

Re-mapping the Arctic:
contemporary approaches to
practising cartography across
diverse knowledge traditions

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Declaration of Originality

I declare that this thesis is entirely my own work, and includes nothing that is the outcome of work done in collaboration with others, except where clearly acknowledged in the text or Acknowledgements. It has not been submitted in whole or in part for a degree at this or any other University. This thesis does not exceed 20,000 words, excluding Figures and their captions, Tables and their captions, Cover Page, Declaration, Acknowledgements, References, and Lists of Contents, Figures, Tables, and Mathematical Notation.

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Abstract

Note: This abstract is a bibliographic resource, and is not presented for examination.

This thesis examines historical and contemporary debates surrounding the way in which knowledge traditions interact in the Arctic. This is done through examining the theoretical and practical history of cartography, both as a discipline, and as applied to the Arctic.

In doing so, I make the argument for an inextricable link between cartography and knowledge production across supposedly different 'knowledge traditions', through the privileging of performativity as the primary way of making knowledge, and an understanding of human cognition as inherently spatial and narratological.

Based on these understandings, I examine debates within geography and wider social science that might assist the practising of cartography under this philosophy – the possibilities for 'working with multiple ontologies'. For example I explore the opportunity for working with complex adaptive systems, and suggest that a contemporary understanding of how cyberspace is produced in the Arctic fits in with these philosophies. I also examine those debates that might stand in the way of practice that acknowledges these philosophies of complexity – for example debates about the nature of digital materiality, and of the epistemological / ontological divide.

These theories and debates are anchored in the Arctic through the use of historical and contemporary examples concerned with the mapping of space and knowledge primarily in the North American Arctic.

Ultimately debating a future for practising cartography in the Arctic is situated within the confines of post-colonial critique, so I examine how we define "counter-mapping", and where the philosophies outlined above fit into this politically strong tradition. In conclusion I suggest that whilst contemporary theory has much to offer an increasingly digital indigenous Arctic, there remains a partial disconnect between theory and practice that can be addressed through reading this debate.

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Re-mapping the Arctic: contemporary approaches to practising cartography across diverse knowledge traditions

1. Introduction

1.1. Background

This thesis examines the way in which contemporary theory approaches the practice of cartography, highlighting key debates for those attempting to practice commensurability across diverse ways of knowing and making knowledge.

The Arctic is a lived space, and is home to diverse knowledge traditions. The history and contemporary politics of the Arctic require an understanding of this diversity of knowledges for any academic or political work in the region.

This thesis merges two zones of study; geographically, the Arctic – largely the North American Arctic – and theoretically, cartography. Cartography is a practice in motion. It is a practice that has emerged from being understood militarily, imperially, and scientifically, to an ontogenetic practice that is now central to an attentive reading of what it means to be agent, author and audience.

In one respect, this thesis traces a history and future of cartography. I argue that throughout history, cartography, its meanings and power have been integral to relating and connecting different ‘ways of knowing’ and making knowledge. The extent of the relationship between cartography and the production of knowledge is illustrated in this thesis through accounts of cartography fulfilling diverse roles – for example as an imperial governmental technology, but also as a commensurate practice.

The Arctic has been central to the historical development of cartography, as much as cartography has shaped the region itself. Experimental mapping practice and use has been crucial to the history of the North American and arguably circumpolar Arctic, from colonial surveys (see Bravo, 1996) to knowledge exchange programs in the past few years (see Pulsifer *et al*, 2012). In reflection, understandings of knowledge-making and cataloguing

diverse knowledges have often been centred around the Arctic (e.g. Gearhead *et al*, 2010; Laidler *et al*, 2010; Pulsifer *et al*, 2012).

This thesis contends that the Arctic and the practice of cartography are fundamentally intertwined through their colonial history, and the tension over the extent to which they can be called post-colonial. Subsequently, there is attention to key debates and concepts that shape the wider political position of cartography, the Arctic, and how they interact.

Fundamentally, I argue for a post-structuralist understanding of maps as complex processual events. Further, these events are inherently attentive to making sense of complexity through narratological cognition – that is, making sense of the world through the telling of stories on a number of scales. This thesis works towards explaining reasons for understanding cartography and knowledge in these ways, before reflecting on how this philosophy is relatable to the contemporary.

Having established the theories I want to use to understand mapping, knowledge-making, and how they intersect, I address the extent to which these theories can be applied in a space that is necessarily changing technologically, societally and politically. Here I highlight projects that are indeed successful in appreciating indigenous knowledge in more than a romantic fashion, without fulfilling the philosophical theories outlined above. Therefore I argue against philosophical relativism and its politically weak position, giving support for practical “counter-mapping” projects that have been shown over the past three decades to further subaltern politics.

1. 2. Structure and writing

I argue for an understanding of cartography fundamentally as an emergent practice. This non-representational and deconstructionist view of cartography allows us to build on wider literature concerned with the mapping of knowledge and knowledge management, and also the centrality of performativity and therefore practice to everyday life and cognition. Chapters 2 and 3 work towards this conclusion, and operate as a justification for this definition of mapping.

Chapter 2 highlights the historical issues with mapping and mapmaking and traces the reasons for a re-imagining of cartography by postmodern thinkers and critical geographers in the past thirty years. This builds on Foucauldian analysis exposing the power relationships involved in governmental technology, but also engages contemporary debates about how to understand the spatiality of knowledge. Understanding spatiality is key to this debate, as it provides the link between the material aspect of cartography and wider debates about knowledge-making. Through suggesting that knowledge-making and cognition are hodological and narratological, we can relate the making of knowledge to the making of space (following Turnbull, 2007; 2012), and look at these concepts through the same lens as practicing cartography.

Linking chapters 2 and 3 is the importance of performativity. In cartographic theory, we have witnessed a re-thinking of how mapping is performed; reflecting the changing position of maker, publisher and user, and the eroding of defined spaces for different actors. Understanding performativity as the key to 'ways of knowing' and making knowledge refutes the assumption of hegemonic or diametrically opposed knowledge systems (following Bravo, 2000). Rather, thinking of performativity as central to the nature of human life opens up the possibility for "working with multiple ontologies" (following Turnbull, 2012); given that ontologies are therefore only products of their location and epistemic situation. This focus on performativity as central to knowledge-making characterises one of the central axioms of this thesis; the argument for possibilities of viewing knowledge-mapping projects as complex adaptive systems (following Maturana & Varela, 1987; Turnbull, 2007; 2008). This positing of the opportunity for complex adaptive systems as a way of working across multiple ontologies helps to clarify the argument that the binaries created through academic anthropology are not necessarily a valid way of thinking.

Having built the argument for viewing mapping as processual and emergent, and the ability to pursue complex adaptive systems through understanding knowledge as narratological and hodological, chapter 4 brings this theory up to date by examining debates arising from the increasing digitalisation of cartography. This digitalisation has brought about new challenges for theorists

both in terms of how to make sense of technical/human interaction, and also how we make sense of space in the contemporary environment. Key to this debate is how we view the separation of ontological and epistemological knowledge when working with GIS and distributed mapping, or indeed whether this separation should or does exist. This debate has been lively both within geography and across social science, and informs our understanding of what we mean by a “digital ontology” for the Arctic, and how this moves our theories forward.

The final chapter of this thesis asks “what kind of mapping for what kind of use?” Having answered what kind of mapping we view as contemporarily attentive to ways of understanding and practicing diverse knowledges and ways of knowing, this paper must address how and if these are implementable and if they can be politically influential. This question locates our debates within a post-colonial context, and the wider trend towards “counter-mapping” (following Peluso, 1995).

In order to understand counter-mapping, and how this central part of the political geography of post-colonialism fits with our conceptions of mapping, we need to examine what fits under the term “counter”, and thus discuss conceptions of narrative and practice. This discussion illustrates that whilst I have argued for a certain way of thinking about mapping, other forms of mapping and other mediums have been successful in challenging the hegemonic narrative put forward for the Arctic. So I argue that over-attention to theory and “best-practice” should not necessarily come in the way of political action through alternative forms of agency. Extolling the need for political action therefore helps us to conclude that this thesis does not constitute a “best practice manual” for practicing commensurate cartographies and knowledge management, but is rather a reference for key debates that might inform future practice.

2. The (post)colonial Arctic space: understanding a political cartography

Understanding cartographic practice in the Arctic requires addressing the contemporary debates surrounding colonial forces and their presence. From the colonial project, spreading from Western Europe, starting in the Early-Modern period, cartography has been a powerful tool on many levels for both oppression and resistance. Thus beginning a discussion of cartography in contemporary societies requires a sensitivity to wider debates: the tension between colonial and post-colonial visions of the North American Arctic, but also an understanding of the location of cartography in colonial interactions with the North.

I want to examine the important link between colonialism and cartography through two lenses. First, by examining the ways in which cartography was integral to the direct colonial control of populations and then by investigating the role of cartography as a way of making and enforcing colonial narratives, as a form of colonial power-relations. The former examination reflects a definition of imperialism as the control of the weak by the “rich and powerful” (Stone, 1988: 56). The latter understanding of imperialism and colonialism follows the contemporary awareness of the importance of narrative in shaping empire in a way that is more than physical subjugation, but about the construction of a network of complex flows (following Pratt, 1992). Understanding the primary positioning of cartography in the colonial project is key to locating this thesis within a wider literature of post-colonialism.

2. 1. Cartography and colonialism

A clearer way to examine the tangible link between imperialism, colonialism and cartography in terms of *control* is by turning to the African arena, where there is extensive literature on the subject (see Bassett, 1994; Akerman, 2009; Cosgrove, 2001). Worby (2007), for example, illustrates this process through the “ethnic mapping” of North-western Zimbabwe, with specific reference to the *Shangwe* ethnic group. Through the naming of territory and space in ethnic maps, colonial powers were able to divide groups, and create turbulence, if not conflict, based on the (mis)division of peoples along arbitrary

lines of possession. Furthermore, division was not just about the demarcation of space, but also the more conceptual relative positions of hierarchies, familial and tribal ties that were implicitly illustrated in maps.

Using the example of a British map of the Shona and Ndebele peoples of Rhodesia, Worby (*ibid.*) points out the turbulence created by the map when certain groups were portrayed as lacking connections to other more regal familial groups. In summary, he suggests that “by affixing names to discrete territories, such maps served to both encode and represent the implicit, silent vantage point of the colonial state in relation to the subjects over which it presumed or desired to hold authority” (2007: 371). Africa provides useful material for analysis not only in terms of direct colonial control and division, but also through the way in which maps were integral to enforcing colonialism as legitimising narratives, going beyond practice to technology and theory of colonial governance. Stone studies the work of 18th century travellers in Niger, where he argues that maps “were based on instrumental observation which added a scientific dimension to the travellers' records, an important 'civilizing' element in legitimizing the European penetration, presence and even interference in Africa in the eyes of the unofficial mind” (1988: 59).

The use of science as a tool for building a legitimising narrative is something that is reflected effectively in polar tradition, through Scott's geological approach to Antarctic exploration (see Huxley, 1913) or the meticulous mapping of Arctic explorers following contact with indigenous populations on Canada's Eastern coastline in the 19th century (see Withers & Kierghan, 2010). This understanding of the relationship between narrative, cartography and empire – which will be re-examined in chapter five – is reflected in the dissemination of a number of media other than maps. Pratt (1992), ever attentive to the way in which power relationships are formative of all those involved, helps us to understand the central role that narrative plays in the development of empire; through travel writing, mapping, and field science.

Focusing attention on an international literature dealing with direct mapping and colonial history, we should note Stone's (1988) articulation of the differences and movements between colonialism and imperialism. There is an important distinction to be made as this control was gradually migrated across

from the imperial power – the state – and towards the jurisdiction of agencies and companies, in colonialist form. As Stone (1988) and McGrath (1982) point out regarding the process of mapping in Africa, responsibility was divested to the Ordnance Survey and the Overseas Development Agency – adding a commercial dimension to colonial rule, which in the 18th and 19th centuries would previously have been distinctly imperialist. Here, northern parallels seem clear, as the Canadian Arctic moved away from a space of imperialist expansion and exploration which we see through 18th century British explorers, and towards an economic colonialism in which indigenous groups were forced to partake in the first half of the 20th century (Tester & Kulchyski, 1994). These trends must of course be taken within a softer understanding of Empire as a multi-directional concept that had effect on both colonies and the metropolis (Pratt, 1992). Understanding the turn to colonial rather than imperial control, and empire as a network of flows privileges cartography as a power technology through its ability to fulfill diverse roles in both these forms of control.

Specifically in the Arctic, we have to be acutely aware of the fact that there is no convention regarding colonial presence, and indeed the mention of a “colonial present” can be somewhat affronting for those who are investing significant economic, financial and intellectual resource in a belief to the contrary (Cameron, 2012). Whilst we can establish that maps are integral to forms of colonialism that emerge in the 19th century, this thesis appreciates complexity in the contemporary world, and argues that binaries of colonial and post-colonial understandings of the world, and specific regions, are unhelpful for engaging in contemporary politics.

2. 2. A relevant history of cartographic theory

In grounding my later discussion regarding the interplay between mapping, complexity and the co-production of knowledge, is it necessary to think through how contemporary and past scholars conceptualise maps and mapping. Cartography has had a turbulent theoretical history (Crampton & Elden, 2007), which has straddled a number of disciplines in both intellectual and technical terms from its origins as a military and imperialist science

(Harley, 1992), to the contemporary, dispersed nature of mapping that involves geographers, historians of science and scientific knowledge, geomatics commentators and those interested in the nature of the internet. This section will outline the key debates emerging from this discourse and its long history, and their relevance for understanding a contemporary mapping of the Arctic.

2. 2. 1. The importance of theory

This enthusiasm to engage in the critical history of cartographic theory is relatively modern, and not yet entirely accepted (Crampton, 2003). Following Crampton, it could be suggested that there are certainly geographers – indeed those who engage with cartography (including GIS) – for whom theory “simply gets in the way of the job” (ibid.: 30). Even where asking whether to engage in theoretical debate for the contextualization of new research, we begin to see a divergence of the ways in which modern academia addresses cartography. For Derek Gregory, “advances in GIS” have meant that certain schools of research “assume that it is technically possible to hold up a mirror to the world and have direct and unproblematic access to ‘reality’” (Gregory, 1994: 68). Crampton (2003) highlights a second group of scholars for whom there are issues with theoretical engagement in mapping and cartography, but who view these issues as “addressed” (2004: 30). Aligning with this school of thought – a “theory embracer” (ibid.) – presents problems with the contemporarily changing ways in which maps are produced and used. This has perhaps never been more so than since the advent of GIS, and then distributed mapping following the sprawl of the internet. Crampton defines a third group of scholars, with which both he and I identify, who are actively engaged in re-theorising mapping and revising theory in order to interact with contemporary events and trends.

Indeed it is through a group aligning with this, last philosophy that such a vibrant discourse has been developed – specifically within the discipline of geography – surrounding the theory of cartography. My analysis of the underlying development and theories of cartography builds on a group of scholars; Monmonier, Pickles, Kitchin, Harley, Edney, Crampton, Turnbull and

others - who have been integral to the rethinking of cartography not only by writing and theorising, but through engagement as a collective and discerning discursive group over the past thirty years.

2. 2. 3. A fundamental spatiality?

So where do we start in a relevant history of cartographic theory? It would be easy to suggest, as many have (e.g. Crampton 2007; 2009b; Pickles, 2006), that a turning point with which to begin would be the introduction of Foucauldian critique to geography and cartographic thought in the 1980s, building on the heights of critical geography (see Harvey, 2006) and suggesting cartography as a governmental technology. Certainly, whilst this historical juncture kick-started a discursive trend within cartographic theory, it does not lead us to a conclusion as to why spatiality and the inherent power of conceptualizing territoriality is so important not only to geography but to society.

For some scholars (e.g. Olsson, 2007), maps and mapping are at the heart of what it means to be human. That is, “spatiality is fundamental to our consciousness and our understanding of experience” (Pagiet & Inhelder, 1967: 6). For others, this “cartographic rationality” (Turnbull, 2008: 217) is only present in “civilized people” (e.g. Ong, 1982). This dated view naturally comes under critical review in later scholarship, and certainly misaligns with the contention that there are multiple ways of knowing, and producing knowledge. Importantly, however, there is a critique of those such as Olsson (2007) by Turnbull (2008) in the accusation that Olsson’s view of the way we make sense of the world being overly linguistic. Unsurprisingly given the tendency for contemporary critical geographers to follow Foucault, this is a similar critique laid by Foucault against Chomsky (Wilkin, 1999) in their disagreement over the presence of a human nature.

However, as Shapiro (2007) notes, geographic spatiality has not always been the focal point of governmentality. Indeed it is only since the treaty of Westphalia that a spatially orientated world has developed over the vertically orientated theological world. Whilst previously hegemony kept order through the government of “divine spaces” in conjunction with “secular spaces”,

following the enlightenment and Westphalia there was a trend towards government over geographical space, and the emergence of territoriality. At this juncture, we see the supplanting of spiritual leaders by geopolitical leaders, and the introduction of borders as legible spatialities. So in this period we see a first 'spatial turn'; that is, the re-organisation of power and discipline by spatial grounds. As Deleuze and Guattari (1980 [2004]) note, discipline and punishment changed from being about *who* you were, to being based on *where* you were. Having understood the centrality of spatiality to a critical politics, we can begin to understand the point at which geographers in the 1980s and early 1990s began a new form of critique.

2. 2. 4. Power, knowledge, cartography

The first critical turn in modern cartographic discourse is the influence of Foucault and the de/reconstruction of mapping as a political knowledge/power technology. Harley (1989) was one of the first proponents of this new critical cartography, setting out his aim to “break the assumed link between reality and representation which has dominated cartographic thinking” (ibid.: 2). This turn in critique was a step-change, as through acknowledging maps as inherently political, it moved away from a previously teleological explanation and study of cartographic practice. That is, it is suggested (e.g. Crampton, 2003) that before this stage, cartographic theory was concerned with a progressive movement towards how “truthful” maps could be. This concept, of a way of representing reality in an increasingly truthful form, has been referred to as a “god’s eye” version of cartography (see Cosgrove, 2001; Harris & Harrower, 2006; Kitchin & Dodge, 2007; Pickles, 1995; Turnbull, 1989). So reviewing the nature of cartography as in fact inherently a “value-laden pursuit” (Pickles, 1995) not only critiques maps as political objects, but also reimagines the way in which we go about cartographic theory – beginning the trend towards maps as “objects in the world” rather than “objects distant from the world” (Crampton, 2003: 7).

For Harley (1989), in order to set out a new discourse in cartographic epistemology, it was essential to entirely rethink the way in which we imagine the discipline. Mapping would have to be entirely relocated from a scientific

epistemology, whereby the map is an “objective form of knowledge” (ibid.: 1). Following a postmodern analysis, the map would be reimagined as an “object of deconstruction”. Certainly initially, the easiest and most common way in which the link between maps and power was illustrated was through the direct connection of maps and legibility of populations as a governmental technology (see Harley 1988; 1989; 1991; Turnbull, 1989), for example the documenting of feudal citizens in order to collect taxes (Harley, 1989: 6). This was a continued critique of mapping practice, particularly after the emergence of GIS technologies. See, for example Crampton’s analysis of crime mapping (2003) or Ratcliffe’s examination of the “geocoding hit rate” (2004).

Linking with other Foucauldian analyses of recent years (e.g. Scott, 1998) this critical tradition was and is effective in highlighting the assumed links between legibility, spatiality and governmentality. Turnbull for example, suggests that as with other governmental technologies – e.g. theories – “maps... have power in virtue of introducing modes of manipulation and control that are not possible without them” (1989: 59). Nevertheless, this early critique of mapping practice and discourse has attracted some significant later critique. Kitchin & Dodge (2007) have challenged Harley with the suggestion that Harley’s critique did not appreciate and use the full and absolute entanglement of power and knowledge put forward by Foucault. They suggest that for Harley, it was what was *done* with the map (my emphasis), rather than the map and practice of mapping itself that was “bad” (Kitchin & Dodge, 2007: 332). As Pickles explains

“If the ‘power-talk’ maintains an overly narrow and instrumental conception of the relationality of spatial representations, how can we begin to think about the production of space and the social lives of maps as embedded practices of complex over-determination?” (Pickles, 2006: 348)

So beginning with Harley’s suggestion for an epistemological shift in the way we think about maps, we see the beginnings of a movement towards a discourse whereby maps are imagined not as representational objects, but as an assemblage of practices under the term “cartography”. Furthermore, imagining mapping as an assemblage of practices allows us to think about the way in which these practices are “historical products operating within a certain

horizon of possibilities” (Crampton, 2003: 51). Over a lively discourse emerging especially from the turn of the millennium, cartographic scholarship began to converge around an understanding that maps should be understood as ontogenetic, processual, relational complex events (Crampton, 2003: 2009c; Turnbull, 2007; 2008; Kitchin & Dodge, 2007).

It can be questioned whether the emergence of a discourse concerned with the ontogeneity and distributed nature of maps and mapping was a product of technical trends in the subject, following the acceleration of the internet and geomatic advances. Indeed wider technological trends have placed cartography and geography in a theoretical entanglement that was not necessarily the direction in which it was headed at the beginning of the 1990s. It could be argued that this opportunity to embrace technological change has benefited the development of the discipline, particularly in an epistemological sense (Monmonier, 2006; November *et al*, 2010). For November *et al* (2010), following the “digital revolution”, space has been entirely redefined, and requires a new way of thinking about mapping and cartography, as a result of new possibilities for efficiently exploring it.

So how to define maps and mapping in context and content of this thesis? Here analysis is drawn from the idea that maps are an assemblage of practices, which are in turn a series of events (Kitchen & Dodge, 2007). That is, maps and mapping should be viewed as processual (Crampton, 2009c). Additionally, maps are viewed as “objects in the world”, which are in a “constant state of becoming” (Crampton, 2003) – in this case synonymous with ‘contingency’ or ‘relationality’. This naturally opens up questions of how to make sense of authorship, which will be addressed. Briefly I want to examine the theory that makes up the path to these tenets.

Critiques of early Foucauldian followers in cartography – e.g. Kitchin & Dodge’s of Harley (2007; 1989 respectively) – necessarily begin the trend towards a further deconstruction of cartography. These critiques arose from a need to elucidate the further power/knowledge structures contained within mapping - beyond the macro-political governmental technologies that were highlighted in early critiques of historical cartography. In order to highlight the ways in which maps are seen as “contingent on the social, cultural and

technical relations at particular times and places” (Kitchin & Dodge, 2007: 333), there is a need to reimagine maps as an assemblage of practices, each of which is made up of an “ongoing series of events” (ibid.: 340).

Whilst this statement has been taken for granted in cartographic theory, I want to explore the way in which we can link mapping to a “series of events” through the activist philosophy of Brian Massumi (2011) following William James. James defines events as moments of change taking place, in a situation whereby “change itself is... immediately experienced” (James, 1996: 48 in Massumi, 2011: 4). Around this proposition – of the world being made up of series of events, which are immediately experienced and give rise to series of practices – Massumi builds his “activist philosophy”, or “event-based ontology”. Thinking with and referring to this “event based ontology” makes it easier to understand the relationality of maps and mapping, as well as thinking forward to more favourable ground for working with multiple ontologies.

So thinking about mapping as a series of practices, rather than representational helps us to understand it as relational, but it is also important to recognise the temporal dimension of mapping when imagined in this way. In a postmodern tradition, mapping is no longer based around a single practice of cognition, inscription or ‘use’, but instead each and all of these are bound together in a performative and participatory “object in the world” (Crampton, 2003; 2009b). Thinking through maps and mapping as other than solely representational objects opens up the opportunity for a more attentive theoretical and political understanding of their authorship and use.

2. 2. 5. Defining authorship

Even using more traditional conceptions of cartography - with a focus on the map as a material object rather than our definition as a set of practices – opinions on how to define and discuss authorship stimulate a lively debate (e.g. Craciun, 2013; McClaren, 1994; Withers & Kierghan, 2010). The evolution of this literature is worth noting in this context, as it characterises the way in which maps and mapping have been reimaged as from a military and

imperialist representative practice to a participatory, distributed and often aspiringly post-colonial pursuit.

As I have previously written¹, research into colonial era cartography largely groups indigenous authorship into different 'levels' of interaction with imperial and colonial mapmakers and navigators (following Short, 2009). In the Arctic, this is a well-documented relationship, with Inuit occupying a number of roles in the production of maps, from John Ross's enlisting of Inuit guides (Craciun, 2013) to William Parry's co-operative production of maps (Bravo, 1996: 9).

Looking ahead, grappling with conceptions of authorship is key to future projects that seek to engage in the relational form of mapmaking that I am suggesting. In moving towards a post-colonial form of cartography, there is much to be learnt from historical structures of authorship, which certainly need to be broken down if we are to succeed in ontogenetic knowledge management and communication structures. Following Johnson *et al* (2006), at the heart of this is a nuanced approach to community participation, in which there is on-going and constant engagement in aims and outcomes, ideally avoiding the positivist 'western scientific' approaches that have been historically enacted. Naturally, this relies on the provision and development of a certain critical literacy (see Freire, 1985; 1987; 2000), which must be addressed in tandem with or preceding said programs.

2. 2. 6. Performing maps: navigation and knowledge-making

A more attentive understanding of the reading and performance of a map as an integral part of its nature opens up a new way for geographers to engage with cartography. Laurier and Brown, for example argue that this way of thinking has disrupted traditional conceptions of spatial knowledges (2008). Different performances arising from the move away from traditionally 'read' maps have meant that wayfinding and navigation are no longer necessary performances. However, scholars of cartography and scientific knowledge are keen to ward away from suggesting that this disruption of traditional performance constitutes a dematerialization of mapping. Indeed November *et al* suggest "digital techniques have rematerialized the whole chain of

¹ In MPhil Essay 3

production” (2010: 584). They suggest that the materiality of the map has simply changed location in this “chain” (ibid.), involving the user at every point, rather than in a temporally located performance. That is, if in “pre-computer times” “every geographer knew” that the construction of maps was a highly relational, dependent, complex process, “in the [after-computer] era every end-user is prone to feel the presence of those networks as well” (November, Camacho-Hubner & Latour, 2010: 586).

At first glance, the suggestion that a more distributed and relational way of interacting with maps might constitute rematerialisation jars somewhat with our idea that these new modes of mapping are fundamentally changing the performance involved with relating to the map as an informational being. Where evidence can be found for this argument is through analyzing the theoretical background of the relationship between the map and the “navigator” (Oulasvirta *et al*, 2005; November *et al*, 2010). For November, Camacho-Hubner and Latour (2010), this relationship is particularly interesting – it is suggested that we often think within a complicated misinterpretation. Whilst many people would suggest that in ‘reading’ a map, the user is attempting to align specific points of reference in the ‘real’ world to that of the paper map, November *et al* propose thinking about the interaction with the map “navigationally” (ibid.: 586). That is, the nature of relationship between the “outside world” and the “geometrical world” is the “establishment of some relevance that allows a navigator to align several successive signposts along a trajectory” (ibid.). Perhaps through acknowledging indigenous modes of navigation, this is easier to understand. As Bravo (2012) highlights, even without material maps, Inuit elders with exposition to thousands of kilometres-travelled across Arctic trails can trace lines that successfully link important toponyms and places, and are successful for navigation, despite the disregard for geometrical accuracy.

Understanding this nuanced distinction about how to understand performing a map helps to explicate the “rematerialisation” of maps as digital and distributed forms. As November *et al* explain,

“both [understandings] are depending on correspondence, but one engages the mapping impulse into an impasse (...is the map similar to the territory?)

while the other allows one to move away from it and deploy the whole chain of production that has always been associated with map making” (2010: 586).

So understanding the way in which performativity, cognition and the materiality of maps and mapping are linked, and are being contemporarily retheorised, we can start to engage with the way in which navigational spatialities are produced, and how they relate to the performance of maps. In the remainder of this chapter, I want to follow our establishment of maps as performative and relational, by thinking about cognition and the way in which mapping, but also these navigational performances can be hodological through linking mapping to narrative (following Turnbull, 2007).

To clarify, in geography, we think about hodology being the study of paths. Turnbull notes in linking together the importance of this concept, that in philosophy it is “the study of interconnected ideas”, and in neuroscience “the study of the patterns of connections in the white matter of the brain” (Turnbull, 2007: 142).

Similarly to Rundstrom (e.g. 1990) and Ingold (2000), Turnbull contends that “from a performative perspective, the making of knowledge is simultaneously the making of space, and space is made by travelling” (2007: 142). The way in which space is “produced” in contemporary geography and social theory will be further addressed in the terms of Lefebvre (1991) in chapter 4. In this case I want to focus specifically on the co-production of knowledge, and the way in which moving through space is, in itself a form of narrative (Turnbull, 2007). Further, I want to think about how we can understand making paths not only as central to human experience, but also to the way in which we think on a number of levels – not only navigationally and experientially, but in the construction of knowledge systems, technologies and practices. As Turnbull argues, “trails, along with string and stories, were among homo sapiens’ first artefacts and they may have been the foundational practices on which human cognition, knowledge and technology are based” (2007: 143 following Carruthers, 2002; Liebenberg, 2002).

So what can we gain from thinking about the production of knowledge as hodological to help make sense of mapping and performativity? For Turnbull

(2007), “paths, tracks and trails are inherently performative”. Relationships and interactions produced by trail-making are inherently marked by this process. “For this reason they are deeply intertwined with songs, stories and narratives”. (ibid.: 143). So thinking about knowledge-making and indeed many forms of cognition as hodological is specifically useful in thinking through the interaction between cartography and indigenous knowledge. An awareness of this theory of knowledge production can help to reflect the way in which ways of life, cognition and knowing are narratological, and can help us to make better forms of cartography for diverse knowledge systems.

It is worth at this point relating to theory in contemporary – largely urban – geographies, specifically theorisation about the nature of the cognition and the construction of experience as an encounter with that in the world which we “can’t yet determine” (Rajchman, 2000: 20; in Hinchcliffe, 2003: 222). Following this theory, we can utilize contemporary urban geography to give strength to a hodological approach to cognition in other situations - for example McCormack’s (2010) narrative of making sense of a tourist’s day in Montreal.

2. 3. Conclusion

This chapter initially provided an outline of the way in which cartography has become synonymous with colonial control. This was through both the making-legible of populations and territory as a tool of governmentality, and also through the construction of legitimizing narratives; the latter reflecting the more nuanced approach to definitions of Empire arising from literary theory and contemporary historiography (e.g. Pratt, 1992; Craciun, 2013). Understanding of these processes is necessary for two reasons. First, it helps to elucidate the critical history of cartographic theory. Second, it maps out the colonial landscape from which a post-colonial cartography must emerge.

Later, I outlined a theoretical and discursive history of cartography, explaining the necessary theories that have led to our contemporary understanding of maps and mapping as complex processual objects that are assemblages of practices and therefore events. It has also been noted that cartography is intimately related to a number of human cognitions, not simply about

topological orientation, but also about theories, and the co-production of knowledge. This latter discussion lays the foundation for our next chapter, where I suggest that understanding and appreciating complexity is integral to working with and making cartography across different knowledge systems and cultures through performativity.

3. Understanding complexity: working with multiple ontologies

Moving on from our previous chapter, which laid out some ways in which we can contemporarily think about maps and mapping, in this chapter I outline and explore the diverse nature of knowledge traditions, and the basis of opportunities for working with “multiple ontologies” (Turnbull, 2007; 2012) in the indigenous Arctic. Our discussion begins with an outline of how differing knowledge traditions and cultural cosmologies have attended to performing cartographic knowledge, and thus making space in the Arctic. In a large canon of literature, these diverse knowledge traditions are often bifurcated into an “indigenous” and “western scientific”. I debate the nature of this bifurcation building on complexity theory to suggest that definition through difference, and attention to binaries, is not the most useful way of attending to knowledge production when working towards some kind of commensurate knowledge management system.

In order to discuss and critique the ubiquitous ‘western scientific’ / ‘indigenous’ binaries and their origins, I want to discuss the nature of current scholarship surrounding complexity (Turnbull, 2012; Mignolo, 2000). Particularly interesting here is contemporary discussion of “complex adaptive systems” as a way of viewing emergent constructs that succeed in working with multiple ontologies. Thinking through suggestions for “complex adaptive systems” adds an interesting advance to the already substantial multi-disciplinary literature surrounding the making of commensurability through cross-cultural practice and encounter (e.g. Bravo, 1996; Gearhead *et al*, 2010). Having established an appropriate theoretical background in understanding knowledge traditions in the indigenous North American Arctic, I will examine the ways in which suggested complex adaptive systems could be applied to contemporary participatory projects, and how well-integrated existing projects are with this line of enquiry.

3. 1. Complex adaptive systems

Reading Turnbull (2012), we can see that understanding and appreciating a workable notion of the concept of “complex adaptive systems” (building on

Maturana and Varela, 1987) requires the basal acceptance of some important tenets. The first axiom that needs acknowledgement is the idea that “knowledge and space are co-produced as humans move” in diverse fashions, developing social networks and extending cognitive practices (Turnbull, 2012: 9). Working in tandem with other theories put forward in this thesis (following Lefebvre, 1991; Crampton, 2003), I show this to be a useful way of thinking about our cartographic horizons.

3. 1. 1. Performativity is key

In introducing the opportunity for working across multiple ontologies, Turnbull (2012) follows philosopher Enrique Dussel’s “transmodernity”, and Stengers’ “ecologies of practice” and “cosmopolitics” (Dussel, 1993; in Turnbull, 2012: 9; Stengers, 2011). These examples illustrate the way in which contemporary philosophies work beyond the assumption and acceptance of traditional western epistemology, and importantly are integral to a move towards the inherent appreciation for complexity in events, processes and ontology. Building on this deconstruction of the binary that separates the hegemonic “western scientific” knowledge tradition from all subjugated non-western systems, Turnbull articulates performativity as the core strand of thought for working across multiple ontologies.

For Turnbull, the *key* ontological and epistemological claims to understanding performativity are that

“There is no great divide between interior mental or cognitive states of mind, and an exterior material reality somehow mediated by or represented through symbolic systems, and hence no divide between primary and secondary qualities or between humans and things in terms of agency. Rather, ways of knowing the world are co-produced with our practices, our ways of being in, moving through and interacting with the world.” (2012: 11)

This follows from John Law’s attention to “enacting the social” (2009, in Turnbull, 2012: 11) whereby he suggests that in order to understand practices all things must be understood as constituents to performance; “realities, objects, subjects, materials and meanings” (Law, 2009), coming together as assemblages (practices).

An important aspect of performativity, especially in a (post)colonial context is connected to linguistic performance. For Austin (1962) for example, the performative, in a linguistic sense, is “a doing that constitutes a being” (quoted in Turnbull, 2012: 12). It is this linguistic and performative relationship that has perhaps formed one of the strongest academic understandings of performativity in relation to possession (see Seed, 1995). One debate that arises around the involvement of linguistic practice as performance is through disagreements over the structure and nature of language. For certain scholars, whilst linguistic practice is a powerful performative process, it is governed by a grammar and syntax that objectifies it (e.g. Mignolo, 2000). Therefore within this linguistic system, performativity is arguably not so emergent. Turnbull (2012) notes that this has been debated by Pennycook (2010) who argues that languages are enacted in a certain place and set of cultural activities, ungoverned by universal factors. This is affirmed by recent research, which suggests that there are no universals to govern word order; a “deep grammar”, or a “language processing center” (Turnbull, 2012: 13).

This second argument is important and useful in the attention to post-colonial mapping. It goes against the notion that colonial knowledge and “languaging” (Mignolo, 2000) are necessary in the linguistic performance of possessions. Rather, deep knowledge and situation in a cultural system is important, opening the opportunity for subaltern performances of possession, which could even be seen as countering a colonial “languaged” performance.

In establishing a basis for proposing complex adaptive systems, Turnbull’s final explanation of performativity is concerned with the way in which multiple disciplines – psychology, history and anthropology – try to make sense of “perception, cognition and language”, without suggesting that there is a kind of “pre-wired capacity” of “pre-existent structure” to human or social nature (Turnbull, 2012: 14; 2007). Different disciplines present a similarly engaged solution to this problem, in the suggestion that cognition and interaction *arises* from the presence of a material world, and the nature of intelligence as an “enactive relation between and among people and things” (Malafouris and Renfrew, 2010: 4; in Turnbull, 2012: 14). This is reflected in anthropology by Tim Ingold’s proposition of the “dwelling perspective” (2000; 2015).

Whilst in the hegemonic “western scientific” knowledge tradition this has come to mean that performance and embodiment has “privileged the visual” (Turnbull, 2012: 15), this is not the same across other cultures. For the Ongee people of the Andaman Islands, it is smell that is the privileged sense (Classen, 1993); for the Kaluli of New Guinea, it is sound and hearing (Feld, 1996; in Turnbull, 2012). So already we can see that through deconstructing the western narrative about what it means to be performative, and understand that different cultural cosmologies are not bound within the same visually and linguistically dominated discursive systems as western science, options for collaborative and emergent performativities can begin to arise. As I established in the introduction, performativity is key to a cross-cultural knowledge system. As Turnbull articulates

“...there is no great divide between science, technology and the arts, between intellectual, artistic and practical knowledge and expression, between mind and body, organism and the environment. But most profoundly there is no great divide between Western science and indigenous knowledge traditions once you acknowledge that all knowledges are local, produced by particular people in particular places using particular skills, and that knowledges are performative.” (2012: 17)

Arguing for complex adaptive systems as functional ways of working follows the view that life is a sort of biological and cognitive assemblage. Having discussed the multi-disciplinary agreement of what it is to be cognitive, it is then necessary to use this understanding to make sense of the way in which beings move through life as performance, giving rise to an assemblage that is epistemically - in the Foucauldian sense - situated. That is, an assemblage relational to the societal and cultural conditions under which it develops.

3.1.2. Characterising complex adaptive systems and storied space

In forming a definition, or at least a working concept for complex adaptive systems, I follow a number of components laid out by David Turnbull (2007; 2012). The overarching capacity for these systems, he argues, is for “Assemblage, Connection and Movement with their own performative

dynamic, but without any directionality” (ibid: 20). Deriving from the terminology – or indeed vice-versa - these systems must be *complex*, *adaptive*, and *systematic*.

In terms of complexity, there must be *multiplicity*. That is, “variability and diversity”... “allowing for massive redundancy, plasticity and alternative possible paths”. There is also a complexity in spatiality – where “locality matters”, and “scale independent levels and autonomous modules whose spatial relations and interactions co-produce further niches and spaces” (ibid.).

They are *adaptive* in terms of their *processuality* – with structures and things being constantly in a state of becoming; reinforced and abandoned – “natural experiments in action” (ibid.). There is also *temporality* – situated in time, “profoundly inflected by the irreversibility of time and the contingency of events” (ibid.).

In terms of *systematicity*, there is “no prewritten plan”. The structural organisation of the system is “heterarchical” and emergent, by necessity giving agency to a number of parts, all doing work. The system is also stigmergic, the distributed parts producing and reproducing indirectly through the existence of traces and trails. Perhaps most importantly, the system is “performative and constructivist, in a continuous state of becoming” (ibid.).

So having established some philosophical parameters for complex adaptive systems, primarily arising from the work of Turnbull (2012), it remains to articulate what such a system might look like, and see some examples. Here, I want to look at two pieces. First, as outlined by Turnbull (2012), a project on which he collaborated with the Museum of Archaeology and Anthropology in Cambridge, and then also turning to Baskin’s (2008) work on the relationship between complex adaptive systems and storied space, to look at how we might map out this form of complexity theory to the specific codes of knowledge enacted in the indigenous North American Arctic. This is important because I believe that through understanding the relationship between storied spaces and complex adaptive systems, we can begin to see links to the way in which we think about Inuit geographical knowledge-making as

narratological and hodological, in order to further examine examples of contemporary cartographic projects.

Turnbull (2012) refers to a project run by Cambridge University Museum of Archaeology and Anthropology; “Emergent Databases, Emergent Diversity” (E²D²) as a way of illustrating the opportunity for working across knowledge traditions in performative, heterarchically distributed ways. Museums aware of post-colonial critique have struggled with the real question of how to handle their collections of anthropological artefacts from around the world. As Turnbull highlights, there are often debates around what the role of museums is; archival, conservationist, or participatory in an actively counter-hegemonic project. The E²D² project arises from a belief that museums can serve all of these means through “virtual repatriation”, which is relatable to participatory counter-mapping. In this process, the idea of a museum as an archive of things is abandoned, and is reimagined as a “theatre of knowledges”, where there is not a unifying single ontology. Instead agency over how objects are related to, through practices, stories, narratives and images is returned to indigenous experts. Indigenous communities can “ascribe descriptions and interpretations according to their own understandings and ontologies as well as contribute whatever stories or materials they like” (Turnbull, 2012: 26). Ultimately, it is argued that this setup advantages the possibility for emergent knowledges and understandings.

Having established what we mean by complex adaptive systems, and a way that this might work for participant-based community knowledge management, it is important to understand the way in which the philosophy of complexity attends to narratological understandings of the world. Baskin (2008) has written extensively on this topic, and I briefly explain some definitions before relating this to the Arctic and the work of Claudio Aporta (2004; 2005; 2009). For Baskin (2008), and indeed many scholars of complexity theory (e.g. Gell-Mann, 1994), one of the primary philosophical enquiries is the need to understand how, why and in what ways humans – and societies – make sense and order out of a world which is necessarily complex and chaotic. For Baskin, as a proponent of “internal storytelling’ (2008: 2), and on a larger scale “storied spaces” (2008: 3), the primary way in which this is done is

through the derivation and approximation of these myriad complexities into ordered stories and narratives.

Indeed for philosophers such as Baskin, when applying an anthropological lens to their questioning of the world, it is the characteristic of storytelling that has come to *define* humanity. So what do we mean by these “stories” which define our cognitive relation with the world. For Baskin (2008), as we move through the everyday, we create a story from the events and processes around us; “the teller chooses and orders events for inclusion or exclusion, putting them in sequence, and indicating cause-and-effect relationships.” (2008: 3). This articulation of the philosophy of storied space is fascinating when we think about contemporary cartographic theory. During the burst of activity in cartographic theory in the 1980s/90s, there was a growing attention towards the “silences” and “secrecies” of the map (Harley, 1988). The way in which cartographers started to think about the map as a processual story in which absences were as politically important as presences is relatable to a philosophy in which humans make sense of space by constructing stories, necessarily excluding certain information.

Baskin argues that the act of storytelling happens for humans on a number of levels, each requiring a different kind of behaviour and creating different sorts of narratives. Throughout all of these, however, is the idea that through storytelling, we reinforce certain ideas through their advantaging, and the exclusion of others – forming a narrative – that ultimately works for the fulfilment of “truth”. Baskin calls this “the whole story” (2008: 4). Amongst differing epistemes, this “truth”, on a societal level, has held different epistemological positions. Figure 1. shows the different levels, suggested by Baskin, on which humans operate a storied experience of the world. Thinking both about maps as a reflection of these stories, and also the construction of indigenous cosmologies as a narratological act happens on a number of these levels.

Fig. 1. Storied Spaces Categories (adapted from Baskin, 2008: 4)

In order to articulate what is meant by this narratological explanation of human cognition, we can think about the nature of the “truth” of the sun. Baskin suggests that

“...at various times people have known that Apollo drives his chariot across the sky, that the sun rotates around the Earth, or that the Earth rotates around the Sun. What determines their knowledge about this fact is whether they accepted the stories of Greek mythology, the Bible, or the Big Bang, respectively. For the most part, what anyone “knows” about any information appears to depend largely on the narrative, socially negotiated stories through which he or she processes that information. – (Baskin, 2008: 4)

So understanding the idea of storied spaces is important to our thinking about working with multiple ontologies, as it helps us to understand how information is processed in order for humans to relate to the world around them, and construct particular cosmologies. Baskin further argues that it is important in using Gell-Mann’s theory of how complex adaptive systems learn and know about their environments (1994). This is through condensing experience into “schemas”, responding to “new information by predicting from those schemas, observ[ing] the results, and either select[ing] effective schemas or generat[ing] new ones [learning][sic]” (Baskin, 2008: 5).

The final concept I want to introduce is that of an “antenarrative” – which, rather than thinking solely in terms of hegemonic and counter-narratives, as has largely been the case in postcolonial thought, gives us the opportunity to

think about narratives as more dynamic, ongoing stories. Drawing on Boje (2001), we use 'ante' in its Latin sense, to mean 'before'. For Boje, in storied space, antenarratives provide the small feedbacks to the construction of a narrative that are reflexive of ongoing and immediate events and happenings. It is through the interaction of narrative and antenarrative in storied space that characterize the evolution of a narrative. Baskin's example of this interplay is in a corporate system, whereby the narrative is the strategic direction that the board is taking. The innovators in the company provide antenarratives that can alter this path. It is reflective of the nature of whatever system is in question to what extent these antenarrative feedbacks are positive or negative, and how they shape the overarching narrative.

We can associate the idea of an antenarrative to recent research by Brian Holmes (2009) and his attention to the importance of second-order cybernetics (following von Foerster, 2003). In this explanation of systems theory, "second-order cybernetics tries to map out how a system unbalances itself, alters its parameters and rules and then goes through phase-changes provoked by the excess of positive feedback" (Holmes, 2009: 211). So we can relate this attention to second-order cybernetics to antenarrative, with antenarratives forming the necessary changes needed to effect alternative outputs to the system. Antenarratives are an important concept in relation to storied space as attending to them limits the possibilities for the blind acceptance of a simple primary narrative that fails to recognize possibilities for different, and following von Foerster (2003), the extent to which the narrative can be self-reinforcing. In our following discussion of how to associate storied space and Inuit travelling, it is important to remember the significance of antenarrative in influencing a constantly changing and immediately experienced way of making space.

Finally I want to relate the idea of a storied space to Aporta's work on Inuit relationships between making trails, travelling, storytelling, narrative, and making space. As I have touched upon elsewhere, Aporta's research over the past two decades has been seminal in the explanation of how Inuit move through the North American Arctic landscape, and the ways in which cognition, knowledge and tradition are linked to an occupancy performed

through movement and travelling (Aporta 2003; 2004; 2005; 2009; Aporta & Bravo, forthcoming). Before the introduction of permanent Inuit settlements in the 1950s and 1960s, the Inuit way of life was arguably defined by movement and travelling along a set of ephemeral but repeated trails which crisscrossed the Arctic (Aporta, 2009). This was for hunting, communication and trade, and was part of the seasonal social variations of the Inuit. Whilst other sections of this thesis address the relationship between narrative, movement, occupancy and autonomy, here I want to think about the way in which this movement was a narratological form of environmental cognition, which is relatable to Baskin's (2008) discussion of storied space.

As Aporta explains, journeys for the Inuit are "both literally and figuratively" imagined through the retelling of trips. "The narrative of a journey is not a mere literal description of the trail, but involves the story of the trip (and sometimes of different trips along the same route). Such narratives will include precise descriptions of the landscape and icescape, along with the memory of personal anecdotes" (Aporta, 2009: 134). This is then made real in subsequent trips through a phenomenological cognition arising from the use of horizon as a point of orientation – through the topography and toponyms that pass over it (following Aporta & Bravo, forthcoming). As will be discussed further, place names are also part of a narratological sense-making of the landscape and journey. Aporta notes, for example that "densely named" areas are evidential of extensive use and travel, as space is produced through stories and events (Aporta, 2009; following Collignon, 1996).

3. 2. Addressing contemporary knowledge management practice: breaking down ontological binaries

So far in this chapter I have argued for the viewing of differing cultural cosmologies as necessarily complex, relational and situated, but that through contemporary complexity theory; an understanding of complex adaptive systems, and space as produced and narratological, it is possible to outline participatory (geographical) knowledge management systems that make commensurability through working across multiple ontologies. However in doing so, it is also necessary to understand and illustrate the way in which

knowledge systems have come to be defined as binary in terms of a 'western scientific' and a form of 'subsumed indigenous' ontology.

As well as outlining some of the characterisations of indigenous and 'scientific knowledge' that are put forward by 1990s and early 2000s anthropological texts (see Ellen & Harris, 2000), I argue that the bifurcation of these two all-consuming knowledge systems is not so much active from the discipline of anthropology or geography, but rather is an epistemic outcome of the need to relate knowledge systems across cultures within anthropology and SSK – for example works such as Nicholas Thomas's (1991) *Entangled Objects*, which follows a disciplinary tendency to subsume different cultures in the pursuit of a thematic conclusion.

3. 2. 1. Understanding a supposed 'western scientific' / 'indigenous' binary

Attempts to label a form of knowledge that runs counter to the hegemonic 'western scientific' way of knowing and thinking have taken a number of forms (see Ellen & Harris, 2000; Pulsifer *et al*, 2011; Usher, 2000). Scholars such as Ellen & Harris (2000) have attempted to outline a set of characteristics for the production and transmission of indigenous knowledge, whilst further writing has made definitions on different grounds, for example arguing for the use of "traditional knowledge" as a term, and "Traditional Ecological Knowledge", as ways of stressing the specific ways in which co-production of knowledge in these differing ontologies and cosmologies is different to the historically hegemonic 'western scientific' tradition.

For Ellen & Harris, it is necessary to some extent to codify the nature of indigenous knowledge, or at least to outline some "commonly asserted characteristics" of this type of knowledges system. These commonly asserted characteristics can be seen in fig. 2²

² Please note, this adaptation has been used in MPhil Essay 1. However in arguing the case for understanding a disciplinary codified IK, it is necessary to review it.

attempt to essentialize, isolate, archive and transfer such knowledge can only seem contradictory. If western science is to be condemned for being non-responsive to local demands, and divorced from people's lives, then centralized storage and management of indigenous knowledge lays itself open to the same criticism.” – (Agrawal, 1995:5)

Such scathing attacks on the attempts to “characterize” and archive indigenous knowledge have found ardent support, especially before the past decade. I would argue, however, that the problem for many scholars lay not in the act of codifying and archiving, but more the way in which this was necessarily done across different cultural systems, homogenizing complexity under “indigenous knowledge”. Ellen & Harris for example – who actively engage in the practical need for an indigenous knowledge management system argue that “codifying and documenting indigenous knowledge systems could be a worthwhile endeavor if it were not for the tendency to present such systems as models or blueprints for general use, and under the broad heading ‘indigenous knowledge’” (2000: 18).

In looking forward for ways in which we can think about complexity theory in conjunction with indigenous knowledge systems, hopefully this divergence of opinion can be reduced. Building on earlier discussion of the ways in which knowledge management systems have showed promise towards becoming emergent and processual, through thinking about complex adaptive systems and storied space, perhaps we can move past necessitated definitions about what it means for knowledge to be indigenous. Instead, we should look to a system whereby knowledge systems do not run “counter” and hegemonic, but rather each project builds a new, emergent way of knowing.

3. 2. 2. ELOKA and Igliniit Projects

Having outlined some contemporary theories regarding possibilities for working with multiple ontologies, I want to examine two contemporary projects from the North American Arctic, and think about the ways in which they reflect this theory, and also where our theory can contribute to a critical assessment. Both of these projects, the Igliniit project and the ELOKA project, were initiated as a result of and with funding from the International Polar Year 2007-

2008. *Igliniit* focuses on the collection, mapping and use of cultural and environmental geo-located data (Gearhead *et al*, 2010), whilst ELOKA (Exchange for Local Observations and Knowledge of the Arctic) is concerned with both data collection but more importantly the organisation and databasing of this local and traditional knowledge (LTK) (Pulsifer *et al*, 2012).

The *Igliniit* project took place in Clyde River, Nunavut, from 2006-2010. Its focus was on the collection of environmental data, and specifically in finding new ways to integrate the indigenous and local knowledge of hunters in the collection and mapping of information about the environment that “could not otherwise be collected” (Gearhead *et al*, 2010: 181). The project was conceived by Shari Gearhead, a Clyde River resident, in conjunction with the Geomatics Engineering Department at the University of Calgary (*ibid.*). Methodologically, the project focussed on iterative engineering, with conscious attempts made to promote participatory development in the choice and development of research questions, hardware and software. I want to focus on two ways in which this project interplays with examined theories. First, through the focus on *practice* as the primary route to commensurable knowledge making, and second on the nature of what knowledge was documented and how this was done.

The *Igliniit* project seems successful in appreciating a certain level of complexity of knowledge-making through its focus on participatory practice. Rather than more historical examples, which elicited the use of interviews (e.g. Aporta, 2004), *Igliniit* focussed on integrating research methods into everyday hunting practice, with specifically tailored equipment allowing hunters to “spend time on the land... sharing knowledge with each other, youth and others, as they practiced travel, hunting and other skills” (Gearhead *et al*, 2010: 182). This approach is certainly promising. As formerly stressed, following Turnbull (2007; 2012) and Mignolo (2000), performativity is key to building complex systems that have the opportunity to create a shared “third space” (Turnbull, 2007; 2012). These sorts of project, in which practices are at the centre of engineering commensurability, are certainly a start in this respect.

In terms of what knowledge was documented and produced by the Igliniit project, we see a slightly more conflicting theoretical relationship with the conduct of the project. As explained, in attempting to construct attentive projects it is fundamentally necessary to engage in an ongoing and processual relationship between indigenous knowledge-makers and holders, and the distribution and documenting of this knowledge. In the “logging” of observations in the Igliniit project, this relationship it seems became slightly static. Additionally, necessary concessions made about what types of toponyms and observations were recorded - initially limited to 20 – due to programming limitations, inevitably meant that complex indigenous knowledges were being made to fit and be prioritised into certain boxes. See fig. 3. for an example of these symbols within the interface.

Figure 3. Screenshots of the Igliniit user interface. Source: Gearhead *et al*, 2010: 187

Without intending to over-critique, I would argue that shortcomings such as these detract from the emergent nature of the project, despite its highly practice-based and participatory construction. As Nadasdy argues, ‘participation’ is shaped by sets of underlying political and economic relations (2005: 218). In this case, those are relations that limit the funding and development of the interface. Strength can be found, however in the way that the project coordinators treat this co-produced knowledge. As David Iqaqriulu – one of the Inuit participants – explains,

We already know about the animals. We know where they are and when they will be in certain areas. We also know about climate change and where certain places are changing, and what is changing. This [tool] it helps us. It can be combined with our knowledge to document it and share it with others – (Gearhead *et al*, 2010: 201)

So as the authors acknowledge, Igliniit will not and cannot *replace* or truly document Inuit knowledge, but can be used in conjunction with Inuit to help them to log observations in a time and place for further interpretation and communication.

The ELOKA project arose out of the need for the facilitation of effective data management for local and traditional knowledges (LTK) collected in Arctic communities. As Pulsifer *et al* (2012) note, the nature of establishing a system of knowledge exchange and documentation was accelerated by the presence of the International Polar Year 2007-2008, where “for many Arctic social scientists... formalized and policy driven data management posed a new challenge”. Perhaps in a more nuanced fashion than with the Igliniit project, ELOKA’s proponents embrace the nature of processual knowledge management systems, admitting that “ELOKA will always be a work in progress” (Pulsifer *et al*, 2012: 276). This kind of ongoing engagement from “LTK holders and researchers” (*ibid.*) is reflective of the kind of adaptive systems that Turnbull (2012) suggests.

Similarly to the Igliniit project, authors of ELOKA admit the difficulties in presenting a database of indigenous knowledge.

Simply attempting to capture local observations and knowledge in a tabular database will likely fail to adequately represent the knowledge upon which the data are based: the complex relationships and nuances typical of the knowledge can be very difficult if not impossible to codify or quantify – (Pulsifer *et al*, 2012)

It also risks removing contextual information about data creation and use. Coordinators were aware at the time of construction that the database construction would involve “abstraction, selection and partial representation” (Pulsifer *et al*, 2012: 278), but are at least following Pulsifer’s (2011) recommendations for an “indigenist research paradigm”, with knowledge documentation methods that “aim to mitigate the risk of destructive reduction of Inuit knowledge” (Pulsifer *et al*, 2011: 115). Here it is worth noting the speed at which the nature of the internet is changing research project methodologies. Disruptive methods of storage and sharing mean that gathered knowledge is no longer so located, in its abstracted state. Physical location of databases is no longer such a focus as distributed access and ownership becomes more commonplace. ELOKA was well positioned at the beginning of this trend with its exchange system, and now hopefully contemporary trends remove further concerns about the abstraction of data.

3. 3. Conclusion

This chapter has suggested that thinking about complexity is at the heart of the possibilities for working across multiple ontologies and practicing commensurability. I discussed how we contemporarily understand complexity, and how a nuanced understanding of knowledge systems as epistemically and locally situated informs the view that none is privileged above another, and that performativity is the central way of producing knowledge. Discussion continued through analysing cognition across multiple ontologies, and concluded in arguing for an explanation of cognition as narratological (following Baskin, 2008).

Second, I examined the 'western scientific' and 'indigenous' knowledge-system binary that has arisen in multi-disciplinary research, and suggest that it has been a useful way of thinking about anthropological research, but has arguably arisen from its epistemic surroundings in the discipline. Whilst certain projects examined have been successful in acknowledging a level of complexity theory in focussing on practice-based research and performance, there is an opportunity for the work with complex adaptive systems that has been produced in museums (see Boast *et al*, 2007; Turnbull 2012) to inform field research.

4. Geomatics and the mapping of knowledge

In this section, I want to think about the ways in which contemporary mapping projects in the Arctic are necessarily reflective of a wider debate about the relationship between spatially organised data, and the collection, mapping, and production of diverse knowledges. Initially, this will necessitate a discussion of how a new, “distributed” cartography (Crampton, 2003: 27) has emerged, which forms new positions in the process of mapping for both users and makers – but also how these discrete definitions of authorship and readership are being eroded. Later, I situate the discussion of geomatics and cybercartography within the specific confines of a contemporary geographical discipline. Here I give reference to debates around what it means contemporarily to be empiricist, and how this is referenced within a possibly post-structural episteme (Crampton, 2009a; Leszczynski, 2009) – an issue that has affected wider social science as well as human geography.

4. 1. Distributed mapping, cartographers, users

The first axiom of this argument follows the “spatial turn” in geographic enquiry (see Massey, 2005). Conceptualising space and spaces not only as static, territorial mediums, but also as a constantly moving, produced web of things is integral to the further argument. Following Lefebvre (1991), geographers have been encouraged to think about space as the product of relationships between things and people – human and non-human. Here I want to use Crampton’s re-reading of Lefebvre (2003) to encourage us to think about how *cyberspace* is produced; integral to the mapping of a region and environment – the Arctic - in which traditional knowledges are increasingly intertwined with a digital ontology that is shaped by spatial productions.

The first task is to examine the phraseology of certain aspects of this argument. We can start with analysing the use of the term “distributed mapping”. For Crampton the term captures the nature of a highly dispersed, multi-user contemporary cartographic landscape (2003: 27). In the same way that Taylor (2005) makes a distinction between the nature of *cybercartography* and GIS – in that cybercartography is more immersive and

relational, rather than informational – Crampton also sets apart the concept of distributed mapping from the concept of GIS. Crampton’s separation arises from a focus on interactivity and relationality. This focus moves towards a scenario where the distinction between cartographers and users is eroded to extinction.

Crampton (ibid: 28) lists some critical concepts for distributed mapping which are important to note.

1. Access to spatial data processing and visualisation tools to a dispersed audience;
2. Interactivity with map or a spatial database;
3. Spatial problem-solving or visualisation need.

Whilst here Crampton makes some important distinctions, I would argue that there is certainly room for improving research questions, particularly in light of developments since the writing of his book. Particularly his use of the term “audience” is interesting. The term seems to contradict, to an extent, the immersive nature that is being worked towards through the very idea of distributed mapping. Furthermore, Crampton draws on an analysis of the internet under the schema below (ibid: 29).



Unsurprisingly, writing eleven years ago, the extent to which cyber-connectivity has intensified to such an extent was not predictable, and thus the separations made in this schema are being eroded. I would suggest that it is now time to rethink these distinctions, and also the nature of users as an “audience”. The re-imagination of audience can be even further removed from historical conceptions with the rise of more social and shared networks of distribution. These trends create a situation whereby “diversity persists through many voices but little dialogue; ownership is only available on the level of the individual and access on the level of the virtual society generally.” (Boast *et al*, 2007: 400). Thus increasingly diverse author-roles are finding increasingly less active control over how their audiences are constructed.

Contemporary cultures of online sharing are engendering a more distributed agency, in terms of author and audience.

Having understood the reasoning behind our reference to 'distributed mapping', we can look to how this fits into the idea of the 'production of cyberspace', and what it means to think in this way with specific reference to the lived Arctic environment. Whilst Lefebvre gives an account of the relationships between capital, things, and people, the concept of the virtual is necessarily absent. Crampton (2003) amongst others (Virilio, 1997) notes the need to update this conceptuality of produced space to include the layer of virtual interconnections that now interact with and shape quotidian life.

Where we can add something in this case is in the proposal of understanding the production of cyberspace through a Foucauldian lens. In this respect, the role of the *subject* in society becomes key (following Foucault, 1975, 1976, 1982). Following Foucault's argument for an *archaeological* understanding of scientific knowledge, we need to think about how there are not truths, or orders of truths, "except on the basis of political conditions that are the very ground on which the subject, the domains of knowledge, and relations with truth are formed" (Foucault, 1973 [2000]: 15). To bring this philosophy to my work, we can suggest that all productions of knowledge are a reflection – to some extent – of the societal episteme in which they are produced. Through this examination of the way in which the subject interacts with the web of society, we can relate this to subjectification – in a Foucauldian sense - and cyberspace.

Through Elden's (2001) reading of Foucauldian 'technologies', as any actor that has the ability to produce something that was not previously present, we can start to think about selves as technologies. That is, whilst the subject is produced *by* cyberspace, it is also implicitly involved in the reproduction of cyberspace itself. Here it is also useful to think about Haraway's concept of the body as a cyborg (1985). That is, the body and self acts and reacts in a way not necessarily discernible from machine or non-human in producing and reproducing its subjectivity. Therefore in linking this discussion back to forming a terminology for contemporary mapping, what is important is that through thinking about mapping as distributed, and the spatialities of virtual

and interactive maps as produced, we are able to move further towards an ontology in which users, the map and both space and cyberspace are formed in relation to one another.

So whilst I follow Crampton's (2003) analysis of the production of cyberspace as entirely relational and inextricable from the productive flows of everyday life, there remains something to be said for what this looks like in terms of an indigenous arctic environment. That is, an environment where traditional perceptions of capital and relational flows are certainly different to the urban world from which Crampton and Virilio (1997) build their arguments. Indeed, this way of thinking requires an attention to the unique ways in which space is produced in the indigenous Arctic environment, before relating this to what we can say about an interaction with or situation within a digital ontology.

4. 2. Producing space in the Arctic

Conceptions of space, permanency and occupancy in the indigenous Arctic are extremely different to the mainly urban, western environments that have formed the field for the analysis of knowledge and spatial production in the 20th century (e.g. Foucault, 1975; Lefebvre, 1991). Translating these theories to such a different landscape provides fertile material for analysis. Indigenous life in the Arctic is often inherently seasonal (e.g. Mauss, 1976 [1905]), with spatial productions being ephemeral in different time-spans to the urban world (see Aporta, 2005; 2009).

Integral to this understanding is the work of Claudio Aporta (2005; 2009), who talks about the "trail as home" (2009: 131). That is, the trail is so entangled with ways of living and making knowledge in Inuit culture that it becomes homeland. Aporta emphasises that the Canadian Arctic *is* a network of trails (ibid: 132). Trails are imbued and entangled with the relationships, memories and collective memories of trips, journeys and communities, which build a narrative of life in the Arctic. This way of remembering is enabled and accentuated through an oral culture of Inuktitut place and trail names that are symbolic of environmental information and narratives of the journey. For Aporta, this definitive analysis is important as

1. *it rejects the idea of the Arctic as a barren place, or an empty land inhabited by geographically remote and isolated communities (still present in the popular imagination);*
2. *it implies that Inuit have made systematic use of the Arctic environment as a whole;*
3. *it suggests that trails are, and have been, significant channels of communication and exchange across the Arctic;*
4. *it presumes that some types of oral history and knowledge can be accurately transmitted through generations, and*
5. *it proposes that an important part of Inuit cultural identities is better understood in terms of moving as a way of living.*

(Aporta, 2009: 132)

There is something to be said here about how we think about spatial production as defined by movement. In the same way that Lefebvre and Crampton (1991; 2003) think about space as produced by the flows of people and capital, Aporta's description of a gradual imprint of movement on cultural memory is also a production of space. As he explains, at the beginning of each season, trails are embarked on and marked by experienced hunters – making physical demarcations in the snow. Routes are thus the established ways through and towards locations. Journeys are the whole experience of travelling along a trail or route, and all its constituents (Aporta, 2009). Journeys are not only the physical travelling along a trail. They are also the telling and retelling of that trip and previous trips on the trail, which knit together over time to be realised as a narrative.

A useful example of the way in which the spatial indigenous landscape has unique modes of production is through the way in which distances on the trail are often measured in terms of "sleeps" (Aporta, 2009: 134) – at least before the introduction of a sedentary lifestyle in the 1950s and 1960s (ibid.). Anecdotally, this meant that travellers were very rarely thought of as "delayed" as the journey most definitely took precedence over the importance of route. Here we can also think about the way in which news travelled and travels between communities in the Canadian Arctic. As Aporta recounts, "news about other travellers encountered on the way would also be passed on, and the trail becomes a channel where information flows back and forth as the people travelling it build and feel a sense of community." (2009: 141).

So having established some positions regarding recent theory around the production of space, the production of cyberspace, and how this fits into a historical and contemporary indigenous Arctic, I would like to turn attention to the relationship between these concepts and the idea of occupancy and political agency. In this situation, I want to examine the Pan-Inuit Trails Atlas as the most tangible attempt to acknowledging the relationship between trails, cybercartography, and occupancy in the Arctic. The Atlas is a digital resource that compiles hundreds of sources in order to map a pan-Arctic trail system used by the Inuit over hundreds of years. A collaborative project by the University of Cambridge, Dalhousie University and Carleton University, the Atlas is an assemblage of a vast number of encounters with Inuit over the course of centuries – by “explorers, scientists, ethnographers and other visitors seeking access to the traditional indigenous knowledge to unlock the geographical secrets of the Arctic.” (CRN³, 2014).

The relationship between cyberspatiality, trails and occupancy has begun to be articulated in reactions to the activation of the atlas. As project co-director Michael Bravo explains “This atlas is a first step in making visible some of the most important tracks and trails spanning the North American continent from one end to the other... Essentially the trails and the atlas reduce the topology of the Arctic, revealing it to be a smaller, richer, and more intimate world” (quoted in CRN, 2014). From a synoptic perspective, it seems then that this atlas is attempting to address the disconnect between two imagined cartographic spaces. First, the space constructed by an imperialist historical mapping tradition – that of 19th century explorers, recycled by modern governments to show the Arctic as purely topographical; culturally homogenous in its vacuity. Second, the true nature of a culturally complex and lived space, with networks of settlements, located memories and trails which signify the true nature of an inhabited Arctic.

Nevertheless, the initial construction of an atlas such as this neither solves the problem of a disconnect between cartographic narratives, nor serves as an effective way of portraying Inuit occupancy claims in itself. What is important is the need for this sort of project’s constant renewal, to reassure of its nature

³ Cambridge Research News

as a relational and processual project. Additionally, this form of constantly renewed authoring, I argue, should be done reflexive of the literature and practice surrounding forms of co-management in the Arctic, and the power of indigenous authorship (see Bennett & Lantz, 2013; Nadasdy, 2005).

Following Nadasdy (2005) part of this literature is the concern that development projects are often implicitly carried out within a regime of political and economic capitalism. Therefore whilst the technical “participatory” nature of projects is still apparent, often the ideology and agenda of former colonial, or macro-economic powers ‘win out’. So as projects such as the Pan-Inuit Trails Atlas continue to be made and re-made in coming decades, there is a need to ensure that co-management and a level of well-understood indigenous authorship is not only enacted on a *technical* level, but also in terms of understanding where the project is going, and how it is used. This will be expanded on in the following chapter, when addressing the political nature of ‘counter-mapping’.

4. 3. Geomatics, empiricism and post-structuralist debate

Since the emergence of geographical information systems (GIS) in the late 1980s and early 1990s, there have been a range of critical assessments of the theoretical positioning and disciplinary context of the technique (e.g. Gregory, 1994; Dixon and Jones, 1998). As will be explained, these “deconstructionist” assessments (Leszczynski, 2009; following Popke, 2003) were in the tradition of a contemporary agenda for critical geography. There has since been a counter-criticism by cartographers such as Jeremy Crampton, illustrating the lively disciplinary context of geomatics, with a focus on GIS, within contemporary geography.

4. 3. 1. Post-structuralism and GIS

As has been alluded to, scholars have noted that following the introduction of GIS, there was a discursive split between proponents and users of the technology and those involved in the pursuit of a critical geography (Leszczynski, 2009). Original critiques of the involvement of GIS in geography arose from the belief that GIS was a positivist and empiricist technology, inherently linked to the quantitative revolution in the discipline (Pickles, 1997;

Taylor and Johnson, 1995). With the advances in GIS and its increasingly widespread use, as well as the increasingly distributed nature of mapping technologies, in 2009 the disciplinary criticism of GIScience came under fire from Agnieszka Leszczynski in *Environment and Planning D*. In order to chronicle the extremely important debate ensuing with Jeremy Crampton in the same publication, there is a need to first understand her arguments.

First Leszczynski argues that the scholars critiquing the position of GIS in geography have focussed only on the positivist objectives to which GIS has contributed “deleterious effects for society” (2009: 582). For example its use in military warfare (Smith, 1992); environmental degradation (Katz, 2001); and capital / economic growth (Smith; 2005). In this tenet, scholars of GIS refute the positivist nature of GIS, and point towards their belief in ontology; and GIS as a representative tool that is impossible to use in a non-positivist manner (Pavloskaya, 2006; Sheppard, 2000). However it is the disjuncture behind this theoretical disagreement that provides the grounds for an analysis of the disagreement within geography about what it means to be ontological. Leszczynski argues that with a post-structural turn in human geography, there has been a collapsing of the ontology/epistemology boundary. That is, that the supposed break between “questions of knowledge and the nature of its contents” (Leszczynski, 2009: 583; following Agarwal, 2005; Dixon and Jones, 2004; Elwood, 2006; Popke, 2003).

For scholars such as Leszczynski, this intellectual positioning poses a problem, as it tends towards an explanation of the world in which all analysis is constructed. Whilst this opinion can work in certain medium, it poses problems in GIS and cybercartography, as it “denies a world beyond consciousness” (Leszczynski, 2009: 583). Therefore, in her critique of post-structural approaches to GIS, GIS is abstracted from its material nature. That is, its nature as a material computer tool, made up of a series of non-human, non-conscious objects; a definitive ontic dimension. There is not a suggestion that the sets of practices and discourses involved in GIScience should be ignored, but simply that there needs to be more attention to the non-conscious and material aspects of the GIS process.

These accusations by Leszczynski about the nature of post-structural critique and GIS kick-started an opposition, notably by Jeremy Crampton (2009a) and those who believed she had failed to appreciate the nuance of the critical geographers' critique. First, Crampton suggested that her accusation of a conflation of epistemology and ontology is overemphasised. He argues that following his situational philosophy, humans are "always already" in the world (ibid.: 604). Therefore we cannot be subsequent or separate to the world. Indeed a belief in this "being in" has been central to the emergence of "performative, embodied and processual geographies" since the 1990s (ibid.: 604). Likewise, Crampton disputes the thesis that critical geographers conflate the "world" and "knowledge". He argues that even if we were to accept Leszczynski's assertion that modern definitions of epistemology think only of "mere discourse", then it would be difficult to suggest that this epistemology is in any way separate to the "real world" ontic objects.

It should be noted that the debate over an ontological/epistemological collapse is not confined to geography, and has been attended to by wider social science – particularly in qualitative research (Maxwell, 2012). For example Smith and Deemer (2000) argue that "we cannot employ an ontological concept of a reality that is independent of our theories in a way that can avoid the constraints of a relativist epistemology" (Maxwell, 2012: 12). This argument has been critiqued, reflective of Leszczynski's critique, suggesting that this ontological/epistemological collapse results in the two "simply [becoming] reflections of each other" (Lincoln & Guber, 2000: 175-176).

The debate within geography is important, as it begins to point to the complexity of opinion over the way in which we treat digital objects; particularly those that are processual, and in-motion. In finding common ground between these supposedly opposing schools of critical geography and GIScience, it is agreed that examining the materiality of GIS and distributed mapping; "it's systems, its labour relations, its practices, its knowledge production" is key. Returning to Kitchin and Dodge's (2007) suggestion that we should think about making maps not as representational, but as processual things is a particularly useful way to overcome this disagreement.

Crampton suggests a different way of tackling questions about defining a spatial ontology/epistemology; “thinking cartographically” (2003). As discussed, Crampton builds on his situational philosophy, and the concern for humans “being-in” the world. This philosophy of how to address epistemological/ontological/ontic divisions can be conceptualised through the “fisherman’s problem”, taken from Gunnar Olsson (2002: 255). He suggests thinking about the way we try to gain knowledge about the nature of the world as equivalent to a fisherman casting a net in order to learn about what is in the sea. When the net is brought in, however, it tells us actually more about the nature of the *net* than the ‘truth’ as to the composition of the depths. Following Crampton, our “ontological net” (2003: 55) is flawed in that it is far too scientific. He suggests that we like to measure things in a far too objective manner, with the belief that ontology can be re-presented.

Building on Foucault, another interpretation for a future cartography is to think about a critical politics of cartography as a technology. As in my previous discussion, we can understand technology as “art, skill, or way of doing”. In following this sense of the phrase technology, we go beyond the material aspects of technological issues in GIS and mapping, and look more towards the ways in which these technological aspects are *interoperable* with ways of doing and making knowledge in a ‘critical’ fashion (following Crampton, 2003: 67).

This theoretical discussion has showed some of the more recent attempts to address the issues facing research in the making and analysis of maps, and specifically how and what it is that we think about as ontological and empirical – but also, whether this is important. In light of these critiques, and in forming a consensus, I would follow contemporary geographers (Crampton 2009c; Kitchin and Dodge, 2007) in suggesting the need to concentrate on the experiential side of mapping – that is, understanding cartography as an understanding of the lived context of the object (Crampton, 2003: 63). Relating to the previous chapter, it is worth thinking about how to understand the epistemological/ontological divide (or collapse) when thinking through complex adaptive systems. I would suggest that in support of Crampton (2009a) or Smith and Deemer (2000), in this sort of system the need to

pursue emergent realities is such that rematerialisation of the ontic is unhelpful. In concluding this chapter, we elucidate theoretical debate with some contemporary Arctic cartography, bringing together the discussed concepts to understand how we can enjoy a workable ontological/epistemological situation in a contemporary landscape.

4. 4. Conclusion: a digital ontology for the Arctic

So far in this chapter, we have established that there is not a clear binary of ontological things and epistemological constructs when it comes to cartography. Further, defining the materiality of things that make up cartography and navigation is not necessarily a useful way towards building a working system for geographical knowledge management that can be defended against being positivist or teleological. As we move towards a situation where we can think about a “digital ontology”, there must be detraction from definitions that seek to bifurcate knowledges and “technologies” as exclusive things. If projects such as the Pan-Inuit Trails Atlas are to be effective at communicating the way in which a future for the indigenous Arctic can be produced in cyberspace as well as in terms of physical occupancy, then there needs to be a more appreciative balance of the ways in which “knowledge” and material digital technologies can be part of a single system.

Differing disciplinary outlooks and definitions of a “digital ontology” or “ontology of the digital”, if not addressed, can obfuscate working towards a conclusion of how the peopled Arctic works in the digital age. For philosophers, following Konrad Zuse (1993) a digital ontology suggests that the world is, at its most elementary, made up of discrete “entities and processes” (Floridi, 2009). Floridi explains that functionally, this means that “the physical universe can be adequately modelled by discrete values like the integers; the evolution (state transitions) of the physical universe is computable as the output of a (presumably short) algorithm; and the laws governing the physical universe are entirely deterministic” (2009: 4). It is easy to see how this is an interesting intellectual position to take, given our need to form some kind of plane which can acknowledge both the material parts of a

cartographic system, and the idea of indigenous knowledge as technology to be interconnected and indeed integrated.

Whilst this forms the basis of much scholarship tackling digital ontology, for some scholars (e.g. Evens, 2012) “ontology of the digital” is not only about defining a microcosmic view of ontic things, but also the way in which this has meant society and culture becoming, by definition, digital. For Evens, this process, the digitalisation of everyday processes in society means that, like for Floridi (2009), our everyday lives are in essence reducible to a series of binary codes. He argues that this is important as it allows a level of *abstraction*. That is, a process that “divorces the products and processes of the digital from particularities of time and place and loosens the sticky grasp of the material that ties down objects and events” (Evens, 2012: 4). For our work in understanding the nature of an indigenous knowledge management system, this is particularly interesting as it is *through* the materialised location and provenance of knowledge that it gains its ‘value’, as discussed in other chapters.

In looking for ways in which Inuit geographic knowledge could be documented, Aporta (2005) makes the observation that younger Inuit travellers lack some of the orienting techniques and geographical knowledge of older generations. Interestingly, he notes that “technology” struggles to bridge the gap due to reliability, and a failure to work well across generations. Aporta’s work here is useful and interesting, and is part of a small canon of tangible fieldwork that addresses the gaps between the quantity and type of knowledge across generations. However, in terms of using Aporta’s research, it might be interesting to rethink the definitions of technology going forward, and using our earlier discussion, rethink the binary of geographic knowledge, and non-human tools which help to preserve it. Rather, following Elden’s (2001) clarification of what Foucault is talking about when he thinks about “technology”, we should be looking towards a system where the two are thought of together as a technology, which is itself a type of knowledge.

5. What kind of cartography for what kind of use?

This chapter seeks to locate the outcomes of this thesis within a literature of post-colonial political geographies. Central to this is the understanding of the primary interplay between political geography and cartography since the cultural turn (Valentine, 2001); the articulation of “counter-mapping” (after Peluso, 1995) as an integral part of subaltern resistance. Initially I want to think about what counter-mapping means and how it has been defined since the term was coined in 1995. Necessarily this will relate back to our first discussions of deconstructionist cartographers and geographers (e.g. Harley, 1989; 1991; Turnbull, 1989; Wood, 1993) but also necessitates understanding the *active making* of ‘counter-cartographies’ as well as the deconstruction of hegemonic narratives.

Therefore I examine salient features of particular counter-cartographies that have emerged in the past twenty years, noting the centrality that the Arctic region has held in this canon (e.g. Avataq Cultural Institute, 1990; Bennett & Lantz, 2013; Norman, 2014; Riewe, 1992). Having explained the ways in which I want to think about maps and mapping in previous chapters, we must then attend to how this processual, practice/event based mapping relates to literature on counter-mapping and a situation within post-colonial geographies (e.g. Johnson *et al*, 2006). In concluding this section and the thesis, there is discussion of how best to elide the theories of cartography already discussed, with practical post-colonial ‘counter’ projects. For whilst deconstructionism has accelerated critique in political cartography, following Turnbull (2015) there is a need to act against relativism – where it is a politically weak position – in a time and place where use and occupancy are at stake. Therefore I discuss the interplay between relativism, realism and politics.

5. 1. Counter-mapping and counter-narrative

Following Marxist critique and the work of Gramsci (pub. 1971), political geography and critical theory in the past thirty years have been inextricably tied to the understanding and exposing of cultural and political hegemony (Painter & Jeffrey, 2009). Whether or not this turn is linked to geography’s imperialist history, geographers and geographic techniques – i.e. mapping –

have been at the heart of attempts to “counter” these hegemonies (e.g. Orlove, 1993; Peluso, 1995). Referring back to discussion of cartographic power in chapter two, the embodiment of hegemony in this context is through the establishment and re-enforcing of narratives (Bamberg, 1997; 2004). Therefore our definitions of counter-mapping necessitate a brief understanding of narrative and counter-narrative.

For Derrida (1992), narrative is inherently tied to imaginaries. An example that Derrida explores is the narrative involved with the geographical imaginary of Europe. In *The Other Heading* (1992), he critiques the geographical imaginary of Europe that is championed by Paul Valery (Caraus, 2014; following Valery, pub. 1977), exposing the need to rethink it through differing definitions of “heading”. Derrida reads Valery’s work as privileging Europe in an imaginary as the “head” of the world, and as constituting part of a discourse of European “heading”. By this, he means that discourse is seemingly always on a teleological path in which Europe and euro-centrism is the predetermined hegemonic narrative.

Derrida argues that there is a need to instead prioritise the “other”, and take the “other heading”. That is “beyond our heading, it is necessary to recall ourselves not only to the other heading, and especially to the heading of the other, but also perhaps to the other of the heading” (Derrida, 1992: 15). In company with other dissident thinkers (e.g. Said, 1979; Gregory, 2004), we must notice Derrida’s focus on “the other” as a way of defining the hegemon. However Derrida goes beyond this definition of hegemon by opposition, and argues for orientation *around* the ‘other’ in a form of ‘alterity’. As we move to discuss ways in which mapping and narrative can be “counter”, this idea of a subaltern orientation takes on increasing importance.

So performative counter-narratives can take a number of forms. For Derrida (1992), or Said (1979), a more attentive awareness towards hegemonic forms in a theoretical sense can help us move towards counter-narrative thinking. For contemporary political geographers and cartographers, however, literary and theoretical engagement in exposing hegemonic narrative and alternative “orientations” have been only the background to a number of active forms of

'counter' engagement through the development of material projects. (e.g. Baghat & Mogul, 2008; Peluso, 1995).

In this form of 'active' 'counter' engagement, I want to briefly examine some differing examples of Northern mapping projects, and how they can be considered 'counter-mapping' whilst taking different approaches to engaging with hegemonic narratives. Following Craciun (2009), we can look at a map drawn by Hans Ragnar Mathisen, entitled "Davvia'lbmogat: Indigenous Peoples of the Arctic" (1990; fig. 4.). As highlighted by Craciun, his map is an assemblage of both structures that reinforce and oppose hegemonic narratives of both cartography and the Arctic. First, spaces that in political maps of the circumpolar Arctic would be blank, as simple national definitions take up vast areas, are filled with the names of indigenous groups. This places indigenous groups as central to a representation of the Arctic. This is a tactic that – especially at the time of its making – was notably absent from other maps. Second, it depicts an Arctic that is circumpolar in its occupancy, not only in its geographic existence. This was a fact that was only just being noted, and reflected in the construction of pan-Arctic forums (e.g. Inuit Circumpolar Council, see Wilson, 2007) as a position of political strength.

Fig. 4. "Davvia'lbmogat: Indigenous Peoples of the Arctic" (Hans Ragnar Mathisen, 1990) Source <http://www.utexas.edu/courses/sami/diehtu/giella/art/mathisen.htm> (last accessed 04/06/15)

At this point it is worth returning to Harley's reading of Foucault and Derrida (1989), and his postmodern "deconstruction" of maps and mapping. For Harley, maps are constituent of *internal* and *external* power. External power is associated with the way in which they act as what Foucault would call "juridical" objects (1980); an object that "facilitates surveillance and control" (Harley, 1989: 12). Internal power constitutes the creation of a "spatial panopticon" ... "it is a power embedded in the map text" (ibid.: 13). So in this case, perhaps we can think about Mathisen as involved with relations of what Harley calls internal power. For Harley, "to catalogue the world is to appropriate it" (Harley, 1989: 13), and in this case Mathisen is going some

way to an appropriation of territory. Nevertheless it is difficult to see Harley suggesting this sort of counter-hegemonic action; at its heart, Harley's reading of power and cartography suggests that "maps are authoritarian images" (ibid.: 14). Whilst "*sometimes* agents of change, they can equally become conservative documents" (my emphasis; Harley, 1989: 14-15).

So we can understand maps such as Mathisen's as 'counter' in that what he chooses to present in artistic form runs counter to the hegemonic narrative of contemporary maps. Importantly, however, we can situate this sort of 'counter-mapping' within two related theories. The first of these follows Paolo Freire (1968; Johnson *et al*, 2006), and his philosophy of "critical consciousness". In *Pedagogy of the Oppressed* (Freire, 1968), Freire explains that in order to resist colonial oppression, there must be an ability to conceptualise oppression, and adopt the skills necessary to resist – in Freire's teaching this primarily takes the form of literacy. In this case, however we can see that the conceptualisation of a pan-Arctic indigenous identity can be related to Freire's *critical consciousness* as a way of conceptualising oppression by a the cultural hegemony. That is, through the realisation by subaltern groups of the Arctic as a lived indigenous space, across its longitude, criticality can take a more powerful political form.

Second, I want to relate this form of counter-mapping to Marie Louise Pratt's linked concept of *autoethnography* (1991). Here, Pratt suggests that as a form of resistance, artists and authors "undertake to describe themselves in ways that engage with representations others have made of them" (Pratt, 1991: 2). We can understand this theory in relation to Mathisen, as in the making of this map he has used the projection from a polar aspect to legitimise his argument for an indigenous Arctic.

Next, I want to return to a project addressed in the previous chapter - the Pan-Inuit Trails Atlas. Understanding agency and authorship in a project of this kind is complex. More than any other project, boundaries defining authors have been eroded by the nature of data as historical, contemporary, multi-sourced and drawn from different traditions. The politics arising from products of these diverse constituent parts, and the practices involved with building the

Atlas characterise its nature as an example of what it means to go about 'counter-mapping'.

Robert Rundstrom contends that "counter-mapping still refers primarily to actions taken by indigenous peoples" (2009: 314). In problematising authorship as I have argued, specifically with regard to the Pan-Inuit Trails Atlas, Rundstrom's contention becomes more problematic. In its publication as an online digital atlas, it is suggested to be the culmination of 15 years of working with and gaining trust from Inuit communities that contributed to the detail of the map (Taylor, in Doyle, 2014). Similarly the Director of the Geomatics Centre for Research in Cybercartography (GCRC) and Atlas co-author, Fraser Taylor, claims "we're not outside researchers coming in to exploit the Inuit. We literally and metaphorically give voice to local people" (ibid.). Reflecting earlier discussion about maps countering narratives, this is another area in which the Pan-Inuit Atlas holds strength as a counter-cartography. As the co-directors affirm, the Atlas contributes to re-imagining a number of narratives about the North American Arctic; challenging the myth that it is barren and unpeopled; that it is disconnected and isolated; that it is a 'frontier'; ahistorical and post-Columbian.

Figure. 5. Screenshot of Pan-Inuit Trails Atlas, showing area around Iglulik.
Source: paninuittrails.org, last accessed Jun 2015.

The Atlas is particularly interesting politically, however, in seemingly presenting a duality of political ideals. Whilst we have explored the presence of the strong counter-narrative presence to the Atlas, we must also acknowledge the Atlas was funded by a research grant entitled "The Northwest Passage and the construction of Inuit pan-Arctic identities". So whilst pan-Arctic identity is indeed key, this is played out by seeking to confront – and thereby acknowledging – the political and economic construction of a hegemonic landscape – the Northwest Passage – that is inherently a western scientific/political endeavor, and alien to Inuit communities. This part of the Atlas's aims has been highlighted in much of the response/reaction in the wake of its publication, with many seeking to extol the importance of Inuit occupancy as evidence or proof of Canadian

sovereignty⁴ (e.g. Rogers, 2014), an argument that the authors of the Atlas explicitly avoided making.

So the Pan-Inuit Atlas does indeed present a ‘counter vision’ to the hegemonic narratives articulated above, through reimagining certain conceptions of the Arctic as frontier, unpeopled, ahistorical and post-Colombian. It also arguably serves the colonial power that is maintaining a colonial present (see Cameron, 2012) through implicitly espousing westphalian sovereignty. Exposing the value-laden natures of almost every cartographic project makes it increasingly difficult to understand maps as entirely ‘counter’ to hegemonic narrative. As cited, Nadasdy’s argument for the “antipolitics” of traditional and ecological knowledge in relation to participatory development (2005) necessitates practice taking place within the horizon of possibilities inherently made possible by a landscape of political and economic capitalism. This will be addressed, but as Rundstrom has argued (2009), counter-mapping has by and large been considered a pragmatic exercise, in which “successes and failures” (ibid: 315) have been weighed up against each other. He does highlight however the present, but relatively small engagement with the theoretical status of counter-mapping. Importantly for our work is the affirmation that:

“the binary distinction between indigenous and expert scientific–governmental concepts of resources is false. The argument is that discourses constructed this way pit local communities of producers against expert managers in ways that do not accurately represent the blurred quality of such a boundary between supposed adversaries, a highly permeable line that may be crossed repeatedly by those from either side” – (Rundstrom, 2009: 315)

So following Turnbull (2015), and correspondence with the Pan-Inuit Atlas directors, over-critique of the conflicting politics in the making of (counter) maps can detract from the useful aims of such projects. Additionally, the making of criteria by which to practice as “counter” can easily fall into the trap

⁴ This was also clear in an interview Michael Bravo gave with CBC Edmonton on June 12th 2014. The presenter was keen to enquire about the implications of the Atlas on Canadian sovereignty, despite Bravo’s apparent reluctance to suggest this was a core aim of the project. Referenced under “CBC Edmonton, 2014”

of “traditionalizing” the nature of indigenous knowledge and practice (following Cameron, 2012) – enforcing indigenous groups further into practices that are not engaged with the ‘scientific’ side to the binary. In this case, it is useful to look at some other emergent projects in which indigenous groups have (re)claimed certain practices as – in their eyes – acting with indigeneity and self-determination.

One seminal example of this is David Norman’s work (2014) exploring the analogy of “control mapping” as a way of understanding the photographic and film work by the Inuit photographers and film-makers Peter Pitseolak (1902-1973) and Zacharias Kunuk. Acknowledging Inuit agency in the process of photography rethinks the nature of a whole century of a technology that would fall on the side of the “scientific” binary, and might not otherwise be thought of as ‘counter’, or useful in taking the “other heading” (following Derrida, 1992). Norman contends that “the camera is an Inuit medium”. In this definition, he follows the work of late Greenlandic artist Pia Arke in the argument that through Inuit participation in the medium from at least the late 19th century, Inuit were not disengaged from the photographic process. Following Raheja (2007) this theory can be traced back to one of the most recognizable photographic representations of Inuit life, in *Nanook* (“of the North”) (see Flaherty, 1924). Raheja (2007) contends that there is “something beyond *Nanook*’s smile” that suggests an engagement with the photographic process rather than simply melting into the persona of a photographic material object.

Additionally, Norman highlights the example of Arke’s parents, and their photographs taken by Danish telegrapher Sven Lund Jensen in Arke’s hometown of *Ittoqqortoormiit* in 1947. Whilst one of the ethnographic portraits shows a smiling and willing subject, the juxtaposition against the unnatural and unwilling expressions in the other two photos “highlights the resistance and agency of the exoticized subjects in the face of the colonizing photographer” (Norman, 2014: 49).

Moreover, Norman goes further than acknowledgment, identifying the ways in which Inuit actors have *utilized* this technology in self-determination and counter-hegemonic discourse. That is to say “any medium Inuit employ, in any manner, becomes an Inuit medium when it becomes a vessel for Inuit

expression and experience; the medium does not come locked into its corresponding European aesthetic paradigms” (Norman, 2014: 49). This is reflected in the work of Zacharias Kunuk, the founder of Igloodik Isuma Productions, a film production company that tells indigenous stories through “improvisation, drama, storytelling, ajajas (traditional songs) and reenactments – in much the same way in which Inuit life has been represented and experienced within Inuit communities since time immemorial” (Hopkins, 2006: 342). This sort of active engagement with western technology enables action other than simply interpreting a western medium. In Kunuk’s case, film becomes the “raw material of an Inuit story” (Norman, 2014: 63).

In rethinking film and photography as active mediums of Inuit agency, Norman thinks about the making of resistive art as a way of “mapping” – specifically analogous to “control mapping” (Norman, 2014). Drawing on cartographic technical terminology, control mapping is a technique whereby photographs supplement specific locations on a map in order to validate the geographical information. Thinking conceptually, Norman uses this as an analogy for the way in which Inuit photography and film can re-locate the horizons of how we think about the indigenous landscape. Following this analogy, disseminated reproductions (the “map”) are corrected as the

“reproduction is ...inextricably centered around the subject itself, the subject’s presence. In this scenario, the human beings in Pitseolak’s photographs – including their visible relations to him as a photographer and member of their community – and the human knowledge and relations transmitted through the narrative and cinematic time of Attanarjuat serve as the “controls” (the photographs in the model of control mapping) of the reproduced material, and more broadly, photographic/cinematic representations of Inuit (the map itself)” (Norman, 2014: 69).

These examples support my earlier conclusion; that the tendencies to ascribe binaries – in this case in terms of practices, mediums and technologies – is not useful in contributing to politically strong modes of mapping and resistance. So in theme with the previous chapters of this dissertation, and the argument I have been building, I want to now think about how we reconcile

appreciation for complexity, critique of hegemony, with the need for a map-making with political purpose and strength

5. 2. Political action

As I have argued throughout this thesis, the interaction between cartographic critical theory and cartographic practice has ranged from turbulent, to almost non-existent. This can be explained by a number of factors; active academic disengagement through a belief that there is no theoretical debate (Crampton, 2003); misunderstandings or disagreements surrounding theories of how to treat knowledge and practice (see Crampton, 2009a; Leszczynski, 2009); or simply the inherent difficulty associated with practising theoretical best-practices (Pulsifer *et al*, 2011; 2012).

To conclude this chapter, I want to examine and understand the role that cartography and counter-cartography can take in political resistance, and how this role is changing within contemporary settings. A final example to examine in this area is the *Inuit Land Use and Occupancy Project* (ILUOP) conducted by the Inuit Tapirisat of Canada (1976). Part of a series of indigenous Arctic land claims programs; ILUOP was part of a series of early participatory mapping projects that laid the way for participatory cartography to become central to indigenous land claims worldwide (Freeman, 2011; Rundstrom, 2009).

As discussed in the previous section, co-operation or co-option of western or scientific mediums are central practices in counter-mapping and do not necessarily remove indigenous agency. As a project initiated by the Inuit Tapirisat, the ILUOP was based around a counter-hegemonic aim, but utilised a number of traditional data collection methods – archaeology, interviews and field observations, as well as the utilisation of rudimentary GIS – in the pursuit of “a comprehensive and verifiable study” documenting “Inuit land use and occupancy ‘since time immemorial’ over the region of northern Canada contained within the then-boundaries of the NWT and within the northeast Yukon Territory” (Freeman, 2011: 21). Importantly in the construction of this cartographic database was a fundamental philosophy that “the highest priority [was] assigned to ensuring that every Inuit resident wishing to participate in

the study was afforded the opportunity to contribute his/her own record of land use.” (Freeman, 2011: 22).

So following Rundstrom (2009), we can understand the ILUOP as one of the first active counter-mapping exercises. Furthermore, its primary interest for us here is the resultant political impact of the process. The primary purpose of the ILUOP, in which it was successful, was the provision of supporting evidence to commence negotiations on the *Inuvialuit Final Agreement* and the *Nunavut Land Claim Agreement* (Amagaolik, 2007). Observations and recommendations resultant from the ILUOP were of historic political importance. A western boundary to the Nunavut land claim recommended in the *Nunavut Atlas* (Riewe, 1992) – the resultant database of the ILUOP - was of such weight that it was formalized as the boundary of Nunavut after the creation of the territory on 1st April 1999 (Freeman, 2011). In an examination of indigenous land use projects, Tobias argues that “the ILUOP endures as the single most important classic in the field” (2010: 38). Importantly, this acknowledgement is practiced, to the present day. For example, data from the ILUOP constituted one of the key sources for the Pan-Inuit Atlas. This kind of practical recognition privileges the ILUOP as important both politically, but also in showcasing its historicity and cross-generational nature.

Continuing its involvement with the Pan-Inuit Atlas, we can also compare the duality of political aims involved in the ILUOP. Similarly to the Pan-Inuit Atlas, Freeman (2011) notes that the Arctic sovereignty of Canada that relies on Inuit occupancy confirmed through the ILUOP is “considered sound” (Pharand, 2007). So despite its importance as a counter-mapping project, the ILUOP falls under the same problems of working within a regime that acknowledges a hegemonic narrative. It should be noted, however, that the ILUOP was integral to a continued enthusiasm for researching and recording local and traditional knowledges in the conduct of environmental and development practice. As Freeman explains

“the increasingly widespread recognition of the relevance of this [traditional knowledge in the ILUOP] was certainly aided by the recognition of its value in such influential reports as Our Common Future (World Commission on Environment and Development 1987) and the United Nations Convention on

Biological Diversity (CBD) (United Nations Environment Programme 1992).”
(2011: 28)

Following the stories of politically strong mapping projects such as the ILUOP highlights that progress for indigenous agency in the political arena can be made even without total engagement with theories put forward by this thesis – for understanding mapping as processual and emergent, or knowledge as narratological. So we must ask whether without this engagement with contemporary theory, there is another agenda that projects can fulfill, for example engagement with the practice of law and the exercising of land rights; which can attend to a better understanding of indigenous knowledge and life in a practical manner.

5. 3. Conclusion

Previous chapters have examined the challenges we face between theory, philosophy and the technical aspects of attending to mapping practice. This chapter has shown the way in which there has been an emergence of mapping as a form of resistance, or a counter-hegemonic practice. Former chapters have put forward a fairly strict theory of mapping, and how we should understand it. However there is a need to act against political inaction as a result of over-engagement with theory. This chapter has shown that for many mapping projects – and other knowledge-use projects – political outcomes are important to those involved, and the aim of attaining these should not be oppressed in the pursuit of methodologically ‘perfect’ practices.

Important in this argument is the need to recognize indigenous agency not as working with techniques and media ascribed by participatory planners, but as any form of co-option through which indigenous peoples feel empowered. Thinking in this way opens paths for political effect without necessarily following complex theory and techniques.

6. Conclusion

This thesis has taken an open and multi-disciplinary analysis of the challenges and debates involved in the contemporary practice of mapping in the Arctic. As a region in post-colonial turbulence, and home to a diversity of knowledge traditions, the Arctic forms a canvas on which to explore more fundamental theories of what it means to map landscape and knowledge. This work has not attempted to constitute a “best-practice” manual for conducting cartographic and knowledge management work in the Arctic, but has rather sought to inform the reader of key debates and concepts that require attention in the formulation of such projects.

Initially it was necessary to establish the type of mapping with which we intended to work. This required understanding the complex colonial history of mapping, and its subsequent theoretical deconstruction following the introduction of post-structuralist critique to geography and social science. Therefore this work followed the move away from a progressivist view of cartography, proposing a cartography based around emergence, processuality, participation and political nuance.

The adoption of these theories of mapping elucidates cartography as primarily concerned with practice – moving away from understanding cartography as a discipline concerned with representation. Key to this understanding is the centrality of performativity to practice and therefore cartography. Arguing for the centrality of performativity allows a reconceptualisation of mapping as a complex event, and allows for its association and implication with other ways of knowing and making knowledge. Specifically we argued for the connection between mapping and the making of knowledge through the making of space.

Using performativity as a fundamental concept moved us from chapters 2 to 3, and allowed us to link together the argument for a fundamental spatiality to knowledge and a narratological understanding of cognition. This was key to another central argument – that ontologies are not opposed, as insinuated by a historical academic anthropology, but are rather the product of an interaction between a given material and cognitive world within specific locations and epistemes. Understanding ontology in this way allows for the

creation of a “third space” (Turnbull, 2007; 2012), that is the opportunity for working with multiple ontologies in emergent fashion through thinking commensurable practices as complex adaptive systems. Here I examined some contemporary Arctic knowledge-mapping projects to understand a contemporary practical situation.

Chapters 4 and 5 are linked by the apparent theoretical and political tension between theory and practice, and the increasing divisions and debates this causes within geography and social science. These debates are complicated by the practical accelerating nature of cartography through its situation as an increasingly digital medium. I concluded that theory and practice in the Arctic must be attentive to notions of a digital ontology, and appreciate the diverse struggles between technology and everyday life; through the fundamental role of this relationship in changing the lived Arctic.

Having laid some foundational theory in earlier sections, chapters 4 and 5 are where we can draw out additional conclusions for looking forward. After discussing the opportunity for working with complexity in chapter 3, we saw the way in which certain projects have accomplished thinking as complex adaptive systems – for example the E²D² project at the Cambridge Museum of Archaeology and Anthropology. Moreover, discussion of contemporary critique in chapter 4 suggests that theoretically, cartography and geography have space for attentive projects such as this. Nevertheless, projects that fundamentally think with emergent systemacity are few and far between. It could be argued that for much of the theoretical debate I have highlighted, which began almost a decade ago (see Boast *et al*, 2008; Turnbull, 2007), fundamental changes in practising commensurate knowledge-mapping have yet to take place.

Chapter 5 built on this conclusion, illustrating how “counter-mapping” projects – that have been integral to the project of subaltern-acted post-colonialism - have often been structured and played out within a horizon of economic and political capitalism. Nevertheless, there has been enthusiasm for their conduction and support for their aims. Following this thesis, we can conclude that whilst theoretically we may argue for emergent systems, fundamentally projects often necessarily have a duality of political aims, and are subject to

certain funding and practical constraints. Here I used examples of the Pan-Inuit Trails Atlas and the Inuit Land Use and Occupancy Project to show partial success in challenging hegemonic narrative, but yet also in certain ways furthering that given narrative through implicit support for westphalian sovereignty.

Chapter 5 examined this tendency towards more traditional forms of counter-mapping, but also the way in which co-option of supposedly western mediums and re-thinkings of indigenous agency present alternative models for self-determination. This brings into question the possibility of when and how theoretically more processual and emergent modes of practice - more attentive to complexity - might be implemented. Whilst theorists try to escape from hegemonic practice, this is currently showing little success across cartographic media.

So how might these new emergent practices be realised? One suggestion following this thesis is through multi-disciplinary involvement. As we have seen through the debates highlighted in chapter 4, there has contemporarily been significant hostility between theorists and technicians, for example. It is essential to break down this sort of divide, as well attempting to elide academic epistemologies – for example anthropology, geography and sociology of scientific knowledge - in order to practice emergent forms of mapping that might look like complex adaptive systems. Across these disciplines, attending to the debates and theories examined and argued by this thesis can, I hope, help to aid the development of more commensurate systems looking forward.

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