

## Poststructuralism and GIS: is there a ‘disconnect’?

Agnieszka Leszczynski

Department of Geography, University of Washington, Box 353550, Seattle, WA 98195, USA;  
e-mail: agal@u.washington.edu

Received 20 February 2007; in revised form 11 November 2008

**Abstract.** Human geography critiques of GIS are operationalized under a unique interpretation of ontology and epistemology. Internal to poststructuralism, this metaphysics collapses the traditional separation between ontology and epistemology, reducing ontological questions to epistemological constructs. Although critiques have moved beyond an initial fixation upon positivism, critical/cultural assessments of GIS tendered within the last ten years continue to motivate epistemology as a basis for its deconstruction. The epistemological reductionism of such a reading of the technology inappropriately abstracts GIS from its ontic basis in computing, giving rise to a fundamental ‘disconnect’ of poststructuralist metaphysics to the technology. This disconnect is identified in terms of (1) the epistemic fallacy, which, underwritten by (2) an ‘undoing’ of the metaphysics of presence, culminates in (3) an effective ‘deontologization’ of an immediately ontic entity. This does not negate the post-structuralist critique of GIS, but it necessitates that critical engagements of the technology accord a material ontological ground to the objects of critique.

### Introduction

The discursive separation between GIScience and critical human geography is a long-standing division within contemporary geography (Harvey and Chrisman, 1998; Kwan, 2004; Perkins, 2003; Pickles, 1997; St. Martin and Wing, 2007; Schuurman, 2000; 2002a; Sheppard, 2000; Wright et al, 1997). Schuurman (2000) locates the source of this rift in the inability of the critical establishment to leverage its critiques in a language relevant to geographic information systems (GIS). The esoteric nature of critiques of GIS advanced by human geographers (see Schuurman, 2000) is far removed from an ontic understanding of technology as a set of empirical devices that streamline human practices (Coyne, 1995; Feenberg, 2000; Harvey, 2003; Lawson, 2007). Rather, many of these critiques are expressed in a language that uses a discursive logic frequently associated with poststructuralism.

The crux of objections to the presence of GIS in the discipline concerns the knowledge acquisition and production objectives of GIS, problematized by its critics as foundational claims to truth-finding and fact creation. Initially, these concerns were largely voiced in terms of a condemnation of the purported positivistic<sup>(1)</sup> tenets and practices of the technology (Abler, 1993; Aitkin and Michel, 1995; Dixon and Jones, 1998; Lake, 1993; Pickles, 1993; 1997; Taylor, 1990; 1991; Taylor and Johnson, 1995). Such assessments arose from the reification of GIS as crudely positivistic and naively empiricist by virtue of its purported emergence out of the quantitative revolution in geography, and the subsequent canonization of the linkage between numerical methods and logical positivism under a rationalist brand of science (Sheppard, 2000).

<sup>(1)</sup> References to ‘positivism’ in this paper are to *logical positivism*, the Vienna Circle refinement of positivism as an empirical philosophy more generally. The (logically) positivistic theory of knowledge referred to in the subsequent sentence is thereby one wherein knowledge consists of ‘facts’ which meet the conditions of verification (via empirical observation) and validity (demonstrably true via logical or mathematical deduction); all else (theoretical statements or cultural accounts, for example) are rendered inferior by way of their classification as ‘nonknowledge’ or ‘metaphysics’ (Ayer, 1959).

Initial fixation upon positivism reveals early critiques to constitute an epistemological challenge to the technology (Schuurman, 2000). The use of epistemology as a category for reading the technology in this manner has served to imbricate GIS and by extension GIScience into the broader contention over metaphysics<sup>(2)</sup>—specifically, philosophical disputes over the interpretation of ontology and epistemology—within the discipline (Agnew, 2006; Dixon and Jones, 2004; Elwood, 2006a; Harvey, 2003; Kwan, 2002a; 2004; Popke, 2003; Sheppard, 2005). The bulk of this debate has occurred within the realm of critical/cultural geography, and has largely been articulated along the enduring quantitative/qualitative disciplinary binary (Dear, 1988; Elwood, 2006a; Hansen, 1994; Popke, 2003; St. Martin and Wing, 2007; Samers, 2001; Sayer, 1993; Sheppard, 2000; 2005; Yeung, 1997). That this discussion is presently dominated by poststructuralism in geography (Agnew, 2006; Dixon and Jones, 2004; Elwood, 2006a; Popke, 2003) is significant because it carries implications for how GIS is understood by human geographers. The interpretation of GIS underwritten by a metaphysics internal to poststructuralism<sup>(3)</sup> differs significantly from that advanced by practitioners and theorists of the technology.

Critical assessments of GIS have long sought to ‘deconstruct’ the technology (eg Curry, 1995, 1998; Dixon and Jones, 1998; Gregory, 1994; Pickles, 1995; 2004; Taylor, 1990). Emphases on deconstruction in 1990s critical texts coincided with the ‘poststructuralist intervention’ (after Popke, 2003) in the discipline at the start of the decade and the ‘deconstructivist’ agenda set for critical geography at this time (Dixon and Jones, 2004; Doel, 1999; Elwood, 2006a; Perkins, 2003; Popke, 2003). Certainly, close examination of the technology by both critics and GIScience theorists has legitimately exposed many implications of GIS and its deleterious effects for society, including, but by no means restricted to: issues of surveillance and the erosion of privacy (Curry, 1998; Pickles, 1991; 1995); military deployment of the technology for warfare (Katz, 2001; Monmonier, 1996; N Smith, 1992); use of the technology to facilitate and accelerate environmental devastation (Katz, 2001); its subservience to the interests of capital and its complicity in the production of the spaces of economic growth (Goss, 1995a; 1995b; Katz, 2001; St. Martin and Wing, 2007; N Smith, 2005); masculinist premises of its algorithms (Kwan, 2002a; 2002b; McLafferty, 2005; Schuurman, 2002b; Schuurman and Pratt, 2002); as well as unequal access to both the technology and its information primitives (also known as the digital divide) (Craig et al, 2002; Elwood, 2002; 2006b; Ghose, 2001; Harris et al, 1995; Hoeschele, 2000; Pickles, 1995; Sieber, 2007).

Epistemological critiques have, furthermore, forced researchers of the technology to make explicit the epistemological priors that underwrite its practices and the

<sup>(2)</sup> Here, ‘metaphysics’ is used to describe that branch of philosophy concerned with offering a comprehensive account of the world in terms of both the possibilities (epistemology) and contents (ontology) of knowledge (Wilshire, 1969). Wilshire’s definition has been chosen because it clearly distinguishes between metaphysics defined as traditional ontology synonymous with immediate knowledge of the world (see philosophers such as Lowe, 1998) and metaphysics as an interrogation of this knowledge, or ‘what we know *about* knowledge-about-the-world’, answerable in terms of the two central questions of philosophy. I thus employ ‘metaphysics’ in the latter sense as shorthand for ontology and epistemology throughout this paper. ‘Metaphysics’ is, furthermore, to be differentiated from the ‘metaphysics of presence’, which is discussed in subsequent sections of this paper.

<sup>(3)</sup> ‘Internal metaphysics’ refers to an understanding of ontological commitments as particular, or internal, to the theories or ideological systems under which they are advanced. Commensurate with an ‘internal’ metaphysics, ontology assumes the status of the study of the content of theories, representations, philosophies, etc. This is differentiated from ‘external metaphysics’, which pursues ontology as the study of truth in—or about—an extradiscursive reality (B Smith, 2003).

ontological commitments that sanction ensuing representation. Charges of positivism have, however, been vehemently disputed by GIS theorists (Kwan, 2002b; 2004; Pavlovskaya, 2006; Schuurman, 2000; 2002a; Sheppard, 2000; 2005). To date, however, there has been no consistent examination of the *logic* that supports—and seemingly produces—a dominant reading of GIS by critical/cultural geographers that is inherently at odds with how the technology is philosophically positioned by its own theorists. This paper explains this disjuncture by proposing that there is a fundamental 'disconnect' between the conditions of ontology and epistemology (or metaphysics) under which critics have operationalized their critiques, and the ontic dimensions of GIS as a digital object. This 'disconnect' is identified as a series of three moments which triangulate the critical geographic (mis)reading of the technology: (1) entrapment in the epistemic fallacy, which, underwritten by (2) an 'undoing' of the metaphysics of presence, (3) effectively 'deontologizes' an immediately ontic entity. The 'epistemic fallacy' (Bhaskar, 1986) captures the errors of reducing questions about the nature or makeup of the contents of the world to mere constructs of knowledge. An 'undoing' of the metaphysics of presence refers to a paradoxical logic which makes an ontological claim as to the impossibility or absence of ontology; when operationalized as the basis of critique, it gives rise to the epistemological reductionism which is the subject of the 'epistemic fallacy'. Collectively, (1) and (2) culminate in the misguided and inappropriate imposition of an ontological ambiguity upon GIS.

These 'disconnects' emerge from the critically realist critique of postmodern challenges to science, most famously advanced by Bhaskar (1978; 1986), and popularized in geography by Sayer (1985; 1992). A critical realist analysis of critiques of GIS is appropriate as it is commensurate with the positioning of GIS as realist technology by GIScience theorists and researchers (Hallisey, 2005; Mark, 2005; Perkins, 2003; Raper, 2005; Schuurman, 2002a). Critical realist philosophy posits distinct ontological and epistemological theses: it asserts a world beyond discourse, and maintains that we can, indeed, know something about this extradiscursive reality (Bhaskar, 1986; Niiniluoto, 1999).

Epistemological interpretations of GIS advanced by its human geography critics are, however, operationalized under a radicalized metaphysics particular to poststructuralism where this separation between questions of ontology and epistemology is subverted. Poststructuralism's emergence in geography signaled a profound break with the traditionally maintained distinction between questions of knowledge and the nature of its contents (Agarwal, 2005; Dixon and Jones, 2004; Elwood, 2006a; Popke, 2003). Poststructuralist philosophy collapses the ontology/epistemology boundary and promotes epistemology as the privileged basis of inquiry (Dixon and Jones, 2004; Hay, 2007; Jones, 2003; Popke, 2003). In this paper I am less concerned with poststructuralism as an ideology or social theory; instead, I use 'poststructuralism' to refer to a unique brand of metaphysics which has become established as the 'orthodox' interpretation of ontology and epistemology—and the nature of their relationship—in critical geography.

Effectively, the erasure of the ontology/epistemology distinction denies a world beyond consciousness. The unfortunate consequence of this when applied as a basis for deconstructing GIS is that it has mired critiques of the technology in the epistemic fallacy by incorrectly abstracting GIS from its immediately ontological foundation in computing. By negating the need to address the technology as a material entity, the subsumption of ontological concerns by epistemology serves to dismiss the ontological consequences of GIS as a discreet, empirical technological *device*—in other words, it ignores the ontic dimensions of the technology. The ontic concerns the instantiation of GIS as a set of material and digital objects—the hardware controls, graphic user

interfaces, black-boxed algorithms, data structures and data models, and data—that support and are reproduced by a myriad of socially contingent institutions, conventions, and praxis. Promoting an ontic reading of GIS does not constitute an instrumentalist thesis or essentialize the technology by narrowly identifying it as a set of (supposedly) neutral tools, nor is it a narrative that runs contrary to an understanding of GIS as a unique discourse or set of practices (Chrisman, 1999; St. Martin and Wing, 2007; Schuurman, 2000; Sheppard, 2005). It, instead, emphasizes the material forms that these practices take.

Attempts to ‘deontologize’ GIS by way of epistemic reductionism ironically impose an (extra)ontology that is incommensurable with the object of critique. The conflation of epistemology and ontology under poststructuralism renders its metaphysics an inappropriate platform from which to lodge a critique of GIS or, by extension, GIScience. I flesh out the ‘disconnects’ of what I here refer to as a ‘poststructuralist’ metaphysics to GIS by exploring how the wider poststructuralist scripting of the domain has encouraged the deployment of a particular logic that simply does not ‘fit’ the object of critique. The polemics of ontological agnosticism are by no means exclusive to GIS, but are, rather, part of a broader ‘poststructuralization’ of the discipline that does violence to other theoretical movements in geography. GIS, however, deserves unique attention because, as will be demonstrated in this paper, its instantiation as a substantive object reveals it to be expressly ontological. This renders the errors of the aforementioned conflation more immediate than in, say, the context of literary texts where the level of discrete entities discernable via sensory observation is far less salient.

The emphasis of this work is not to defend against accusations of positivism lodged in the 1990s; this has been accomplished successfully elsewhere (Kwan, 2002b; 2004; Pavlovskaya, 2006; Schuurman, 2000; 2002a; Sheppard, 2000; 2005). Although the content and pitch of the debate over the touted philosophical deficiencies of GIS as it occurred in the 1990s has been well chronicled, and assessment of what—if anything—has changed since the turn of the millennium remains outstanding. As a result I focus on critiques tendered within the last ten years. Challenges to the technology have demonstrably moved beyond a fixation on the positivistic tendencies of the technology. Moreover, a series of practices loosely organized as ‘critical GIS’ has emerged in response to 1990s critiques of the technology. Qualitative GIS, feminist GIS, and, amongst others, postcolonial and queer engagements with the technology have successfully addressed early critiques’ emphases on the nonneutrality of the technology, its masculinist deployments, and the political agendas served by cartographic representation as emphasized by much-warranted early critiques. Critical GIS has been successful as an enterprise precisely because practitioner researchers have managed to incorporate the substance of these critiques directly within the frameworks of the technology (Leszczynski, 2009). These successes, however, are not to be equated with an epistemological or ontological reconciliation of GIS with poststructuralism (Leszczynski, 2009). As Brown and Knopp (2008) attest, the attempt to ‘queer GIS’ is an exercise in “colliding epistemologies” that are ultimately ideologically incommensurable. This does not in any way detract from the urgency of theoretical inquiry as a politics of activism in the service of undoing hegemonies of oppression through rigorous scholarship (Blomley, 2006). The challenge for a critique of geospatial information technologies, rather, is to attend to the productive nuances of poststructuralism—that of the social construction of knowledge, the politics and inescapability of representation, an understanding of diversity and difference—while allowing for a material ontological ground. Incorporating only the former while insisting that poststructuralism be carried to its logical conclusions only nullifies the very presence of GIScience

technologies in the discipline by denying their material constitution in computing (Elwood, 2006a; Leszczynski, 2009). This is neither constructive nor productive.

Despite the change in emphasis of criticism and the flourishing of critical engagements *with* and *through* GIS, however, critical assessments advanced by critical human geographers not directly invested in GIS<sup>(4)</sup> continue to be articulated in exclusively epistemological terms, operationalized under the very same conditions of metaphysics that gave rise to misguided decrees of positivism. Given that the two questions of ontology and epistemology are the identified bone of contention, I begin with their interpretation under poststructuralism and then proceed to describe how they culminate in a fundamental 'disconnect' to GIS.

### Poststructuralism, metaphysics, and geography

Poststructuralism flourished in geography during the late 1980s and early 1990s in response to the ontological and epistemological certainties anchoring the bases of knowledge as "fixed, indubitable, and final" (Barnes, 2000, page 278; Dixon and Jones, 2004). Dixon and Jones (2004) explain poststructuralism as successfully having taken hold in geography because it resonated with human geographers' repudiation of the 'naïve empiricism' espoused by the major theoretical schema—spatial science, critical realism, and humanism—triangulating the discipline at the time (see also Jones, 2003). Empiricism is objectionable not only because it positions sensory observation as the ultimate locus of knowledge and thereby grants ontological status exclusively to empirical phenomena, but also because the categories it provides for conceptually organizing the world accommodate the discretization and classification of concrete entities in physical space, thereby peripheralizing cultural accounts of abstract, non-physical objects as anecdotal at best (Jones, 2003). In more nuanced terms, it is not necessarily empiricism *per se* which is inherently problematic, but, rather, the deployment of a binary epistemology which exclusively endorses empirically discerned phenomena in a system of signification which equates empiricism with objectivity (Natter et al, 1995).

Certainly, not all of poststructuralism is anti-empirical. Deleuze and Guattari (1990), for example, identify themselves as 'transcendental empiricists'. Deleuze's ontological stance clarifies the role of sensation in the production of concepts, which are seen to assume meaning or substance in the form of intellectual categories that follow from experience in a kind of prephilosophical stage untainted by epistemology (Bryant, 2000; Deleuze, 1995). It is empirical in that it does not shun assertions of reality (as an ontology of difference), and, indeed, experience is seen as generative of real (sensations of) time, space, etc (Baugh, 1992; Deleuze, 2004). Nevertheless, poststructuralist philosophy is largely skeptical of empirically sanctioned entities (Pratt, 2000). Bryant (2000) describes Deleuze's epistemology as denouncing *a priori* categories for making sense of experience, necessarily eliminating empiricism defined as reliance on sensory observation as a basis for organizing knowledge. In the Derridean tradition, the indirect critique of empiricism concerns the identification of phenomena, which fundamentally involves—or represents—the very process of 'centering'. To make claims as to presence, essence, or existence is to ontologically declare entities inviolable, veritable, fixed, and stable, or to 'center' them, an *a priori* ontological impossibility. Derrida's (1970) critique of structuralism builds on semiotics to provide

<sup>(4)</sup> For a more detailed exploration of the separation between critiques voiced by theoreticians not immediately familiar with the methods and practices of GIS, versus those articulated by researchers with a firm command of the technology who have developed and contributed to critical GIS as a subdiscipline concerned with applying the technology in critical—and reflexive—ways, refer to Perkins (2003).

an understanding of signifiers (sounds, images, etc) as only signifying a concept in terms of difference. As presence is thus always indicative of absence, any concept, idea, entity, or phenomenon necessarily bears with it a trace of its 'other', precluding the definition of exclusive (ie 'centered') categories.

Enshrined in discursive practices and artifacts of representation, in geography 'centering' became most closely affiliated with the empirical ontological commitments heretofore characterizing disciplinary practices (Popke, 2003). As such, poststructuralist geography represents a direct challenge to the ideological privilege accorded to ontological entities on the basis that any statements about the structure and makeup of the world (ontology) immediately betray the logic or counterpart conceptual framework (epistemology) through which the contents of that world are endowed with legitimacy and acknowledged as valid or 'real' (Dixon and Jones, 2004; Gregory, 2000a). To this end, poststructuralism destabilizes universal 'reality' claims by revealing them to be hegemonic outcomes of discursive practices that socially endorse the specific forms of inquiry that are considered legitimate. Identifying the epistemological priors which 'police' the boundaries of knowledge accordingly constitutes the basis of poststructuralist critique (Dixon and Jones, 2004; Gregory, 2000a; Jones, 2003; Pratt, 2000).

Dixon and Jones (1998) identify three epistemologies as historically dominating critical and cultural theory in geography: (1) Cartesian perspectivalism; (2) occularcen-trism; and (3) the 'epistemology of the grid', the apex of a segmenting logic that renders the world amenable to discretization, measurement, and 'lineation', all of which are premised on a presupposed planar stability which serves to stabilize object and concept hierarchies and permit causal understandings of the world (page 251). Dixon and Jones (1998) understand these epistemologies as mapping to specific ontological traditions because the former are seen to admit particular objects into 'being', a characteristically poststructuralist account which sees any ontology to be "grounded in an epistemology about how we *know* 'what the world is like'" (Dixon and Jones, 1998, page 250, emphasis in original). Indeed, for Derrida (1970), knowledge constructs are but the products of classification schemes—into which we become socialized—deployed as 'Science'. Foucault's (1972) proposition that discourse constitutes a form of epistemological singularity which, once consistently expressed, becomes self-legitimizing in positioning itself as the locus of information similarly suggests that knowledge claims are but statements of the conditions under which they are made possible or considered valid.

Gregory (2000b) describes discussions of ontology as inescapably betraying epistemology: in cognitive terms, ontology as that which we believe to be true cannot be separated from our perception of the world because we only know the world to be as we apprehend it (Agarwal, 2005). Statements about what constitutes reality are premised on assumptions about what questions are considered valid or rational; these, in turn, serve to structure reality because they predetermine the phenomena to be found given a specific line of inquiry. Casting ontology to be 'always already' epistemology in this way reveals the contents of ontology to be no more than epistemological artifacts (Dixon and Jones, 2004, page 80).

Under poststructuralism, epistemology assumes the status of a "[t]heory about how to interrogate the ontologically given world" (Rose, 2004, page 462). Ontology can thus be interrogated solely by way of epistemology, because it is the latter—the available frameworks for making sense of our collective realities—which designates and legitimizes the presence of particular entities in 'the world'. This is a linear understanding which casts ontology to be necessarily determined by epistemology; in poststructuralist terms, it is through epistemology that we lay claim to ontology. Therefore, while

poststructuralism represents an inherently *ontological* challenge in its subversion of geographic narratives which position knowledge as ultimately foundational and proclaim to guarantee access to those foundations through their own theories, models, and methods, it is one leveraged in unequivocally epistemological terms.

Jones (2003) consequently characterizes poststructuralist geography as constituting an epistemological critique. This is not a critique which outright eschews ontological concerns, but, rather, one which employs epistemology as an entry point for debasing unsubstantiated presuppositions about the world—more succinctly, the assumed immutability of ontological categories. Privileging epistemology over ontology in this manner translates ontological commitments into epistemological constructs, erasing the ontology/epistemology distinction. Negating the need to theoretically engage the contents of 'the world' in their own right, however, is tantamount to epistemological reductionism: it suggests that ontological questions can be sufficiently answered in epistemological terms alone.

The preeminence of this "culture of epistemology" (after Strohmayr, 2003) in critical branches of the discipline has led Pratt (2000) to describe poststructuralist geography as essentially "anti-ontological" (page 626). This sentiment is evident in the profound ontological agnosticism resounding in critical branches of the discipline. In perhaps the seminal volume on the subject, Doel (1999) identifies poststructuralism as the antithesis of 'spatial science—for him a term synonymous with positivistic, empiricist geography. According to Doel, the intentional undoing of this spatial 'orthodoxy' can be achieved only through ontological nihilism. Not only does poststructuralist geography not involve or affect any ontological commitment whatsoever, but also the point of the "whole exercise is to affirm the becoming-otherwise of spatial science" (page 113). Doel's description of poststructuralist geography as an "affirmation of everything that defies integration and swerves away from stabilization" is commensurate with a pursuit of moments outside of ontology (page 199). There can be no ontology, only process or 'becoming'. This 'becoming' is not teleological; rather, any entity, emotion, or moment defies definition because it is in a constant state of movement, lacking any form or foundational substance.

Other poststructuralist efforts are more explicit in their attempts to 'deontologize' the discipline. Recently Marston et al (2005) called for a "human geography without scale" premised on a "flat" ontology of self-generating systems supporting emergent as opposed to a priori defined entities (page 422). Their interpretation of scale as an epistemological construct which stratifies the locations of knowledge—a "'looking up ... spatial ontology'" (page 417)—leads them to suggest that scale be replaced with a series of socially contingent, simultaneously global–local, fluid–fixed malleable scalars supporting a 'flat' theory of knowledge where no one point of entry provides access to superior explanation or understanding. Their treatise is exemplary of the deployment of epistemological arguments to indirectly debase ontological polemics; indeed, their tendered solution is to render scale nonontological by simply expelling it from the geographical lexicon, a move which would strip it of its epistemological force. If scale can no longer be used to structure geographic knowledge, there can be no more products of scale-as-epistemology.

Ontological agnosticism is a definitively poststructuralist moment (Jones, 2003; Pratt, 2000; Strohmayr, 2003). Nevertheless, it is important to impress that it is not characteristic of all veins of poststructuralist philosophy. Indeed, Bonta (2005) identifies Deleuze and Guattari (1990) as providing a solid ontological basis for poststructuralist theory. He himself seeks to reassert ontology for poststructuralist geography by, for example, using a Deleuzian approach to explain how resistance amongst disparate groups to state/corporate-driven deforestation in Honduras

culminates in forest conservation (Bonta, 2005). For him, these resistance movements and their effects are 'rhizomatic'; in taking place, they actualize space. Thrift's (1996) nonrepresentational theory, which Richard Smith (2003) considers poststructuralist, represents a more direct challenge to the anti-ontologism of contemporary critical geography. Concerned with the practices which produce social relations, nonrepresentational theory suggests that there are moments which elude representation; otherwise stated, there are instances of space–time which have ontological substance beyond or outside of their signification by way of representational epistemologies. The fleetingness of emotion, for example, cannot be codified, and thus disrupts mapping to an epistemologically reduced ontology.

The tendency towards extra-ontological conformity is simultaneously strongly contested by other theoretical movements in the discipline. Callard (2003) argues that the poststructuralist dominance of critical/cultural human geography—expressed as a blind faith in its tenets and celebrity theorists—is discernible in the Foucauldian correction of competing, often incompatible philosophical narratives so as to align them with its own politics and philosophical commitments (see also Kingsbury, 2003). She maintains that the endowment of the psychoanalytic subject with political agency ontologically violates the Freudian-ascribed inertia of the human psyche. Saldanha (2006) contends that this poststructuralist abdication of ontological concerns compromises its own efficacy as a political project. He identifies the casting of 'race' as an epistemological artifact by poststructuralist-inspired theories of race, ethnicity, and (post)colonialism in geography to have had the adverse effect of confounding efforts at combating race-based prejudice. Race has no basis in biology. If, however, empirical visual markers are the basis of racial discrimination despite their lack of foundation in any biological science, then denying them by proclaiming them to be merely discursive constructs engenders a situation wherein racial prejudice is prevalent but its perpetration denied under the rubric of political correctness. Blindness to the immediately ontological substance of 'race' allows the perpetuation of racial subordination to be discursively circumvented.

### **Poststructuralist metaphysics in a digital universe**

While it does not present an ethical dilemma similar to the treatment of 'race' as a purely linguistic problem, a parallel epistemically reductionist logic has been operationalized as the basis for deconstructing GIS. Critiques of GIS lodged since the 1990s are an outgrowth of the long-standing human geography critique of spatial science and its methodical pursuit of regularity (Kwan, 2004; Schuurman, 2000; Sheppard, 2000). While this is simultaneously a critique of empirical methods and theoretical schema in geography at large, it was spatial science which became the select object of 'post-prefixed'<sup>(5)</sup> ideological attention in the discipline (Sheppard, 2000). This has been explained in terms of spatial science's affiliation with numerical methods, and the consequent equation of spatial analysis with logical positivism in the critical/cultural geographic conception (Kwan, 2004; Pavlovskaya, 2006; Sheppard, 2000). GIS became subject to the same criticism on the basis of its historical association with spatial science. Dixon and Jones (1998), for example, reify GIS to be a default extension of spatial science in that it "involves the same questions that one finds within data analysis, simulation, and optimization" (page 248).

<sup>(5)</sup> This is Barnes's (1996) catchphrase for what are colloquially referred to as the 'pomos'—namely, postmodernism and poststructuralism, but also more recent theoretical platforms, including branches of feminist theory and postcolonialism.



The unequivocal rejection of positivism as a mode of inquiry which presumes the value-freedom of rationalist science and the existence of fixed social laws figures first and foremost amongst the central tenets of critical geography, poststructuralist or otherwise (Blomley, 2006). The association of 'spatial science' with positivistic epistemology certainly precedes the rise of poststructuralism in geography. At the time of its inception, proponents of GIS readily touted the positivistic bases of the technology as a means of capitalizing on the social prestige ascribed to (any) rigorous science (Sheppard, 2000); more recent evidence of such an alignment can be seen in the rebranding of geographic information systems as a *science* (GIScience) encompassing applied branches of the discipline (Wright et al, 1997). The self-proclamation of GIS as positivistic by GIScientists is, however, distinct from indictment of the technology as positivistic by its critics. The latter stems from a conflation of 'science' with positivism which occurs by way of inducing the positivistic basis of *all* science from the historical contingency of science with a positivistic theory of knowledge. The association between GIS and spatial science persists because, as per Gold (2006), "the distinction between GI Systems (the technology) and GI Science is a fuzzy one" (page 505). It remains difficult to separate out GIS as one particular collection of software and hardware encapsulated under the acronym 'GIS' from the scientific orientation of GIS as a praxis and form of representation—because, in the beginning, "[t]he System *was* the Science" (Gold, 2006, page 505, emphasis added; see also Raper, 2005; Wright et al, 1997). The logical error, however, occurs when the leap is made from the invariable binding up of the systems in the science to an understanding of the systems—because they are predicated on the science—as positivistic.

Kwan (2004) explains the positivistic branding of GIS as a retrofitting of epistemological narratives by 'reformed' spatial scientists seeking to justify the practices and methodologies of their ideological conversions. Although the association of quantitative methods and positivism is an enduring fixture of the critical geographic imaginary (Poon, 2005; Sheppard, 2000), the mapping of a singular epistemology (positivism) onto a specific ontology (empiricism) by way of this "ex-post epistemological rationalization" served to cement the empirical-positivist object in geographic theory (Kwan, 2004, page 757). The subsequent subsumption of ontology into epistemology under a poststructuralist metaphysics created the logical grounds for reasoning that the empirical basis of the technology revealed it to be necessarily positivistic (for examples, see Ahlqvist, 2000; Dixon and Jones, 1998; Gregory, 1994; N Smith, 1992; Taylor, 1990; 1991). Critical narratives of this sort, which align GIS to numerical methods, indict the technology as the superlative apex of the aforementioned 'grid epistemology' and thereby the most egregious materialization of positivism in geography. This is a unidirectional argument, summarized by Sheppard (2000) in the following terms: "Cartesianism [as extreme logical empiricism] is not peculiar to logical positivism, but logical positivism—like much natural science—adopts a Cartesian worldview" (page 542).

GIS was thus deemed positivist by virtue of its demonstrated empiricism. Critics did not rally against GIS because it was positivistic in and of itself, but, rather, because its positivistic epistemology—betrayed by the mapping (or representation) of visually discerned objects in space—is seen to disclose a naturalistic appreciation of 'the social' amongst GIScientists that parallels their conception of 'the spatial' and the amenability of physical phenomena to law derivation and prediction (for a similar argument see also Sheppard, 2000). For Dixon and Jones (1998), GIS (as an extension of spatial analysis) is reprehensible not because it is epistemologically positivistic, but, rather, because as a positivistic technology, it is generative of a "stable, stratified, and hierarchical social ontology" (page 250)—a Cartesian world where persons behave no differently from their counterpart discrete, regular occurring physical objects in planar space.

The subject of critique is, therefore, *not* the (positivistic) theory of knowledge endorsed and reproduced by GIS, but, rather, the (socially) ontological commitments which such an epistemology is seen to support. In other words, while epistemology is certainly the territory, disputes over epistemology are *really*—in human geography—about the nature of the social world (ontology) (Hansen, 1994). For critics of GIS, the issue at hand is, as identified above, empiricism.

GIScientists certify empiricism as a sound basis for geographic visualization in the sense that such an ontological commitment is both rational and *reasonable* in context: for physical phenomena to be mapped with a GIS, their existence outside the ‘text’ must first be acknowledged for encoding to proceed (Frank, 2000; Schuurman, 2002a). Schuurman (2002a) and Raper (2005) clarify GIS to be a critically realist positioned technology. Although GIScientists and practitioners see mapping and analysis practices initiated in the GIS environment as validly associated with the real-world objects represented in its outputs, they, nevertheless, understand those representations as abstractions, ‘snapshots’ of a slice of the world in a particular instance of space–time. Whereas materialist conceptions of the world under positivism presume the fixity of representation, GIScientists recognize their space–time contingency, as is commensurate with a critical realist theory of knowledge. A commitment to realism understands representations initiated in a GIS environment as communicating at least some portion of ‘reality’ (Hallisey, 2005; Mark, 2005; Raper, 2005; Schuurman, 2002a; 2006; Sismondo and Chrisman, 2001; Sullivan, 1998); this does not, however, suggest that the technology exclusively sanctions ‘sense data’. Instead, a realist ontology involves an acknowledgment of a world “outside all interpretation and all the conception we have of it” (Kraft, 1992, page 960). This reality beyond ‘text’<sup>(6)</sup> need not be empiricism. Indeed, Sheppard (2005) attests that “GIS need have no special relationship to logical empiricism” (page 11). Critical realist philosophy recognizes causal mechanisms that simultaneously affect change and mediate our intellectual engagement with the world independent of our appropriation of the world by discourse, yet maintains that any knowledge we have of this world is necessarily theory laden (Groff, 2004). Neither of these tenets, however, makes claim to the empirical nature of ontology.

Moreover, any endorsement of the empirical nature of objects populating GIS models does not *de facto* prove GIS to be demonstrably positivist. Kwan (2002b) considers attempts to essentialize the technology by reducing it to an epistemological singularity to amount to technological determinism. For her, the reductionism of such arguments is exposed—and countered—by uses of GIS that both capture and further our understanding of “difference and subjectivities” (page 647). She herself uses GIS to perform ‘feminist visualizations’ that oppose the traditional masculinist utilization of the technology. While feminist GIS theorists problematize the disembodiment of the conventional deployment of GIS from a god’s-eye-view, they simultaneously recognize the possibility for feminist visualization both within and beyond the confines of masculinist technoscience (Kwan, 2002a; 2002b; McLafferty, 2005; Pavlovskaya, 2006; Schuurman, 2002b; Schuurman and Pratt, 2002).

While emphases on positivism have consequently waned [Ahlqvist (2000) notwithstanding], critiques of GIS, nevertheless, follow a familiar form: opposition to

<sup>(6)</sup> Here I use ‘text’ in the Derridean, rather than the literal, sense. Accordingly, ‘text’ refers to not only writing and literary works, but, indeed, “all possible referents”: the economy, social institutions, culture, etc (Kraft, 1992, page 960) The implication of Derrida’s infamous axiom ‘nothing exists outside the text’ (Derrida, 1976) is that while it is possible to acknowledge all possible structures (‘text’) and, indeed, to “make *reference* to” them, this can be accomplished only within the confines of discourse—in other words, within the text itself (Kraft, 1992, page 960).

(empirical) ontological commitments is raised on the basis that the effects and objects of mapping and encoding practices ensconced within the technology are enabled by a contemptible epistemology systematically implicated in the networks of control that rationalize daily life, such as the economy (Pickles, 2004; 2005; N Smith, 2005), the ubiquitous surveillance grid (Curry, 1998), and the politics of representation (Pickles, 2004). The logic which underwrites these more recent assessments is, furthermore, enabled by the same displacement of ontology by epistemology which led critics to pronounce the inescapable positivism of GIS.

Pickles's 2004 volume is no exception, and I choose to focus on it in this paper because his contribution constitutes perhaps the most significant contemporary human geography critique of geospatial information technologies (GITs). Despite presenting an original interpretation of the epistemological tenets of these digital devices, his argument remains exemplary of the ontology/epistemology conflation. I do not wish to essentialize Pickles's critique as a reified poststructuralism—or as poststructuralist critique for poststructuralism's sake—but, rather, seek to demonstrate that the conditions of metaphysics under which he advances his challenge to GITs are aligned with the interpretation of ontology and epistemology unique to the philosophy of poststructuralism.

*A History of Spaces* is, in many ways, an extension of Brian Harley's (1988; 1989; 1990; 2001) substantial body of work on the politics of cartography. At the centre of Pickles's critique are the "representational epistemologies" of digital computing infrastructures which exonerate the objectivity, accuracy, and neutrality of cartographic output (page 10)—what Rorty (1979) infamously termed the 'mirror of nature'. These epistemologies, articulated in the deployment of increasingly sophisticated technologies for geovisualization that eclipse the simple Cartesian perspectivalism of traditional paper maps and cartographic practices, supersede the mathematical gaze supported by the spatial analyst's 'grid' by engendering what are seen as "new ontologies and practices of transparency and malleable depth" (page 162). This ontology, which Pickles terms "investing objects in depth", is one where phenomena are severed from an economy of reflection and, instead, transplanted into an economy of "productive reconstructive surgery" premised upon a system of vision that renders the world as transparent and fully penetrable, and its entities as infinitely malleable and manipulable—the mirror at the level of the machine (page 163).

### **A series of disconnects**

Pickles's (2004) book may be characterized as poststructuralist in two respects. First, he employs the use of epistemological critique to express ontological dissent as is consistent with poststructuralism as an internal metaphysics. The real issue is not the 'representational epistemologies' of geographic visualization themselves, but, rather, that they certify an ontological world of simulated lived experience in the form of a digital earth—and society—that can be perceived and interrogated from any position, from any angle, and at any scale. Second, it is exemplary of poststructuralism's use of deterministic metanarratives, which explains the state of affairs in terms of single-factor causality (Agnew, 2006); in this case, the deficiencies of the technology are reduced to its representational epistemology. This reductionist reasoning is a by-product of the nominally poststructuralist inability to adequately maintain the separation between the ontological and epistemological metaquestions of philosophy, which Bhaskar (1986) seminally identified as the *epistemic fallacy*.

The epistemic fallacy describes an effectively Cartesian logic which both begins and ends with questions of epistemology, confusing knowledge of the world for its contents. It inevitably results when questions about what the world is like are incorrectly

answered in terms of why the world behaves as it does. Strohmayr (2003) describes the privilege afforded epistemology in poststructuralist critique as a “[binding of] knowledge to its objects without allowing the latter to ever be independent of the former” (page 520). This self-referential reasoning inherently suggests that everything can be explained in terms of knowledge (Van Bouwel, 2005), resulting in a failure along the metaphysical ontology/epistemology boundary. The subsumption of ontology by epistemology ultimately sanctions ontological negligence by reducing everything to a problem of framing. Following Bhaskar (1993), this “overt collapse” of the knowledge-of/substance-of-knowledge distinction is always either symptomatic of or disguised by the epistemic fallacy (page 4).

Pickles’s (2004) reasoning that the technology’s purported ontological defects (the ontology of represented objects) can be sufficiently accounted for solely in terms of the flawed epistemology from which they arise is epistemically erroneous in suggesting that the identified deficiencies can be remedied by simply supplanting one epistemology—a fragmented “‘guerrilla’ epistemology” (page 160) in support of a “nomad cartography” (page 64)—for one less desirable (the aforementioned ‘epistemology of representation’). This notion incorrectly suggests that the objects we know—for example, the people we represent—are transformed when we presume to change the filter through which we know (or, in this case, represent) them. Although the way in which people are represented—in social theory as well as GIS—has political and social implications, it is our representations that change, and *not* the individuals themselves. To suggest otherwise is to incorrectly ‘undo’ the metaphysics of presence.

After Derrida (1978), the ‘metaphysics of presence’ is the idea that phenomena in the world have endurance beyond their epistemological ratification as ontological objects. ‘Reality’ is taken for granted as consisting of entities which remain constant under conditions of world distortion (Kingsbury, 2002; Peet, 1998; Rose, 2004). In other words, such objects assume the status of self-evidence, explainable in abstract terms—such as “God, reason, [or] history” (Rose, 2004, page 462)—irrespective of changes in their ontological or epistemological circumstances. Poststructuralist philosophy renounces the ‘metaphysics of presence’ on the grounds that any acknowledgment of the endurance of entities is synonymous with discursive ‘centering’ (Peet, 1998). Epistemological reductionism becomes a way of discursively ‘policing’ ontological commitments, thereby preempting ontological relativism in the form of the ‘metaphysics of presence’.

Indeed, the abnegation of ontological ‘substance’ is an overt attempt, on the part of critical theorists, at evading ensnarement in the *ontic fallacy*. The counterpart to the epistemic fallacy, the ontic fallacy characterizes an equally erroneous logic whereby subjective meanings are bestowed ontological status (Bhaskar, 1989). It captures the sophistry of mistaking ‘facts’ to be sufficient for knowledge—what Bhaskar (1989) terms the “compulsive determination of knowledge by being” (page 181)—that plagues rationalist science (Groff, 2004). The epistemic fallacy occurs whenever we consider ‘reality’ to be no more than our representation (or perception) of it; its ontic parallel is implied whenever we consider our representations of reality to ‘mirror nature’ or to be an exhaustive reflection of it (Scollon, 2003). Accordingly, the ontic fallacy is a critique of logical positivism and its presupposition of knowledge as there for the reaping in the form of ‘facts’ presented to us unabated by nature, and the subsequent positioning of these empirically verified entities into the realm of knowledge itself (Groff, 2004).

It is this attempt at evading the ontic fallacy of which positivism is accused that beguiles critiques of GIS in the epistemic fallacy. Kingsbury (2002) explains the paradox as follows: to ‘undo’ the metaphysics of presence requires first that they be acknowledged. He illustrates this by way of reference to the science fiction genre of film, which

involves the perturbation of our collective assumptions of the metaphysics of presence in everyday life. The regularity of quotidian settings and activities must be first cinematically reified to establish the appearance of alien objects and life-forms as an oddity or anomaly. UFOs, for example, are certainly an aberration, but only in terms of their insurrection of the familiar or expected. We do not expect to see fifty-foot women, but we do not anticipate them precisely because they are at odds with the uniform consistency of the world on which we depend to make sense of the reality of our lived experience. Thus, metaphysics can be negated only by way of an *a priori* ontological concession: presence must be acknowledged before it can be negated. Rose (2004) likewise maintains that postmodern movements have not actually removed themselves from performing metaphysics; they have simply rhetorically and discursively repudiated it.

The incongruity of a simultaneous 'metaphysics of presence'/'pataphysics of absence'<sup>(7)</sup> lies at the heart of the epistemic reductionism of critical/cultural readings of GIS. For critics to counterclaim the ontological commitments of the technology, they must first accede the technology to be bound by (an) ontological commitment(s). If the criticism of GIS is that it is empiricist, then critics must first acknowledge a subscription to an empirical extratextuality implied either in the inception, or more appropriately the deployment, of the technology. Similarly, Pickles's (2004) entry point for critique—representation—necessitates that he first acknowledge the 'representative' basis of digital geovisualization infrastructures. Sidestepping the pitfalls of the 'naturalization of knowledge' (Bhaskar, 1989, page 157) by way of epistemic reductionism requires an initial moment wherein the ontological is bestowed the property of 'presence' such that this kernel of endurance may then be reduced to epistemological constructs. This does not suggest that Pickles's collapse of the objects of representation into their generative practices is equivalent to a certification on his part of ensuing representation(s) from the other end of cartographic visualization. Rather, the implication is that deconstruction—as method, or as something to be 'done'—confines one to the center, precisely that which is to be disrupted (Rose, 2004).

Ironically, positioning metaphysics as antithetical to deconstruction actually functions to reassert the metaphysics of presence (Rose, 2004). The abnegation of 'substance ontology' by way of the theoretical censure of the metaphysics of presence is inherently sophistic as it begets the conclusion that the objects of deconstruction<sup>(8)</sup> are ontological—that is, they express (an) ontological commitment(s)—by virtue of subscription to some ontology. Theoretically annihilating the metaphysics of presence is epistemological reductionism manifest: if there is no ontological substance, everything *must* be interrogated and answered in terms of epistemology. Yeung (1997) sees postmodern philosophical debates in geography as caught up in this very discursive tautology. The implications of this flawed reasoning extend beyond mere inconsistency, however. Indeed, the transposition of ontological commitments to epistemological constructs effectively masks what is a substantively poststructuralist (and postmodernist) argument for the ontological *a priori*: epistemological reductionism conveniently absolves theorists from making ontological commitments, but this absolution is granted only under the condition of an implicit ontology (Bhaskar, 1993). To assert that there is no world beyond discourse, for example, is itself an ontological claim.

This contradiction reveals attempts at undoing ontology (in the form of a metaphysics of presence) to be impossible. Nevertheless, this error propagates throughout critical/cultural assessments of GIS which continue to be tendered as epistemological

<sup>(7)</sup> Kingsbury (2002) identifies the 'pataphysics of absence' as the 'antimatter' of the metaphysics of presence. 'Pataphysics' is understood as the "science of imaginary solutions"; in turn, pataphysical entities are unexpected phenomena which perturb or disturb the prosaic (page 123).

<sup>(8)</sup> That which is being deconstructed.

critiques of the technology, culminating in misplaced instructions for an ontology-free geographic visualization as is mandated by Pickles (2004) in his vision for a post-representational utopia of a “de-ontologized cartography” (page 184). Underwritten by a quest to somehow reach the logical end of the metaphysics of presence, this ‘undoing’ in the context of GIS has served to effectively—and incorrectly—‘deontologize’ an entity whose material substance necessitates that any legitimate engagement of its philosophical primitives recognizes it as immediately ontic.

### **The primacy of the ontic dimension of GIS**

Commanding that GIS shed itself of its ontological commitments, as do Dixon and Jones (1998) and Pickles (2004), is consistent with Derrida’s poststructuralist project against metaphysics and its preclusion of the center on the grounds that laying claim to ontology is inherently logocentric. It is in this way that Derrida (1976) maintains there to be world outside of discourse: language is a closed system; there is no correspondence between language and real-world objects. To identify nonlinguistic constructs immediately implicates the metaphysics of presence (Rorty, 2005). This position permeates the poststructuralist theory of technology, which understands GIS to be radically socially constructed (Harvey, 2003; Harvey and Chrisman, 1998). Maintaining GIS to be a system of representation similar to a language certainly reveals its *syntax* to be socially constructed (Schuurman, 2002a; 2005), but it does not amount to a social constructivist argument in the vein of poststructuralism. Social constructivism casts two theses on technology: on the one hand, technology is rendered to be no more than a social construction, and thus no different from any other socially constructed entity; and, on the other, it essentializes technology as an autonomous force (of surveillance, warfare, hegemony, homogenization) that exerts control over the society that produces it (Lawson, 2007). The first assertion is relativist, the second crudely (technologically) determinist. These two claims are, moreover, inherently contradictory: if technology lacks any intrinsic ‘logic’ by virtue of being purely socially contingent, then it is incapable of provoking social change (ie it cannot be autonomous) (Lawson, 2007). Heidegger, however, understood our encounter with technology as “[involving] the transformation of the entire world (and ourselves) into ‘mere raw materials’ or ‘standing reserves’—objects” (Lawson, 2007, page 35). For Lawson (2007), this suggests that there are, indeed, certain characteristics of technology—such as its durability or concreteness—that cannot be socially reduced.

Understanding GIS as socially and culturally embedded thus represents only half the equation. The Heideggerian rendering of technology upon which the constructivist account of technology is based entails both ‘ontological’ and ‘ontic’ definitions (Heidegger, 1977). The ontological definition ensconced within critiques of GIS, which Heidegger (1977) infamously termed ‘enframing’, is best described by Feenberg (2000) as “an attitude toward the world and ourselves in which everything appears as a resource ... the notion that modern culture comprehends everything as a potential object of technical action” (page 446). This alone is not a sufficient narrative of technologies as it fails to account for the material basis of technology, or what Lawson (2007) refers to as technological *objects* that act in response to technological ‘activity’ in the ontological sense. This gap is accounted for by Heidegger in his recognition of the *ontic* substance of technology. The ontic is the “level of empirical objects” (Feenberg, 2000, page 446). Thus, the ontic dimension of GIS is its constitution as a particular technological apparatus (Feenberg, 2000). Although the ontic resides in the ontological, the ‘essence of the technology’ should not be conflated with instances of specific devices (Coyne, 1995; Feenberg, 2000). Coyne (1995) explains this difference in the context of computing as follows:

"There is a world of electronic components, microchips, cables, monitors, software, and so on, of electronic communications. In [the ontological] sense, the world of electronic communications includes the abstract concepts and theories (communications theory, protocol hierarchies, and so on) we use to explore and explain it. This is the 'way of being', the ontology, of the entities of the ontic world under study" (pages 166–167).

As a universe of literals, the ontic is a world of 'limited meaning' (Coyne, 1994; 1995), a definition which assumes the utmost salience with respect to discussions of GIS where its data structures—and practices of selection, generalization, and discretization—ultimately "[truncate] representation" (Schuurman and Leszczynski, 2006, page 712). In the world of critical theory, knowledge and representation are latent in holistic concepts referenced by the conventional signifiers of traditional semiotics: words, free text, images, ideas, vocal intonations, body language, sounds, associations beyond the immediate context of a conversation. The possibility of spatial representations in the software environment, however, necessitates the initial serialization of these unstructured complexities into persistent, regular, discrete objects of code—in computing terms, their *formalization*. Defined as the process of transposing concepts in the theoretical or cognitive realms to computable 'packets' or entities, formalization imposes immediate limits upon representation in the digital universe that is GIS (Schuurman, 2006). Indeed, the computing architectures which constitute GIS as a digital *device* (read: ontic entity) circumscribe the kinds of representations that (may) ensue (Curry, 1995; Sheppard, 1995). Emotion, sacredness of place, ethical judgments: these are statements that are difficult to quantify and therefore reify as a GIS representation. This is not to suggest that GIS cannot take up issues of affect (cf Kwan 2007), sacred value, or ethics; rather, as per Sheppard (1995), "GIS incorporates some forms of knowledge better than others" (page 9). In other words, the 'reductivism' of GIS data structures engenders representational ambiguities and exceptions: those representations that are privileged are those that conform to, or can be made to conform to, the Boolean logic of digital architectures (Sheppard, 1995).

As a philosophy of science, critical realism maintains that social and natural kinds are, ontologically speaking, worlds apart. To borrow from Heidegger, social objects are recognized as having an "interior", or essence, that "cannot be collapsed" (Bhaskar, 2007, page 196). This critical realist 'orthodoxy' is implicit to how cartographic representations are understood by theorists invested in and familiar with the methods of GIScience: physical geographic phenomena are emphasized and overrepresented in the vast majority of geovisualization not because they are somehow superior to, say, cultural entities by virtue of their empirical qualities, but simply because the binary nature of brute code cannot, nor will it ever, do justice to the complexity and nuance of, for example, individual subjectivity or emotional attachment to landscape. For this reason Schuurman (2000) locates the epistemological shortcomings of GIS as residing in component architectures of the technology, and not, as Pickles (2004) maintains, in the fact that GIS 'represents'. Rather, epistemological polemics of GIS are more appropriately attended to in terms of the representational ambiguities that arise from the 'reductivism' of Boolean logic upon which GIS reasoning is based (Sheppard, 1995).

It is only by considering the ontic dimensions of GIS, however, that these material limits to representation brought on by the inherent limits of digital computing become apparent. In denying extradiscursive entities, poststructuralist metaphysics precludes the possibility of there being "non-linguistic objects which constrain (in straightforwardly physical, causal ways) both our linguistic and non-linguistic behavior" (Rorty, 2005, page 175). In the computational universe that is GIS, this includes the data structures that store meaning (encrypted as 1s and 0s) in the physical registers of

the computer. Allowing for the ontic does not in any way absolve the epistemological hegemony of the reductive logic of Boolean architectures constitutive of most commercial GIS platforms (see Sheppard, 1995); rather, it correctly locates their effects in the material constitution of GIS as a technological device.

Conflating the ontic and ontological under the combination of a poststructuralist metaphysics and radical constructivist narrative of technology erroneously locates these effects in the material production of knowledge. The invalidity of equating the ontic and the ontological is made more apparent using general terms: to say that how 'the world' is understood and subsequently represented is the result of social negotiation does not demonstrate 'the world' *itself* to be entirely a social construction (Kitcher, 1998). Concluding that latter follows logically from the former is to instantiate a particular variant of the epistemic fallacy particular to poststructuralism (and postmodern movements more generally, as well as branches of Marxist philosophy) that Bhaskar (1993) calls the *linguistic* fallacy. It is implicated when 'the world' is rendered as purely discursive; alternatively, when 'the world' is seen to be nothing but our discourse about it.

GIS is both technological in the ontological sense, and ontic as an instance of a digital device. Therefore, it is not merely a textual entity; its material foundation in computing differentiates it from other purely discursive objects of poststructuralist deconstruction.<sup>(9)</sup> Acknowledging its engineering to be socially mediated does not negate the physical substance of GIS latent in its digital makeup. Collapsing the ontic into the ontological by means of 'undoing' the metaphysics of presence, and subsequently reducing it to epistemology by means of the epistemic fallacy, is, however, a discursive maneuver without basis in a 'formal universe of discourse'<sup>(10)</sup> where the ontological is by definition ontic, a conjunction immediately apparent in the informatics interpretation of ontology as "an explicit specification of a conceptualization" (Gruber, 1993, page 199). In simpler terms, a formal ontology is a machine-readable model of entities that are literally encoded into existence. As a computational device, GIS is subject to this definition of ontology. Differentiating *formal* from *philosophical* ontology reclaims the ontic for GIS as a digital spatial technology: as the ontology of literals, the ontic is populated only by objects presented to the individual (Coyne, 1994). This is, moreover, commensurate with the discrete, empirical basis of computing wherein spatial representations become 'real' in database terms in the form of numerical abstracts serialized as objects of code (Schuurman, 2006).

## Conclusion

An acknowledgment of the ontic level of GIS mandates that any discussion of the polemics of 'representation', such as that advanced by Pickles (2004), occurs under an

<sup>(9)</sup> Deconstruction was initially advanced—and popularized in the North American academy by De Man—as a form of literary criticism (Rorty, 2005). Derrida was a language theorist and therefore emphasized literary texts and writing (Coyne, 1995); accordingly, by the 'purely discursive objects of poststructuralist deconstruction' I mean not the texts *of* deconstruction such as Derrida, Foucault, and Barthes, but, rather, the textual objects (see footnote 6, this paper) that have traditionally been *subject to* deconstruction. Technology may certainly be deconstructed, and legitimately so, but, as Coyne (1995) argues, an unadulterated Derridean brand of deconstruction is not appropriate for such a task, as technology was not Derrida's immediate focus. Indeed, the "crisis of the endless reproduction of texts, the chase of the signifier by the signified, and the elusive quest for truth and meaning are not brought about by mass media and electronic communications but are integral to our sign system, or language" (page 108). Technologies are, therefore, distinct from *literary* texts that have oft been the subject of deconstruction within the *texts of* deconstruction. The argument is, therefore, not with deconstruction as a means of destabilizing the technology, but with the form.

<sup>(10)</sup> An expression coined by Gruber (1993).



explicit recognition of the *physical* limits to representation associated with digital computing, immanent in the data structures and component architectures which discretize complexity, only to reify it as a series of 0s and 1s where meaning is tied to their combinations in blocks of code. Formalization thus imposes conditions under which any engagement of the philosophical tenets of GIS may be considered legitimate. This legitimacy is premised on a valid engagement of the metaphysical tenets of GIS. Specifically, it necessitates an a priori acknowledgment of the explicit commitment to ontology expressed in the codified objects that constitute the formal 'universe of discourse'. Critiques operationalized under a metaphysics internal to poststructuralism are inappropriate for such a task because, as epistemological narratives, they reduce GIS to nonlinguistic constructs, such as the initiation of the technology or practices of representation, thereby rendering it purely discursive. Effective 'deontologizing' GIS by removing it from its material constitution as a computational entity in this manner incorrectly suggests that the shortcomings of the technology can be resolved in purely theoretical terms, an epistemologically reductionist (and epistemically fallacious) claim which serves to dismiss the ontic consequences of GIS as a discreet, empirical device.

The immediacy of the ontic dimension of GIS avows that there can be no GIS of the sort envisioned by poststructuralist theoreticians such as Dixon and Jones (1998), who impress that its legitimacy as a technology may be established only in "first [rejecting] the presumption that there exists a 'field' of real world processes and objects" (page 257). For Rose (2004), solutions to remedy the ontological paucity of GIS by way of its epistemological priors constitute "false exits" (page 462), so termed because they overwhelmingly fail to position themselves outside of the 'metaphysics of presence' they seek to subvert. 'Deontologizing' the technology is a quintessential 'false exit'. Indeed, a 'false exit' is all that becomes available when the internal metaphysics of poststructuralism are applied as a basis for assessing GIS, precisely because the ontological and epistemological deficiencies cannot be remedied through discourse alone but must be simultaneously engineered at the empirical level of the machine. Schuurman's (2000) insight that "emphasis on epistemology has drawn attention away from the architecture of the technology where many shortcomings are ultimately located" attests to the failure of the critics to 'undo' the metaphysics of presence by effecting critique beyond the ontic immediacy of GIS (page 586). Instead, attempts to discursively circumvent the ontological substance of the technology in this manner implicate the epistemic fallacy. The subscription to the poststructuralist conflation of ontology and epistemology renders critiques of the technology logically self-fulfilling and thereby self-negating under the weight of their own epistemological reductionism.

Critiques formulated under a poststructuralist-inspired collapse of the ontology/epistemology distinction are thus 'disconnected' from GIS because they are incommensurable with its demonstrably realist (ontological) essence. In this paper, I explain this fundamental 'disconnect'. Rooting critiques in poststructuralism's unique interpretation of metaphysics as a basis for 'reading' GIS, however, reveals a double *entendre* of poststructuralist critique: tautological conclusions resulting from this discursive hegemony paradoxically *ontologize* the technology as an inevitable 'gridding'. 'Ontologizing' the technology is equally as erroneous as its negative counterpart in that it substantiates all technological geographic devices as entities in an epistemologically reduced ontology. Emergent interfaces for geovisualization such as Google Earth defy pigeonholing as exclusively surveillant instruments because the experiences of exhilaration, paranoia, intimacy, euphoria, and expectations of utopia enabled by new affordances for interaction in the digital realm represent a blurring of the disillusionment of boundaries, a moment which lies beyond—or escapes being represented

within—the inevitability of the ‘grid’ as a conservative ontology of discrete areal definition (Kingsbury and Jones, 2007).

Discussing GIS through an alternate critically realist philosophical lens will better position critical/cultural geographers to contribute theoretically to the unprecedented transition from a definitive proprietary technology (GIS) to distributed geospatial virtual environments of the global information economy currently sweeping across GIScience. Sustaining a redefinition of the geographic information society, this shift is not only redefining the constituent technologies and praxes which define GIScience, but, furthermore, locating them beyond the purview of geography proper. Recently termed ‘neogeography’ (Turner, 2006), this new geospatial information market is being pragmatically driven not by geographers, but by computer programmers, web developers, ‘mapping hacks’, and members of online communities, the vast majority of whom have never used a GIS, much less engaged with geography (or GIScience for that matter) as an academic discipline. Given that this transition is being largely technology driven, constrained by available primitives for formal knowledge representation, the ontic dimensions of constituent technologies assume an ever-greater significance because they mandate that geographers understand the philosophical commitments latent in their design and expressed in their deployment. In a geospatial marketplace where feasibility of computational implementation is largely defined in terms of the bottom line, geographers must be able—and willing—to come to the table with tractable solutions to the identified polemics posed by emergent interfaces, new affordances for interaction, and the increasing verisimilitude of geospatial environments. For example, merely critiquing the use of high-resolution satellite imagery—which allows the identification of individuals—to drape digital earths is no longer sufficient. Effecting change necessitates the identification of a series of realizable protocols which mediate these polemics, such as zooming thresholds in urban or residential areas which preclude us from spying on our neighbors. Otherwise, we risk eclipsing geography from influencing what this purported ‘new geography’—defined in terms of geospatial digital objects and environments—will look like.

**Acknowledgements.** I am grateful to Nadine Schuurman for her invaluable theoretical insight, as well as Paul Kingsbury for his feedback and assistance with an earlier draft. I would furthermore like to thank the three reviewers for their nuanced commentary and detailed attention to this paper.

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