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VIEWPOINTS

Care of the Subject: feminism and critiques of GIS

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Critique is a fundamental part of academic discourse. It is a means for researchers to critically examine assumptions, ideas, statements and theories. While there may be general agreement about the integral value of critique to scientific and intellectual enterprises, less attention has been paid to the form and delivery of critique. This article argues that 'how' critique is expressed, as well as what its objectives are, is critical to achieving changes in any research area. We start from the position that many of the critiques of geographic information systems (GIS) have aimed to demonstrate what is 'wrong' with this subdiscipline of geography rather than engaging critically with the technology. Critics have judged the processes and outcomes of GIS as problematic without grounding their criticism in the practices of the technology. This follows a pattern of external critique in which the investigator has little at stake in the outcome. External critiques from human geographers tend to be concerned with epistemological assumptions and social repercussions, while internal critiques have focused on the technical. But there is a further difference. Internal critiques have a stake in the future of the technology while external ones tend not to (Pratt, 1996). While dividing critiques of GIS into 'external' and 'internal' oversimplifies the field, we use it as a heuristic to delineate broad differences in approach. By drawing on feminist analyses of critique, we argue for a form of critique that transcends this binary by tackling enframing assumptions while remaining invested in the subject. To be constructive, critique must care for the subject. A feminist critique of GIS engages more directly with GIS practices, and need not reproduce the antagonistic dualisms that have characterised debates about GIS and technology to date.

Over the past decade, there have been a number of critiques of GIS in geographic journals. Many of these were written by critics concerned with the effects of widely disseminated GIS technology, but expressed in a manner consistent with external critique. Critics expressed concerned about the promulgation of positivism, repercussions of enshrining quantitative techniques in software, as well as social effects of GIS (Smith, 1992; Lake, 1993; Sheppard, 1993, 1995; Pickles, 1993, 1995, 1997). Accounts of GIS from the early 1990s were polemical and often negative, while those published later in the decade, when GIS was better ensconced, tended to be more conciliatory (Schuur-

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man, 2000). The earlier, critical accounts were welcomed by some researchers in GIS, who found them refreshing contributions to a field motivated by technological rather than social concerns. The combined impetus of these critiques was, however, interpreted by many in GIS as an unfavourable judgement of the technology (Openshaw, 1991, 1997; Warren, 1998). Critiques of GIS were, in effect, examinations of the 'value' of GIS in geography.

Debates about GIS within the discipline of Geography did not emerge suddenly and inexplicably. Rather, they followed patterns of antagonism between scientists and social scientists that were established during the 'science wars' (Schuurman, 2000). At the core of this complicated and contentious dispute, known as the science wars, is the epistemological privilege enjoyed by science, and the degree to which science is culturally influenced (Haraway, 1991; Harding, 1991; Latour, 1993; Pickering, 1995; Rouse, 1996; Gross, 1996).

Proponents of traditional science have defended themselves with the publication of books and articles intended to undermine the politics and motivation of its critics (Gross & Levitt, 1994; Sokal, 1996; Gross *et al.*, 1996; Koertge, 1998). This is not to claim that the issues and debates over GIS were exactly the same, but that the binary split between two solitudes, evident in the science wars, was recreated when critiques of GIS emerged in geography. The problem was not just the issues addressed by critics but their manner and the extent to which they were (or were not) constructive. Over the course of the decade from 1990 to the present, critics of GIS have started to work much more closely with GIS researchers. This is made apparent by shared research and writing teams in the field of Critical GIS, with members from diverse backgrounds (McMaster *et al.*, 1997; Harris & Weiner, 1998). Nevertheless, a thin divide remains between the two research groups, a fault line that was initiated by critiques of positivism in GIS. The division is frequently bridged by such collaboration, but remains evident in the different epistemological tenors of Critical GIS and GIS research. By examining past debates over positivism, we develop the argument that critique is a political act, and that constructive critique is central to feminist practices.

Science Wars Incarnate: critiques of positivism in GIS

One of the most piqued skirmishes between critics and defenders of GIS took place over positivism. Positivism is used here as an example from the critiques of GIS because it was consistently emphasised by social scientists concerned with use of GIS. Positivism provides an illustration of how debates over GIS became polarised, and ultimately divided geographers. As the critique of positivism in GIS gained impetus, the word lost meaning, and started to 'stand for' a host of ills that critics associated with the technology. GIS researchers were, in turn, defensive about accusations of positivism. Though it was never well defined by either group, positivism became a magnet for antagonism from both communities. Disagreements between practitioners of GIS and its critics over whether or not the technology is positivist have never been resolved, but they do provide an example of how tensions between the GIS and the human geography research communities were played out.

Critics of GIS have asserted that positivism was the epistemological basis of the technology's use and construction (Taylor, 1990, 1991; Smith, 1992; Lake, 1993; Aitken & Michel, 1995; Pickles, 1995, 1997; Roberts & Schein, 1995). Peter Taylor initiated the critiques when he suggested that GIS inherited an agenda from the quantitative revolution of 'retreating from knowledge to information' (1990, p. 212). He characterised

this retreat as the revenge of the positivists, an accusation that was rendered more bitter by its insinuations of epistemological naivety on the part of GISers. Subsequent critiques of GIS referred to positivism as an epistemological weakness (Smith, 1992; Lake, 1993; Pickles, 1993, 1995; Sheppard, 1993), and in this they restated a standard feminist scepticism toward objectivity and the neutrality of science (Keller & Longino, 1996). Lake offered that '[p]ositivist assumptions of objectivity, value-neutrality and the ontological separation of subject and object (or of the analyst and the object of analysis) constitute epistemological conditions with political and ethical consequences' (1993, p. 405). He solidified this assertion by stating that:

> the violation of individual rights inherent in Geographic Information Systems derives directly from the positivist assumptions underlying the GIS project. Specifically, GIS runs afoul of deontological principles because of its assumption of subject–object dualism and its inability to comprehend subjective differences amongst the objects of its analysis. (Lake, 1993, p. 408)

In a review of David Martin's GIS text, Pickles described positivism as a way of resolving problems of representation: '[Martin] resolves the matter through recourse to a traditional positivist interpretation of maps, in which the relationship between reality and image is an unproblematic one of representation, and error is merely a result of technical skill or unintentional distortion' (1992, p. 599). Neil Smith, in turn, implied that positivism inherent in GIS led to the 'killing fields of the Iraqi desert' (during the 1990–91 Gulf War). Positivism became a strategic focus for critiques of GIS.

None of the critics supplied a definition of positivism, but, when later asked if positivism is confused with representational realism, Pickles responded:

> I guess that there is a certain looseness around the term positivism which has been very functional physically and intellectually. Certainly most positivist traditions have within them a form of representational realism, a mirror of nature … epistemological assumptions. In that sense, there is a certain linkage. The issues are quite different. The question of representational realism has to do with something more specific and the question of positivism has to do with how that sort of epistemological understanding is embedded within an understanding of science and its relationship to its use. So a positivist approach, by and large, is one which … assumes the ability to make a rational scientific model to assign a priority in decision-making about social action. (Pickles, personal interview with Schuurman, 1997)

Pickles described positivism as equivalent to instrumentalism.

Michael Goodchild, a pre-eminent GIS researcher, defends a 'positivist' approach to science and geography in particular:

> I think 'positivism' is often used synonymously with science, or the scientific method, or the activities of scientists, and has been overused as a label for scientific method. I mean that in the broad sense 'positivist science' is redundant. Some of the things that I read grate so much with my own recollections. It's amazing for me to read that positivism died in geography in the 1970s. From my perspective, it's not even been ill. I've spent my professional life at Western Ontario and here [UCSB] and at McMaster. I've always understood that if you wanted to get support for your research at NSF [US National Science Foundation] or NSERC [Canada's Natural Science and Engineering Research Council], you emphasized the scientific aspects of what

> you did. It was inevitable that you had a positivist framework (taking the term in its broad sense). That argument applied as well to human geography as it did to physical. … So I feel that somehow I've escaped the critiques, and it's amazing to me to read that positivism died in human geography almost 20 years ago. (cited in Schuurman, 1999)

Pickles and Goodchild both used 'positivism' in a very expansive sense to refer to an approach to science. To Goodchild, it signalled a taken-for-granted scientific methodology based on empiricism. It did not necessarily imply that data would be vastly generalised, only that observations are the basis of analysis. For Pickles and other critics, however, positivism implied a relation between science, technology and society, one that many human geographers had been at pains to sideline in the discipline (Pickles, 1993; Sheppard, 1993). Despite some exchange about the meaning of positivism, there was little effort to specify how GIS could be improved or made more rigorous through a shift in epistemology. Instead, social scientist critics focused on a strategy of questioning the credibility of GIS by exposing perceived epistemological weakness. This led to some confusion on the part of the GIS community: 'I really don't understand what the social theorists are proposing although I can tell what they don't like' (Mark, 1998, personal interview with Schuurman).

Members of the GIS community resisted the amorphous charges, with a wide range of interpretations. An understanding prevailed that 'positivism' was not a compliment when applied to GIS. Some GIS researchers were flabbergasted by the accusation of positivism in the first place: 'Yes, I was astounded to find out that I was a positivist', recalled Keith Clarke (1998, personal interview with Schuurman). Other GIS researchers refute the charge of positivism with alacrity, drawing attention to the layers of translation, between databases and digital displays, that obfuscate claims to positivism (Buttenfield, 1998, personal interview with Schuurman). As far as Goodchild was concerned, positivism *stood for* science, but neither the technology nor its use was inherently positivist: 'GIS is a machine that is capable of a wide range of operations, and these in turn are compatible with a wide range of philosophical positions' (Goodchild, 1998, personal interview with Schuurman). Helen Couclelis suggested that GIS has aspects of positivism, especially at the computational level, but that different people have different conceptions of what positivism means (1998, personal interview with Schuurman). Waldo Tobler is a self-declared positivist (Tobler, 1998, personal interview with Schuurman), but he is perhaps more representative of the scientific culture of his time than of most contemporary GIS researchers. Despite clear reservations about the links between positivism and GIS on the part of GIS scholars, the accusations persisted, and contributed to a divide between critics and researchers of GIS.

It is difficult to deny undercurrents of hostility between the two groups and a binarised perception of 'us' and 'them'. When asked about his motivation for studying GIS, Pickles explained:

> At the IBG, someone stood up with Ground Truth and said 'this is a manifesto of destruction' [1]. We should mobilise to attack it. That has a lot to do with the technicist claim within which those people operate and think. And the way in which social theory is being constructed as a marginal activity by those people. In some ways, the reasons I started with a critique of GIS was that the claims about GIS were clearly not matched by its performance, claims about effectiveness, about accuracy, about quality, about usability. Those cruddy maps, you couldn't see. … I think that that sort of clear commitment to the

> promise rather than the performance which was problematic for me and remains so. (1997, personal interview with Schuurman)

Part of the tension over positivism between researchers and critics of GIS stemmed from a general ignorance of the other group's research domain. GIS scholars maintained their own traditions of suggesting new approaches to data structures, algorithms and display mechanisms that were invisible to critics. They thus resented the implication that they are epistemological dupes who fail to engage with epistemological questions raised by the critics. Karen Kemp of the National Center for Geographical Information Analysis (NCGIA) explained that being a positivist (whatever that means) doesn't interfere with the:

> Exciting … big challenge [which is] to represent the analog world in the computer. Every time we represent things, we are making decisions about what we are representing. Those representations are not considered absolute. There is no one representation. The science is to understand how our representations fall short. And I don't need a critic to tell me that. I can figure that out myself. (Kemp, 1998, personal interview)

The use of positivism to critique GIS provides a cautionary tale of the theory wars. It allowed debates in GIS to bypass substance and detail. Positivism stood for a 'bad thing' that was ill defined but understood to be inherent in GIS. By focusing on positivism within GIS, critics were detracted from the subtleties of GIS. Existing debates within GIS about the social construction of data sets and the indeterminacy of GIS representations, as well as constructive means of engaging with the technology, were bypassed. The result was a defensive posture on the part of GIS researchers, and an increased resistance to the message of human geographers concerned with GIS. This resistance was linked to the style of external critique used by many social scientists.

GIS publications often begin with an analysis of an old method and follow with suggestions for a new and improved technique—critique, in effect. Clearly, there are significant differences between this type of critique and that utilised by critics of GIS. One distinction is the content. Internal critiques of GIS focus on the technical while external critiques, largely from human geography, tend to be concerned with basic epistemological assumptions and social repercussions. But there is a further difference. Internal critiques have a stake in the future of the technology while external ones tend not to. For the latter set of critics, GIS was not part of their own work. This realisation of the difference in stakes between GIS scholars and their critics leads to preliminary reflection on the role of feminism in critique.

Feminism and a Set of Suspicions

Feminism is suspicious about binaries. It certainly begins from a critique of gender dichotomy, but through the 1980s and 1990s the critique of binarised thinking proliferated beyond gender to binaries of all sorts: e.g. heterosexual/homosexual, black/white; coloniser/colonised; North/South. Feminists also have directed their critique of stabilised binaries onto their own knowledge production and disciplinary formation. The consolidation of Women's Studies as a discipline and its separation from Sexuality Studies and other sites of critical theory, for example, have been theorised and debated (e.g. Butler, 1994; Joseph, 2002). We turn to one such argument developed by Gayatri Spivak (1989). Following Derrida, she argues that the construction of any discourse involves 'something like a two-step': creating a unity around an object and dividing it from

something 'it seems to repeat' (p. 211). Feminism's identity as a critique of Western intellectual traditions is itself a binarised distinction that creates an entity, feminism, and simultaneously covers the trace of its origins in Western thought. One implication of Spivak's argument is that it forces feminists to take responsibility for their participation in Western circuits of power and domination; feminists fall from their position of moral purity and superiority and must negotiate a more nuanced and complicit relation to the traditions of knowledge that they critique. Spivak is adamant that deconstruction is not an exposure of error:

> it says, when you are looking at yourself and distinguishing yourself from others to say that you are better, stop a minute, unload and listen, listen and look at your subject position … remind yourself that the only way in which you can deconstruct is to love the thing you are critiquing. You know it so well, that you cannot not make the structures of the thing the structures of your own discourse. You cannot not present your discourse through the structure that you are critiquing. (p. 214)

Regardless of whether we take up Spivak's invitation to deploy the deconstructive method, her observations invite us to ask: what would the criticism of GIS look like if critics looked at their subject positions as academics who are also shaped by the institutions in which we work, and by shared intellectual traditions? Spivak's cautionary comments about feminists' engagement with critical theory are well worth considering here, in so far as she draws attention to the latter's privileged position within the humanist academy: 'Critical theory is the most developed gift of the humanist academy. It is dangerous because it is genuinely powerful' (p. 218). While it may be that the contemporary threat to the humanist academy in part drives the criticisms of GIS, configuring critical theory and GIS as two trajectories within a shared, powerful tradition of Western intellectual production may change the tone of the exchanges. Even more so, what would criticisms of GIS look like if the attitude of the critic shifted from one of exposing error to a careful study of the production of truth?

We already have some examples that allow us to answer this question. One such example is offered by Sarah Elwood (2000) in her study of the adoption of geographic information technologies by a neighbourhood association in Minneapolis. Through an ethnographic study of the association, Elwood demonstrates how geographic technologies shifted the power dynamics between the state and community. For example, the neighbourhood association successfully challenged exclusion from a state rehabilitation fund by using a combination of GIS and anecdotal information. But Elwood's study shows that GIS is by no means a neutral tool and, while it led to an increased legitimacy of the neighbourhood association, it also changed the language, practice and, to some degree, the aims of the organisation. In particular, it led to a greater reliance on rational planning procedures, which may create barriers to participation for some residents (see also McLafferty, this issue). Moreover, emphasis on standardisation of information led to a re-priorisation of goals and energy within the neighbourhood association, allowing those with greater technological facility to gain more control. Studies such as this, which examine the practice of GIS, discourage sweeping assertions, and allow both defenders and critics of GIS to situate their claims in a context that is neither promotional nor denigrating. They allow us to understand how the technology is interwoven with the production of knowledge in complex ways. Such studies of GIS require greater knowledge of GIS on the part of any critical *user*, but have the potential to result in a more engaged and constructive critique—one that interrupts the convenient separation be-

tween social scientists and GIS researchers in the academy. Mei-Po Kwan (this issue) illustrates how GIS-based computation can incorporate finer spatial scales that allow analysis of gender-based spatial activity. Feminists who develop computational expertise are able to represent 'the fluidity of gendered bodies and spaces' (Kwan, 2000). Kwan was able to develop specialised routines precisely because of her technical expertise. In the process, she illustrates that GIS can be made to do unintended and alternative tasks. Being a user/critic allows the identification of particular practices and operations that reinforce traditional power dynamics. This approach adopted by Kwan will result in a more detailed, more specific, and possibly more effective GIS.

There is one further reason why feminists might choose to engage in a different style of critique of GIS that goes beyond a generalised criticism of binaries or a commitment to the deconstructive method. This is less an epistemological than a more overtly political concern. Women want to be at 'the high staked tables of the game of contesting public truths' (Haraway, 1991, p. 186) about constructions and use of GIS technology. There is a long history of exclusion of women from science (Harding, 1986), and some suspicion that the academy is becoming (once again) increasingly hostile to women, as the effects of research assessment exercises and the like enforce a masculinised work regime (Stanley, 1997). By advancing an alternative model for critique of GIS, feminists have an opportunity to shape the discipline in a constructive manner. The stakes in constructing GIS are too high to choose the position of external critic when being on the inside is more effective epistemologically—and ontologically.

In trying to describe a position from which to critique science that transcends the binary of inside/outside, Haraway suggests:

> Looking for the cracks is rule number one. And looking for the cracks not necessarily from the point of view of the marginality or the voice of resistance or the place that isn't yet colonized, but more [from a position] of commensurability in the world by which folks are supposed to live but which they don't and can't fit … If you're interested, let's say, in the informatization of the world and the globalization of the world through the expansion of telecommunications, you don't look for spaces of resistance in terms of some kind of primitive, antitechnology warrior. Instead, you begin your political, intellectual enquiry from the position of folks who have no choice but to live inside the system of commensurability which is being established, but who don't and can't quite fit. (Harvey & Haraway, 1995, p. 514)

Not quite fitting can be a productive stance and, following Haraway, our objective is not just to criticise science, but to transform it through situated, knowledgeable, specific conversations about the coding and objectification of the world, and about the power-laden particularities of this coding. Ill defined, generalised conversations about 'positivism' are unlikely to create the ground for these types of conversations.

Conclusions

We have urged a change of attitude in critiques of GIS, from morally and intellectually superior outsider to critic who is more open about his/her complicities in shared circuits of power and intellectual traditions. We urge a refocusing of the objectives of criticism, from that of exposing error to the task of uncovering the production of truth. Understanding the effectiveness of GIS, the production of truth within and through GIS, requires a specialist's knowledge of it. The objective of this criticism is not to accept GIS

as truth but to understand how it works as a knowledge system. Feminists may see tactical ways of using existing GIS technologies to further goals for social justice (see other articles in this volume). But the objective of understanding GIS as a system of knowledge goes beyond this; understanding how GIS produces truth opens opportunities to produce truth otherwise.

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NOTE

[1] *Ground Truth* is the title of a collection of essays edited by John Pickles, and published in 1995. Originally a project jointly conceived with Brian Harley, the book brought together a number of critiques of GIS. *Ground Truth* created a furore among GIS researchers, many of whom felt unjustly maligned.

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