognitive cartographics’ to emphasize the idea that maps, just like words and images, open up ‘mental spaces’ beyond spatial structures. These mental spaces are also influenced by stories, novels and films that can have an impact on our perceptions of places and on our spatial decisions (Andrew, 2006; Tuan, 1975). Cognitive maps, places and stories are deeply intertwined in oral culture, as illustrated by Wickens Pearce (forthcoming: 23), who argues that the moment a travelling member of the indigenous Penobscot nation recognizes a place he has never been two things happen: ‘[He] updates the imagined section of the map in [his] mind, now ground-truthed for [his] present experience. And [he] activates an ancient story and its knowledge in the present.’ The relationships between places, memories and maps in indigenous communities is further explored by Sletto (2013: 10), who argues for a post-representational

positioning in approaching participatory cartography: 'by shifting attention away from maps as *product* for instrumental ends to mapping as contextual, social *process*' in which memory plays a central role, participatory mapping can serve indigenous groups to drive action as well as to claim ownership on both the physical and the symbolic landscape.

Memories, emotions and perceptions are now mapped in many different ways within and outside indigenous communities. Geographer Elyse Olmedo (2011) envisions what she calls the 'carte sensible' (sensitive map) as a way to better express emotions associated with places that conventional maps fail to convey. Her textile map of the everyday life environment of Moroccan women living in a low-income neighborhood of Marrakech comes with an extensive description of its emergence, illustrating the post-representational idea at work. In a similar vein, geographers Sarah Mekdjian (2013) and Anne-Laure Amilhat-Szary have been working with artists and asylum seekers help the latter to develop their own personal maps of their migration experience and memory, far from conventional cartographic representations (Fischer et al., 2013). As part of her practice, Jerusalem-based artist Ariane Littman (2012) has been sewing and bandaging pieces of maps of Israel and Palestine in public places all around the world. These three projects, developed by women, have in common their use of non-digital media to map personal experiences that put major social issues into perspective. They can be read as embodied responses to the new violent forms of cartographies emerging at the state level (Opondo and Shapiro, 2012); as contemporary forms of 'tender mapping' that could help us move 'beyond imperial cartographies of today' (Aitken, 2009: 1); and as ways of expressing our mental – or imaginary and embodied – maps and recognizing their emotional and affective

dimensions as well as their socio-political power and value.

V Conclusions

A few principal conclusions can be drawn from this exploration of contemporary cognitive cartography. First, this domain is extremely active in addressing a range of practical and intellectual issues raised by the increasing presence of new forms of digital maps in our daily lives, and framed both by recent scientific advances and by a broader integration of socio-cultural issues. Second, our mental relationship with maps has also been explored extensively from different corners of the humanities, reworking rather than reducing the tensions that have existed for decades between the empiricist and the critical perspectives. As pointed out in this report, from a navigational perspective, there is a double issue related to approaching our mental models of the world through maps. The first one consists in the irrelevance of envisioning our mental spatial structures as 'map like' in form, as argued by anthropologists such as Ingold (2000). The second one consists in the illusory and spurious mimetic association between the map and the world that has framed our imagination since the scientific revolution, as argued by November et al. (2010). Based on these arguments, since our mental spatial models are not 'map like' and that maps are not 'world like', the use of maps as the intermediary between these mental spatial models and the world is at best inaccurate and at worst irrelevant; either way, it needs to be reconsidered.

The third main conclusion of this report is that post-representational cartography opens opportunities for such a reconsideration. On the one hand, the processual positioning of post-representational cartography can be seen as simply shifting the historical lines of divide, since it inherently disqualifies any cognitive study designed around strict experimental controlled

stimuli that artificially separates the map from its contexts of use and production. On the other hand, by enabling the combination of critical positioning with empiricist practices, post-representational cartography offers opportunities to revisit and alleviate some of these tensions, as well as to envision our mental, emotional and embodied relationships with maps and with places through maps. These relationships are made of a complex mix of measurements and perceptions, facts and stories, memories and fantasies. A stronger integration of the diversity of concepts and practices associated with maps and mapping, drawing on a range of disciplines from both the sciences and the humanities might strengthen our understanding of these relationships. Post-representational cartography provides an original framework for integrating these perspectives, and has the potential to bring cartography into a new arena that transcends the empiricist/critical divide.

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