

Philosophy and Mapping

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Glossary

- G0005 **Cartography** Practices, processes, and discipline concerned with transforming and representing a real world in a mapped form.
- G0010 **Epistemology** The study of knowledge and its construction.
- G0015 **Ontology** The study of being and existence.
- G0025 **Semiology** The study of signs and sign systems and their cultural and social connotations.
- G0020 **Traditional Representation** This is something that stands for something else and is a medium through which meaning is communicated. In post-structuralist/postmodernist philosophy, however, representation involves the deployment of power, rather than any necessary semiotic link to something else.

Introduction

P0005 Mapping is a way of knowing the world and of bringing the unknown into the realms of the known. Jim Blaut's work shows how, throughout history, mapping has played an important role in human culture, serving as one of the defining characteristics of being human, a shared way of thinking, a way of relating to the world outside, and a universal language. Histories of cartography have sought to understand these changing ways of mapping and have also been imbued with different philosophies. For example, Denis Cosgrove's work has explored a genealogy of how people have imagined and represented the globe over the ages. Meanwhile, cartography emerged in the late twentieth century as a specialist discipline, deploying different ways of understanding these processes. Ideas and philosophies change; the ways we imagine the world and mapping change with them.

P0010 We all map things out, and it matters whether you are on the map or not: mapping in language is about claiming, making a statement, controlling, representing, and purporting to know the world. Mapping stands between us and the world out there, but it may also be understood as reflecting and embodying different approaches to that world: there are analogies between knowledge and mapping. Both are argued over and

communicated; both are employed to carry out work; both are creative; both are enacted; both rely upon a belief system; both are shared and social, etc. These analogies are complex and contested. They rest upon the relations of mapping and philosophy.

Philosophy matters because of the nature of mapping, its assumptions, social and technological contexts, esthetics, politics, and practices. Mapping is an everyday activity and tool, and it has also been employed and theorized in different ways in different times and places. There are different ways of understanding the relations between mapping practice, the world being mapped, the map as an entity, and the human capacity to engage in mapping, and it is these differences that form the focus of this article. The many different audiences and voices speaking about the map's significance partly explain the rich variation in the ways in which it has been understood. The ideas underpinning mapping have themselves shaped different peoples' knowledge of the world, altered how they have employed the map as an artifact, and engaged in mapping behavior in different contexts.

Philosophical difference underpins the practical application of mapping and how we understand mapping as an activity. For example, adopting a scientific approach to mapping allows different insights to be reached from those that might flow from a more critical form of knowledge in which the social function of mapping is emphasized. Within scientific approaches, different assumptions about the ontological status of the map can lead to profoundly different approaches to mapping: the behavioral scientist will emphasize human factors, the software engineer might stress data organization; the information visualization specialist might emphasize the ways in which symbology operates. Difference also resides within social theoretical critiques of mapping: an emphasis on deconstruction is likely to lead to different maps and understanding, from those that emerge from an anthropological concern with practice.

This article discusses the implications of different philosophical approaches to mapping, exploring the ways in which people have sought to understand the medium and its practices, and relate these to the world of ideas. It explores the ends (and beginnings) of mapping, and its relations to cartography as a discourse, by simplifying and generalizing complex and difficult arguments into a

map of the field. It starts with a key to the concepts and explores the epistemological and ontological status of mapping, and some of the different strands of thought that might be relevant to this process. The rest of the article details how these principles have directly and indirectly contributed to the multifaceted practices and products associated with mapping in different times and places.

P0030 The author's argument is inevitably partial. It offers a guide, rather than a definitive picture. Illustrations and examples are employed to make issues easier to follow. Just as the best maps are personal statements, so the intention here is to tell the author's story of the relations between philosophy and mapping, exploring the genealogy of the ideas, assessing the contributions of key thinkers, classifying and simplifying, but also stressing how human, complex, and relational the map has been as part of our material culture. By revealing the assumptions underpinning different ways of mapping and different ways of understanding mapping in different times and places, we can begin to understand the significance of wider intellectual traditions and explore direct links between the world of ideas and the world of the map.

S0010 Epistemologies and Ontologies

P0035 Mapping is not only epistemological but also deeply ontological. It is both a way of thinking about the world – offering a framework for knowledge – and a set of assertions about the world itself – resulting in things with an ontic, or ontogenic status. Philosophers and theorists have written about the significance of mapping, but mapping itself produces knowledge and has an ontological status. This philosophical distinction between the nature of the knowledge claims that mapping is able to make, and the status of the practice and artifact itself, is fundamental to any consideration of the relations between mapping and philosophy. But what creates difference? How and why is mapping problematic for those who think about its status?

P0040 To answer these questions is to frame subsequent arguments about mapping and philosophy. Here the author would be introducing three ways of approaching these questions, by considering some of the dimensions across which philosophical differences are constituted; by situating Habermas's notions of knowledge domains vis-à-vis mapping; and by reflecting upon more recent ideas of the day-to-day operation of mapping as an assemblage of knowledge communities. It should then be possible to explore how these ideas have been worked through in practice, by considering the context in which philosophies have been used. Following Gillian Rose, this means focusing upon sites through which meaning might be constructed: in mapping itself, and in consumption

and production practices; and also through the modalities of technology, composition, and social context which strongly influence what mapping comes to mean.

Negotiating the Binaries

A useful way of understanding these questions is to explore some of the dimensions across which philosophical debate is made. **Table 1** illustrates some important binary distinctions that strongly influence views on the epistemological and ontological status of mapping: judging a philosophy against these distinctions provides an often unspoken set of rules for knowing the world, or in the present case, for arguing about the status of mapping. These distinctions are clearly implicated with each other; an emphasis upon the map as representation, for example, is also often strongly associated with the quest for general explanation, with a progressive search for order, with Cartesian distinctions between the map and the territory it claims to represent, with rationality, and indeed with the very act of setting up dualistic categories. By exploring how these dimensions work, we can begin to explain how and why mapping and philosophy are related in such complex ways.

The mind body distinction is often a fundamental influence on how people think about the world. If the mind is separate from the body, then instrumental reason becomes possible: the map can be separated from the

Table 1 Rules for knowing the world: Binary opposites around which ideas coalesce

Mind	Body
Rational	Irrational
Empirical	Theoretical
Absolute	Relative
Nomothetic	Ideographic
Ideological	Material
Subjective	Objective
Knower	World
Random	Ordered
Individual	Society
Regulation	Freedom
Text	Context
Map	Territory
Structure	Agency
Process	Form
Production	Consumption
Representation	Practice
Real	Hyper-real
Holistic	Atomistic
Functional	Symbolic
Vague	Precise
Immutable	Fluid
Essence	Immanence
Static	Becoming
Network	Node
Nature	Culture

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messy and subjective contingencies that flow from an embodied view of mapping. Science and reason become possible and a godlike view from nowhere can represent the world in an objective view fashion, like a uniform topographic survey. On the other hand, assuming a unity of mind and body focuses attention on different more hybrid and subjective qualities of mapping, rendering problematic distinctions between the observer and observed.

P0055 The question of whether knowledge is unique or whether the world might be subject to more general theorizing also has fundamental implications for mapping. An ideographic emphasis on uniqueness has frequently pervaded theorizing about mapping in the history of cartography: if each map was different, and described a unique place, searching for general principles that might govern design, or explain use, or direct production would be doomed to fail. Instead, mapping became the ultimate expression of descriptive endeavor, an empirical technique for documenting difference. Artistic approaches to mapping that privilege the subjective may be strongly compatible with this kind of interpretation. On the other hand, a more nomothetic approach which emphasizes laws, denies difference, and risks reifying artificially theorized models or generalizations, while at the same time offering the possibility of progress. Debate continues around the nature of generalizations about mapping, whether they are concerned with holistic approaches or break up systems into parts, whether they are stochastic or regular, invariant or contingent, natural or cultural, objective or subjective, functional or symbolic, etc. It is clear, however, that since World War II, a number of different scientific orthodoxies have pervaded the world of mapping that almost all trade on this notion of searching for common explanations. The formal discipline of cartography has emerged from this process. Yet the paradoxically everyday ideas of geography and mapping as factual knowledge survive, and reflect the continuing power of ideographic and empirical thought.

P0060 An emphasis upon mapping as a text or discourse emerged in the early 1990s, in stark opposition to the more practical and technologically driven search for generalization. Social theoretical ways of understanding mapping often emphasize the discursive power of the medium, stressing deconstruction, and the social and cultural work that mapping achieves. The power of mapping becomes more important than the empirical search for verifiable generalization. A textual emphasis almost inevitably also draws attention to the need for social and historical contextual study.

P0065 Structural explanations of the significance of mapping have also strongly influenced understandings of mapping. Insight might stem from class relations, from cultural practice, from psychoanalysis, or linguistics: for example, semiotic approaches to mapping have been a powerful

and influential way of approaching the medium and its messages. There is an ongoing debate in relation to mapping over how the agency of an individual might be reconciled with this kind of approach, given that structural approaches often posit fundamental and inevitable forces underpinning all mapping. There is also a continuing debate over the philosophical basis of the structural critique. For example, is it grounded in a materialist view of the world, or in a more ideological reading of the human condition? A clear tension also exists between explanations of mapping that value the local and the subjective, as against those that value objective and universal explanations. There may also be conflicts between philosophies that argue for mapping knowledge as a social force, as against those that depend upon more humanistic and individual ways of knowing the world. Understanding mapping as a form of regulation and surveillant force may not be compatible with envisaging mapping processes as emancipatory and empowering for an individual.

The distinction between forces making the world, or forces consuming it, also has a strong resonance in philosophical debates around mapping. The cultural turn described elsewhere in this encyclopaedia has encouraged a growing emphasis upon the contexts in which maps operate, encouraging a shift away from theorizing about production and toward philosophies of mapping grounded in consumption. The map reader becomes more important than the map publisher. Technological change and the democratization of cartographic practice have also encouraged this changed emphasis. Associated with this shift has been the increasingly nuanced drift toward post-structuralist ways of knowing the world, which distrusts all-encompassing knowledge claims. Instead of a belief in absolute space, or a socially constructed world, an alternative way of understanding mapping has suggested the relativity of everything, in a universe where notions of reality come to be replaced by simulation and in which the play of images replaces visual work, or in which speed of change itself gains an agency.

The status of the map as an entity also causes debate. On the one hand, many theorists have argued that maps exist and have an essence from which we can derive understanding. Recently, Kitchin and Dodge, on the other hand, have rejected this ontological position in favor of an ontogenic status for the object in which its properties are called into being when it is employed, instead of residing in its materiality. Mapping, in this view, is always becoming, and is always a process. Instead of relying upon a precisely specified notion of space, its inter-subjective, relational, and multivalent qualities are important in mapping practice, and these qualities may be vague, rather than precise.

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P0080 Recent emphasis on nonrepresentational ways of understanding the world has begun to offer another changing way of rethinking mapping. Also drawing upon actions and ideas of immanence, instead of essence, these approaches focus on the practices and processes of mapping in which meaning is constituted, rather than on representations or discourse. Forms are called into being, with mapping being fluid, and meaning being mutable. Mapping is enacted, action and emotion become important, and the affectual qualities of mapping are matter. The narrative of mapping moves its audience and is itself moved by the context. The emphasis of this work shifts away from the nodes or vectors, toward the flows that allow a mapping network to operate. Relations between actors or actants matter more than the phenomena themselves.

S0020 The Domains of Knowledge

P0085 In practice, some of these dimensions are more important than others in the creation of knowledge claims about the world. Habermas claims it is possible to distinguish between three major types of knowledge, each of which makes claims in particular domains, and each of which has very different aims. **Table 2** maps out these distinctions and makes links to the kinds of insight about the world that flow from scientific–technical explanation, historical–hermeneutic thought, and critical knowledge.

P0090 Scientific knowledge is inevitably instrumental–technical, implicitly seeking explanation, and control over the world. A view of mapping as scientific relies upon reason and generates particular kinds of knowledge, while denying the validity of other truth claims. Western technical practice is valorized, and protected from critique, by an ideology that reinforces the teleological power of technical applied practice. Well-designed maps have to follow ‘good practice’. Good maps ‘tell the truth’. Other mapping is marginalized; expert knowledge alone is deemed valid. The neutrality, distance, and objectivity implied in this kind of knowledge are well suited to many of the contexts in which Western mapping and mapping technologies have been employed. It can be useful to deny human agency and reduce complexity to rules that produce results. Much Western mapping adopted these

T0010 **Table 2** Domains of knowledge

<i>Knowledge type</i>	<i>Domain</i>	<i>Aim</i>
Instrumental–technical	Reason	Control/prediction
Historical–hermeneutic	Understanding, feeling, emotion, etc.	Interpretation
Critical	Disclosure of false beliefs	Emancipation

approaches after World War II, and instrumental–technical approaches to mapping remain preeminent among practitioners.

In contrast, historical–hermeneutic approaches to mapping offer interpretation instead of explanation and evoke feelings emotion and insight. This kind of knowledge has never been frozen out of approaches to mapping. It lurks in notions of design quality, in perceptions of mapping, and in the inspirational qualities of the medium, with its power to fire the imagination. Despite the dominance of science, the rise of geographical information system (GIS), and the power of the Web, alternative human-centered approaches to mapping are of increasing importance. Artists are re-imagining the map, non-Western mapping traditions are being rediscovered and reenacted, and the geographical imagination being re-mapped in diverse fashions.

Critical knowledge also never disappeared during the hegemony of scientific mapping. Here, a normative aim is central to the project, emancipating people, freeing them from false consciousness, and advancing the human spirit. These critical and radical approaches to mapping became re-invigorated in the 1990s when they came to be reflected in a diverse array of theorizing and in a widening raft of counter-mapping enacted by communities employing mapping as a tool to reassert their rights.

So philosophies generate different kinds of mapping and knowledge about mapping. It is to recent theorists of the sociology of science that we must turn in order to begin to explore how these differences become established as social practices, and to show how mapping can work in knowledge assemblages.

Knowledge Communities and Mapping

Theorists in science and technology studies have recently argued that knowledge is constructed and disseminated through a complex and shared array of social processes that might be termed an assemblage. Actors in this array follow carefully orchestrated ways of doing, whether it is work or play, which are at once taken for granted, but also intensely politically charged. In these contexts, a technology becomes a flow that allows differences to be reconciled. David Turnbull has persuasively argued that mapping works like this: in different periods and cultures the map has served as an artifact around which practices coalesce and in which meaning becomes fixed. So the map has immutable qualities that it can carry into new contexts, signifying, for example, Western colonial values in the process of administering and controlling other cultures and spaces.

In this view of knowledge communities, mapping practices are protected from critique by a complex array of actions, flows, artifacts, actors, and processes, but also

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constantly renegotiated. The practice of mapping, whether it is scientific–technical, historical–hermeneutic, or critical depends upon the context, but also influences that context. Different assemblages interact: the Western mapping tradition adapts to others it encounters, and also adopts elements of these traditions, approaches, and philosophies. Within that tradition, networks or webs of practice enact different mapping philosophies. In the world of media, mapping time is paramount: maps are ephemeral and constantly change; the Google map hack celebrates local power in the face of the global corporation; the military Department of Terrestrial Magnetism (DTM) enacts the strategic targeting of a technophilic dream; the planner’s land-use GIS celebrates bureaucratized administrative control; the artist’s mapping performance subverts and celebrates humanity and difference. Each artifact is deployed in a network of practice: philosophies are made and remade, rather than existing as de-corporalized, *a priori*, ideologies.

P0120 So philosophies underpinning mapping practice become a matter of everyday events and transactions. A rule book, an apparently inconsequential ritual, a chance discovery, juxtaposition, and feeling, all reinforce and change ways of imagining mapping. Mapping itself, and philosophies of mapping, have an agency of their own, capable of enacting change. The assemblage, however, is itself not immune from change. It is constantly morphing into something new, changing into new forms, haunted by traces of the past, but always becoming something new.

P0125 So the story of changing mapping philosophies always needs to be considered as historically contingent as timed, placed, and cultured. A web of interacting possibilities in which everything is complex, nothing is inevitable, and everything is possible. The rest of this article illustrates this contingency at work, by considering how different mapping ideas have been worked through and enacted in different contexts.

S0030 **The Practice of Science**

S0035 **Everyday Empirical Mapping Practice**

P0130 For much of its history, maps have been a touchstone for geography, employed as an objective tool to describe regional distributions, and as a source for geographical ideas. Practitioners of the geographic art needed to learn how maps were produced and designed, in order to be able to employ them in their exploration, trade, administration, or research. From the mapping of the Roman Empire onward, this practical approach to mapping as a tool has been hugely influential.

P0135 Following its establishment as an academic discipline in the late nineteenth century, geography adopted this practical approach. Geographers studied technologies of

production and design, debated the construction of different map projections, devised new kinds of thematic maps, and interpreted the landscape using topographic surveys. The kind of science underpinning this technology was rarely considered: mapping was simply assumed to be mimetic and factual. Philosophizing about mapping was something best left to philosophers. Mapping was simply a method, a key tool in the geographers’ kit, with no politics, and the vast majority of people who make and use maps still mostly assume mapping is ‘neutral’ and apolitical. This aphistorical view rendered mapping as a technology, designed through the appliance of science to work for its users.

P0140 However, a rather different scientific approach to mapping can also be traced back through the history of cartography. Ancient Greek cartography created practical maps of the Western world, but it also defined some of the scientific principles on which mapping could progress. For example, the spherical nature of the globe was proposed and scientific experiment based upon astronomical observation verified the validity of the assertion. Pythagorean trigonometry was applied to the development of accurate surveying technology. Mathematical descriptions of map projections were developed for the first time. Grids were invented and applied. Claudius Ptolemy’s *Geographia* systematized scientific principles into the first published guide to map-making. The world was cast as knowable, observable, and subject to representation. Science allowed progress.

P0145 This more abstract and theoretical approach to mapping has ebbed and flowed ever since. Technological ‘advances’ in mapmaking have depended upon scientific knowledge, but scientific knowledge is itself a social creation, with changing values and practices. It is in the period after World War II that these differences in the philosophy of science first became significant for mapping, with the emergence of ‘mapping sciences’ in a separate disciplinary configuration.

P0150 In the 1950s the first sustained attempts began to emerge in the USA, to justify why and how mapping might be scientific. This scientific reorientation was a more political project than an explicit application of any single philosophy of science. Space, following Kant, became a container; geometry and mathematical language were privileged over social or humanistic ways of understanding the world. In this view the history of cartography was a story of progress. Over time, maps had become more and more accurate, knowledge improved, and implicitly it was assumed that everything could be known. The artifact and individual innovation were what mattered. Cartographic research practice never explicitly adopted positivist orthodoxies, and while it may have implicitly employed critical rationalist methods, testing and falsifying hypotheses, few significant working theories emerged. In this taken-for-granted framework,

mapping science was practical and applied. Numerous small advances built a discipline.

this functional cartographic universe. Research aims were normative and focused upon improving map designs by carefully controlled scientific experimentation. Issues, such as how to represent location, direction and distance; how to select information; how best to symbolize these data; how to combine these symbols together; and what kind of map to publish, were worthy of attention.

Cartographic Communication

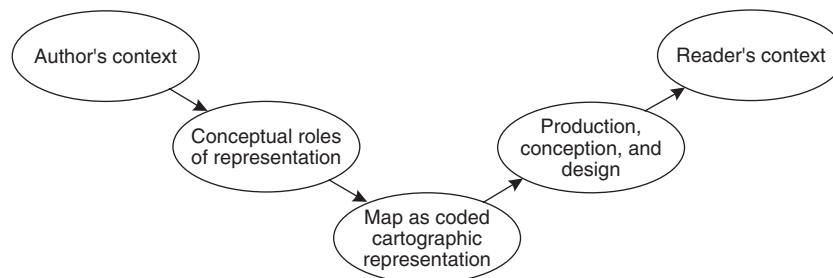
Out of this context, in the late 1960s and 1970s, emerged an increasingly sophisticated and often over-complex series of attempts to develop cartographic communication as a theoretical framework to direct research. **Figure 1** illustrates the emphasis of this approach. The cartographer chooses what to include in a map and how to show it, and the reader interprets this map by relating it to their own prior knowledge. Communication models encouraged researchers to look beyond a functional analysis of map design, exploring filters that might hinder communication. For researchers such as Head, or Schlichtmann, the map artifact itself became the focus of study, with a semiotic focus to the research, instead of a functional emphasis. For Chris Board the map was a conceptual, as well as a functional, model of the world. As models of cartographic communication multiplied, so also attention increasingly focussed on the map-reader, with cognitive research seeking to understand how maps worked, in the sense of how readers behaved, and how they interpreted different aspects of mapping. Researchers proposed that mental maps existed, which might be investigated in order to understand environmental cognition. It was assumed that map-reading depended, in large part, upon these cognitive structures and processes. In practice, most research continued to investigate filters in the centre of this system, concerned with the cartographers' design practice, and with the initial stages of readers extracting information from the map. Little work addressed either what should be mapped, or how mapping was employed socially. Most research adopted a naively behavioralist approach.

Other strands of scientific research into mapping emphasized the technologies that might be employed.

S0040 Robinsonian Functionalism

P0155 The Anglo-American discipline of cartography emerged in the decades after the War, employing the rhetoric of 'good' cartographic science, to advance its status. Institutions grew with vested interests in these practices. Separate graduate programs were developed, PhDs proliferated, drawing offices were established in universities, cartographic researchers were appointed, national societies were formed, and a new discipline developed. The International Cartographic Association was founded in 1959 to help overcome barriers in the profession by encouraging the free exchange of theoretical and technical information, and charged with aims that were both scholarly and scientific in remit.

P0160 Probably the most influential scientific approach to the new discipline was advanced by Arthur Robinson, whose *The Look of Maps*, was published in 1952. Robinsonian orthodoxies came to be represented in the much reprinted and classic textbook *Elements of Cartography*. Robinson suggested that an instrumental approach to mapping grounded in experimental psychology might be the best way for cartography to gain intellectual respectability and develop a rigorously derived and empirically tested body of generalizations appropriate for growing the new subject, and for the application of this knowledge in the new world of the Cold War. Robinson adopted a view of the mind as an information-processing device. Drawing upon Claude Shannon's work in information theory, complexity of meaning was simplified into an approach focusing on input, transfer, and output of information about the world. Social context was deemed to be irrelevant, the world existed independent of the observer and researcher. The cartographer was separate from the user and a single optimal map could be produced to meet every need. It was assumed that uses of the map could be identified and that the sole purpose of mapping was to reduce error. Framed by an empiricist ideology, this inward-facing research agenda aimed to reduce signal distortion. Art and beauty had no place in



F0005 **Figure 1** Cartographic communication.

Waldo Tobler's analytical cartography emerged in the early 1970s, offering a mathematical way of knowing the world, and laying the foundations for the emergence of geographic information science. This analytical approach sought progress through the application of mathematical models and the subsequent application of technology so as to create new conceptual bases for mapping the world. The ethos of most Anglo-American research, however, still positioned the map user as an individual, apolitical recipient, and the cartographer as a technician delivering spatially accurate value-free products, based upon narrowly identified and carefully controlled laboratory-based experiments, that gradually and incrementally improved knowledge of how the world operated.

P0175 In other contexts, different theoretical positions were adopted. The French disciplinary tradition, for example, was much less influenced by Robinsonian functionalism and empirical research. Semiotic approaches were much more influential in this context, and may be traced back to the influential theories of Jacques Bertin. In 1969 Bertin derived from first principles, rather than from empirical research, a set of visual variables, which might be manipulated by designers concerned with the effective design of mapping and other visualizations.

P0180 While Anglo-American orthodoxies separated the academic pursuit of cartographic knowledge, from its commercial or strategic practice by publishers or national mapping agencies, cartographic science in the Eastern bloc explicitly sought to apply technical knowledge about mapping to state interests. Here mapping sciences were advanced as part of the socialist triumph over nature. The emphasis was much more explicitly upon producing improved practical tools, and in particular upon thematic map production, rather than discovering how mapping functioned. The normative goal was to advance revolutionary progress, through carefully controlled and prescribed research agendas.

S0050 **Toward Representation**

P0185 By the mid-1980s the power of cartographic communication as an organizing framework was beginning to wane. Technological changes rendered problematic a single authoritative view of the world at a time when data were becoming much more readily available, and when technologies for the manipulation and dissemination of mapping were also being revolutionized. Users could become mappers: many possible mappings could be made and the map was no longer the end form. Mapping needed to be understood as much more of a process than was possible in communication models.

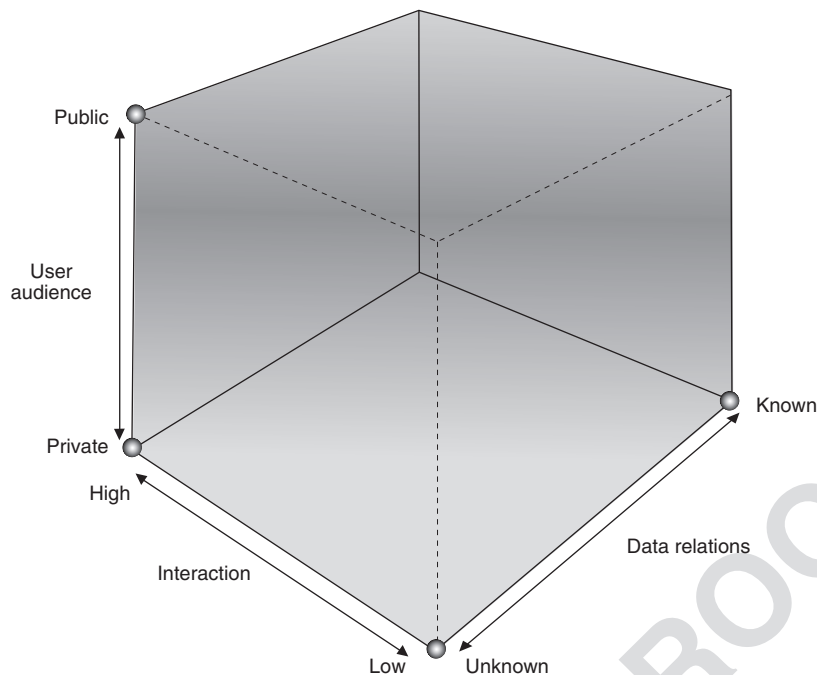
P0190 Digital mapping technologies separated display from printing and removed the constraint of fixed specifications. GIS has increasingly supplanted technical aspects of cartography. Digital position, elevation, and

attribute data could be captured from remotely sensed sources, and easily stored and manipulated in a digital form. Precision and accuracy increased apace. Imagery could be generated to provide real-time updates of changing contexts. The displays of these data are no longer just static maps, and animated displays incorporating time into the mapped world are now commonplace. Tobler's analytical cartography has led to a profound technical revolution that also changed ways of thinking about mapping.

P0195 We can all choose which patterns to display in these new maps. We can include what we want, and show it how we want. The Web allows these images to be widely shared and disseminated at low cost. Barriers between viewer and viewed are blurring: immersive virtual reality systems allow the user to become a participant in the mapped landscape, instead of an onlooker. These technologies are also increasingly mobile: maps on phones or personal digital assistants (PDAs), and incorporating information derived from global positioning system (GPS), now plot 'your' changing real location as you move through the world. A whole range of possible ways of seeing the world may now be created by the users of the image, instead of a single carefully crafted view from an authoritative producer. We can all explore 'our own' visualizations, instead of having to accept a fixed image created by someone else.

P0200 In the face of these profound challenges, a second hegemonic approach to mapping had replaced cartographic communication by the mid-1990s as the scientific orthodoxy. The linear inevitability of communication has been supplanted by a multifaceted and multi-layered merging of cognitive and semiotic approaches, centered around representation and strongly influenced by the work of Alan MacEachren. Articulating ideas grounded in Peircean semiotics, this approach recognized the need for a much less literal and functional positioning of mapping. The iconic representation of this approach is the drawing of cartography cubed that appears in **Figure 2**. The dimensions of interactivity, the kind of knowledge, and the social nature of the process show the three key ways in which scientific understanding has been repositioned. Mapping can now be investigated as collaborative, the social context beyond map-reading *per se* can be charted, and the process of knowing explored. And mapping is one of many kinds of visualization.

P0205 Representation focuses much less on artifacts, and much more upon process. It is grounded in a more realist science, recognizing contingency and context, compatible with a universe where science has to come to terms with uncertainty and where outcome may depend on complex local circumstance. It is, of course, still a scientific approach, reliant upon Western ways of seeing and upon technologies of vision. It still depends upon the neutrality of scientific experimentation and a representational view



F0010 **Figure 2** The mapping space of representation: MacEachren's cube.

of the world. Other ways of mapping exist beyond this still narrowly defined frame and it is to these that we now turn.

S0055 **Humanizing Mapping**

P0210 As a sign system, mapping may be read in different ways by different people and there has been an increasing appreciation that science has to take this social and individual context into account, instead of offering universal explanations. Meaning matters and depends on culture as well as form, content, technology, or politics. Mapping speaks differently to different people. The meanings of the image are constituted in a context that is complex and personal, so the individual can then be cast as an active force in mapping.

S0060 **Subjective Practices**

P0215 Cross-cultural studies of map-skill acquisition suggest that individual mapping skills may be a shared cultural universal, learnt as a practical device in many different cultures, but practiced by individuals according to their own needs. In a long series of empirical studies, Jim Blaut has shown how children acquire these mapping skills in different cultures. A subjective interpretation of mapping can go beyond empirical studies, and be considered a matter of practice and knowledge.

P0220 In the practical world of design, it has long been recognized that esthetic factors are important for the communication of information in mapped form.

Collectable antiquarian maps are valued as objects of beauty, acquired for their rarity and esthetic qualities. The visual display of a map is important: maps decorate as well as inform. In a reaction against the functional Robinsonian orthodoxy that dominated much of the practice during the early years of the American birth of cartography as a separate discipline, attempts were made in the 1970s and 1980s to incorporate art into scientific mapping practice. Following the lead of researchers, such as John Keates, scientific practices sought to systematize artistic qualities such as layout, visual hierarchy, name placement, balance, and appropriate levels of generalization. It was recognized that subjective combinations of different visual variables resulted in designs that articulated particular points of view.

It is also widely recognized that mass production and the corporatization of cartographic practice led to a decline in design quality and that the rise of GIS and web mapping has exacerbated this retreat from the esthetic. Online maps are mostly functional but ugly. But map users are still able to recognize artistic quality in all mapping: individual, subjective, holistic, and personal qualities of designs are often contrasted favorably with more utilitarian, depersonalized, analytical, and functional qualities associated with mapmaking as a scientific technology. And aspects of mystery, emotion, and taste are beyond science: map users are able to recognize good designs even if they do not know why these designs are good.

The person reading the map interprets this esthetic according to the context in which the map is discursively

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positioned, and according to who they are. A vibrant agit-prop image on an alternative web-blog may well be read differently from a pared-down black-and-white information graphic in *The Times*. Esthetics depend upon the historical and cultural context of the image. At different times and in different places, the worlds of the artist and those of the cartographer have overlapped. In the heyday of decorative cartography in the seventeenth century artists and mapmakers shared similar goals, spaces, and visual devices. Following the rise of mass-produced technical mapping, and the twentieth century invention of cartography as a science, a much more separate existence became the accepted orthodoxy. In the 1990s, however, artists increasingly began to use mapping as a device to draw attention to the way in which individuals relate to the world. Surrealists, pop artists, situationists, land artists, conceptual artists, community artists, digital media artists, and live artists have all employed mapping in their work. And non-Western alternative mapping traditions grounded in practice and subjectivity also challenge the appliance of science. Aboriginal art speaks with a different esthetic to a Western map of the same area. It is not only what is mapped and how features are mapped that dictate how the image is employed, reading the map goes beyond the esthetic. Elements in designs may allow a map to be dated or even placed, but the individual can play a much more active role in this process, and the look of a map immediately encourages individual reflection and feeling.

Other humanistic interpretive devices stem from literary approaches and a textual view of mapping. Derridean deconstruction offers one approach to mapping, comprising the identification, and understanding of underlying (but often unarticulated but implicit) assumptions or ideas, upon which the text rests, and which strongly influence what we think or believe about the mapping. It encourages a consideration of absences as well as presences, focusing upon textual contingencies, paradoxes, and contradictions and argues for rejection of dualistic thinking. John Pickles has argued that the hermeneutic circle may be employed to analyze mapping. Mapping may be read in a critical process by exploring the relations between mapping as a text, its language, the cultural context, the authors' world, and the world being represented. Of course, a subjective, polyphonous, and multi-vocal map can emerge from this process and textual analysis is inevitably interpretive, with meaning constantly being constructed.

These interpretive approaches to mapping share a focus upon the cultural context in which mapping is employed. They increasingly stress the ambiguity of the map-reading process, and the need to consider contexts beyond the map. They also tend to reject narrowly structural readings of mapping, valuing instead phenomenological investigation, and increasingly a nuanced and post-structural distrust of universal explanations.

Critical and Emancipatory Cartographies

S0065 Humanistic Approaches to Mapping

P0235 If mapping practice is imbued with human conceptions beyond science, then the same is true for mapping thought. Phenomenological approaches to mapping reject the narrow certainties of functional Cartesian thinking, and challenge empiricism as a way of explaining the world. Interpretation becomes more important than explanation; mapping narrates a personal story, one of many possible ways of knowing the world. Interpretive approaches to mapping are often imbued with an esthetic concern. Some theorists have argued that the forms of the visual medium itself are sufficient to interpret. James Elkins, for example, suggests that the relations of writing, notation, and pictorial form within any image may be analyzed, and regards maps as what he terms 'schemata'. Mapping as a medium clearly carries connotations that are separate from other forms, such as pictures, for example. An iconographic approach, also derived from art history, is another useful way of analyzing the subjective connotations of mapping. Three levels of analysis here are possible: the forms of symbols may be described; their meaning read in a literal sense; or alternatively interpreted and related to social function in a tertiary iconographic analysis.

P0250 There has been an increasing recognition that the image of the world can never fully represent the world, because the process of representing is itself part of the world being represented. The mapmaker and the map would themselves have to be part of the map of the world, and can never, despite the illusion conveyed by the godlike perspective of the image, ever be truly separated from the image. Science becomes a set of cultural practices, with a subjective viewpoint, and a politics. It becomes a view from somewhere, rather than a mirror-like representation.

P0255 In the late 1980s, attention gradually focused on the positioned nature of cartography as a discipline. The work of Brian Harley began to question how mapping operated as a powerful discourse. In a series of papers published between 1980 and his death in 1991, Harley began to challenge scientific orthodoxy and focus attention on the social role of mapping technologies. He proposed a new research agenda concerned with the roles maps play in different societies, arguing that maps often reinforce the *status quo* or the interests of the powerful, and that we should investigate the historical and social context in which mapping has been employed. In this view, cartography was not necessarily what cartographers

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said it was. Instead, Harley argued that we can only understand the history of cartography if we interrogate the forces at play around the mapping.

P0260 This social constructivist critique sometimes articulated structural explanations for mapping, which sought understanding beneath the apparent surface of observable evidence. For example, David Harvey's Marxist analysis of the role of mapping in time space compression examined the role of global images in the expansion of European colonial powers, and situated these as reflections of a changing mode of production. Drawing on linguistic structural thought, Denis Wood employed Barthean semiotics to persuasively argue that the power of maps lay in the interests they represented. Mapping in this view always has a political purpose, and this 'interest' often leads to people being 'off the map'. Wood argued mapping works through a shared cultural reading of a number of different codes in every map, which may be analyzed in a semiotic process to reveal the power behind the map. These interests all too often led to subjugation, oppression, control, and commerce. Through economic relations, legal evidence, governance, or social practice, the power of maps continues to be used to control. It has been argued that many of the social roles played by mapping stem from the modernist project, and that mapping partly constitutes modernist enterprise itself. By examining different categories across which power might be articulated, contextual studies can reveal how maps reflect but also constitute different kinds of political relation. Colonialism, ownership, national identity, race, military power, administration, and gender have all been theorized as playing key roles in mapping relations.

S0075 **The Power of Contextual Approaches**

P0265 Historically mapping has guided the explorer, fostering a sense of inevitable progress, and encouraging belief in the march of civilization. Local knowledge has been translated into tools to serve the needs of the colonizer, with new territories scripted as blank spaces, empty and available for the civilizing Western explorer to claim, name, subjugate, and colonize. Projection and design have been used to naturalize the political process of imperial control and sell imperial values to citizens at home. The continuing progress of colonial adventures is mapped out nowadays in our news broadcasts, and on the Internet, but the imperial rhetoric of control, governance, management of territory, and creation of new imperial landscapes remains the same. The colonial project relies on the map, and in turn the map relies on colonial aspirations.

P0270 This imperial context also shows how maps are part of the geographical imagination of every nation, contributing along with censuses, museums, and the printed word to what Benedict Anderson has termed a sense of

imagined community that was enormously powerful in fostering the modern development of the nation-state. Despite globalization, national mapping agencies still publish mapping designed to different specifications, in a cultural cartography that parallels national landscapes. National atlases serve as cultural ambassadors for their nations and ethnic stereotypes are perpetuated through the fixing of place names on officially published mapping.

The property relationship is also closely supported by mapping. Throughout history, the claims, rights, and desires of landowners are reflected in maps and in technological changes in mapping. The estate map served as a practical tool for the administration of a landed estate, as a means of social control, and as an esthetic statement for its owner. Digital land information systems allow land to be reapportioned but also reflect the power of the regime. Mapping itself can be a property with a value, often accumulated over many years and assiduously defended by its owners. Publication or dissemination is not always in the interests of the powerful: leaving out information from a map may also serve economic interests and reify social relations.

Military interests have exerted substantial influences on mapping throughout the history of cartography. Most of the significant technological innovations now accepted as routine in the mapping sciences, such as remote sensing, GIS, terrain analysis, and GPS-based technologies, have trickled down from the military. The Web has also been strongly influenced by military research. Location-based services stem from military investment and innovation. Multimedia mapping research is fired by military needs for battleground simulation. In high-tech warfare, military personnel are more distanced from the act of killing if trained with simulators that depersonalize conflict, turning the reality in it into a computer game, where the real landscape morphs increasingly into the virtual.

It has also been argued that visual technologies are employed to facilitate social governance and that mapping plays an important role in this process by offering a technology that helps to 'discipline' model citizens by marking acceptable and unacceptable forms of behavior and spaces. National states are much more interested in tracking their citizens after the 9/11 attacks and a renewed emphasis upon mapping and GIS as surveillant technologies, can be seen as part of a strategic and rational governmental response to risks, that parallels the invention of thematic mapping as a technology to reinforce a moral order in early nineteenth-century Europe. People become cast as a problem, or as subjects demanding attention and control, in the interests of the state or corporation. Foucauldian interpretations of mapping as surveillant power-knowledge are strongly compatible with a society in which closed-circuit television (CCTV) increasingly captures and places

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representations of individual behavior and in which real-time mapping places people and things. Mapping technologies have the potential to appear to reveal everything, but at the same time there may be moral, political, or social reasons for not revealing spatial information. There are still huge variations between different nations over what is released into the public domain and many nations still wish to keep secret the existence of strategic facilities. Rights to privacy may conflict with the all-seeing power of spy satellite, or the real-time Web-based tracking mapping of children or criminals.

P0290 The authoritative scientific, 'all-knowing' gaze of the map has been cast as masculine. In this view, mapping becomes analogous to a landscape or nature, created as an entity to be seen, controlled, and subject to male power, de-corporalized and de-personalized, doing male work. Mapping practices appear to reinforce this interpretation. In the history of cartography, most maps have been made by men. Where women were involved in the past, they were often in positions where they could exercise very little power over the medium. When women were depicted on maps, they were often exoticized or eroticized. The world represented on maps has also tended to be a world of stereotypical male interests: the built environment, emotionless and factual, revealed to be managed. And there are gender differences in the way maps are read. However, recent interpretations suggest these generalizations may oversimplify – a feminist GIS might empower very different gazes, new themes can be mapped, in new ways. A more hybrid vision becomes possible in which power may be subverted.

S0080 **Critical Cartography**

P0295 At first, these challenges to science operated as an empirical and social critique of mapping practice, rather than as a theoretical challenge to mapping as scientific or technical knowledge *per se*. A more critical alternative began to emerge from this process, however, in which the focus shifted toward different philosophical ways of understanding powerful mappings. For example, Harley later moved on to employ Derridian deconstruction and Foucauldian notions of power knowledge in the discursive construction of the mapping process. In a Foucauldian sense, mapping offers a very appropriate metaphor to explain the heterotopic associations of contemporary spaces. Power becomes something that may be used to control, but which may also be employed to resist and create alternatives. Post-structuralist approaches show us that governance and oppression include the seeds of resistant possibilities. And in the last decade there has been a widespread recognition of the power of post-structuralist critical approaches. Now there are also postcolonial mappings encompassing new ways of understanding a globalized world of flows and linkages,

orientalist mappings informed by Edward Said's work, as well as feminist mapping theory. A critical cartography has begun to emerge.

This critical project does not only encompass writing about mapping. New mapping has been published to disseminate alternative views as part of a 'counter-mapping' process. For the last 15 years there has been a profusion of these 'alternative' maps: reaffirming the rights of indigenous peoples; arguing local cases in resource struggles; encouraging community involvement in sustainable lifestyles; reasserting the role of the past in contemporary contexts; or celebrating the esthetic and the local in an age apparently dominated by uniform and mechanized production and global style. The World Wide Web has offered a new collaborative medium and forum through which alternatives may be disseminated and which cuts across the limiting forces of traditional institutions. These projects challenge orthodoxies by often suggesting that theory and practice might be combined in a form of praxis, which seeks to change the world while rewriting accepted ways of theorizing about the world. And in turn, practice has become increasingly important in thinking about mapping. P0300

Relational Thinking: Toward Practice

The artistic and critical turns toward mapping described above are taking place in a time of rapid technological and cultural change, reflecting territorial uncertainty in the aftermath of the collapse of the Soviet Union; the global war on terror; as well as challenges to American cultural hegemony and neoliberal orthodoxies. Flux in the information economy; the profusion and dynamism of products and media; increasingly privatized multi-channel and multi-mediated cultures, and the rise of virtual places and spaces have all encouraged a focus on, and questioning of, the apparently fixed certainties of the map. The blurring of contemporary identities and of divides between genders, ages, social roles, and between nature and culture are all central for new mapping philosophies. These shifting ways of thinking about mapping also reflect a more general rise in relativist approaches to knowledge, and in particular an emphasis upon performance, relations, and affect, instead of essence. P0305

Hyper-Reality and Relational Thinking

Mapping allows an exploration of the ambivalence of contemporary sign systems, in which reality and the map are increasingly blurred and where the real and the hyper-real coexist. The TV news graphic of conflict in Afghanistan incorporates mapping, pictures, animated symbols, satellite imagery, text, and is interpreted in a voice-over delivered by the news anchor, where the P0310

events that it narrates are inseparable from the ‘infotainment’ on the screen. A central concern in this Baudrillardian economy of signs, where imitation replaces representation and where new media remediates older geographical imaginations. The inter-textual field of the map may be read in many different ways. Mapping may, in some contexts, be seen as constantly echoing and re-making past tropes. In others, such as the worlds of gaming, it is at the forefront of creating new imaginaries, in which the active subject is immersed as an actor in the virtual landscape or map. The map becomes the territory and carries us with it on a journey of change. We can zoom in onto the landscape and almost become part of the action.

P0315 Maps are also mobile and networked, an outcome of a technology that allows cultural messages to be transformed and shared. The development of Actor Network Theory in science studies has done much to encourage a consideration of the transformative potential of technologies. In his early work, Bruno Latour reflected on the immutable and mobile nature of mapping, the ways in which the medium has been able to carry fixed messages into new contexts, and in so doing support the expansion of modernism. David Turnbull stressed the indexical qualities of mapping, the ways inscriptions brought the world home to different people and he also charted encounters between different assemblages of mapping knowledge. In this approach a thick description of the context is needed to unpack the relations and flows between different actors and actants. Researchers have to trace the inscriptions left behind by different actors, but also need to carry out ethnographic work in the field. More recent actor-network approaches stress the ambiguities of mapping work, and the complex negotiations in different knowledge communities, through which mapping works.

S0095 **The Affective Performance Of Mapping**

P0320 Mapping also reminds us about the pervasive and problematic relations between subjects and objects: mapping can be embodied and its performance reveals the (e)motive and constitutive nature of action. Employing Judith Butler’s notions of performance, Del Casino and Hanna use the construct to argue against binary thinking, and in favor of spaces and mapping as being co-constituted. A hybrid mapping emerges from this process, at once produced and consumed, cultured but also natured.

P0325 Other theorists, such as Kitchin and Dodge, argue that mapping calls spaces into being and is, itself, always called into being to do particular sets of work. Mapping in this view is always emergent, and as practice is concerned with processes not representations.

P0330 For some this relational turn has been theorized as nonrepresentational, drawing on Deleuzian ideas.

Mapping can then be imagined as a suite of cultural practices involving action and affects. This kind of approach reflects a philosophical shift toward performance and mobility and away from essence. This rethinking of cartography is supported by historical and contemporary work. Researchers concerned with historical contexts increasingly stress the interplay between place, times, actions, and theory. Mapping in different cultures reflects three traditions: an internal or cognitive set of behaviors involving thinking about space; a material culture in which mapping is recorded as an artifact or object; and a performative tradition where space may be enacted through gesture, ritual, song, speech, dance, or poetry. In any cultural context there will be a different blend of these elements. So interpreting mapping means considering the context in which mapping takes place, and the ways in which it is performed. Instead of focusing on artifacts, or esthetics, or human agency, or the politics of mapping, a nonrepresentational performative approach questions who employs mapping, to what purposes, and focuses upon mapping actions. In early modernity, the culture of printing allowed mass production and dissemination of mapping, and encouraged the map to play its often oppressive role, but detailed examination is needed to chart the actions that this culture brought about. In contexts where encounters occur between different mapping traditions, for example, the inter-textual field of mapping might best be interpreted through a postcolonial approach: Matt Sparke’s reading of the interplay between North American Indian mapping, colonial alternatives, and nation building in Canada is informed by a consideration of Homi Bhaba’s work. Performance is seldom simple; actions are complex and negotiated and mapping interrelates with other cultural and geographical texts.

Contemporary research is also starting to employ ethnographic approaches to carry out empirical investigations to investigate how everyday mapping is practiced and its relations to identity, the construction of different spaces, and the task-oriented behavior it supports. Researchers have started to critique representational approaches to mapping and way finding. Instead of positing the existence of a mental map, way-finding may be possible because of cultural practice and might be best understood as a narrative reenactment of past mobility. Places are called into being as we move through them, spaces co-constructed through mapping practices. In this kind of approach, mapping becomes a set of social actions.

Praxis

In this performative and relational cartography, technologies need to be observed in specific local contexts, and seen in action. Resistant mappings may be

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understood in a similar fashion to more oppressive mappings that have received the bulk of the attention of historians of cartography, and the worlds of mapping knowledge and mapping practice increasingly blur. Theory and practice merge in a form of critical praxis. For example, the Web brings together mappers as users in collaborative projects grounded in space, in mapping hacks and 'mash ups', which subvert existing power structures, and in collaborative urban exploration. It also encourages a sharing of different ways of thinking about the map. New technologies create new stories and performances and evoke many different emotions. Instead of the rational behavior assumed by the scientific model, or the esthetic experience evoked by artists, or the oppressive behavior implied in Harleyian takes on the medium, a performative cartography imagines many different possibilities. Mapping may be angry, boring, celebratory, exciting, happy, painful, persuasive, playful, proud, reassuring, revealing, restless, sad, or wistful. As human practice we can make it what we want. And the limits to what may be known about mapping are similarly boundless.

S0105 **Summary**

P0345 This article shows how philosophy matters for mapping and demonstrates how changing approaches to the medium have been mapped out in practices, artifacts, and in writing. The apparent neutrality of the mapped image continues to exert a strange power through the esthetics of design, but despite the hegemonic technological power of scientific and technological progress, mapping is still imagined, made, and remade in shifting and ambiguous ways that can evoke powerful emotions and are enacted in every part of the world.

P0350 Philosophy and mapping morph into one another in ways that are beyond a brief encyclopaedic summary. Their relations are complex. The neat subject headings in the argument above are, in practice, fluid and often ambiguous: critical approaches have historically often also engaged with the human subject; scientific ways of knowing the world have always had to come to terms

with esthetics and with imaginative power; post-structuralist thought emerged as a response to structuralist critiques of science; recent performative approaches to mapping depend on relations between human and non-human actors and technologies, etc. Different philosophies coexist and cross-fertilize one another. The world of ideas constantly interplays with the material world and with the world of practice and new maps emerge from this contested process. Human beings will continue to try to make sense of this complexity by advancing new ways of thinking about the world, and creating new mapping.

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Further Reading

- Blaut, J., Stea, D., Spencer, C. and Blades, M. (2003). Mapping as a cultural and cognitive universal. *Annals of the Association of American Geographers* 93(1), 165–185.
- Cosgrove, D. (ed.) (1998). *Mappings*. London: Reaktion Books.
- Crampton, J. (2001). Maps as social constructions: Power, communication and visualization. *Progress in Human Geography* 25, 235–252.
- Del Casino, V. and Hanna, S. P. (2006). Beyond the binaries: A methodological intervention for interrogating maps as representational practices. *ACME: An International E-Journal for Critical Geographies* 4(1), 34–56.
- Habermas, J. (1978). *Knowledge and Human Interest*. Cambridge: Polity Press.
- Harley, J. B. (2001). *The New Nature of Maps*. Baltimore, MD: Johns Hopkins University Press.
- Harley, J. B. and Woodward, D. (1987). *The History of Cartography*. Chicago, IL: University of Chicago Press.
- Law, J. (2004). *After Method: Mess in Social Science Research*. London: Routledge.
- MacEachren, A. M. (1995). *How Maps Work*. New York: Guildford Press.
- Perkins, C. (2006). Mapping. In Douglas, I., Huggett, R. & Perkins, C. (eds.) *Companion Encyclopaedia of Geography* (2nd edn.) pp 555–571. London: Routledge.
- Pickles, J. (2004). *A History of Spaces: Mapping Cartographic Reason and the Over-Coded World*. London: Routledge.
- Robinson, A., Morrison, J. L., Muehrcke, P. C. A., Kimerling, J. and Guptill, S. C. (1995). *Elements of Cartography* (6th edn.). London: Wiley.
- Rose, G. (2007). *Visual Methodologies* (2nd edn.). London: Sage.
- Turnbull, D. (1993). *Maps are Territories*. Chicago, IL: University of Chicago Press.
- Wood, D. (1992). *The Power of Maps*. London: Routledge.

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