

GIS AND SOCIETY: TOWARDS A BEHAVIORAL GIS

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ABSTRACT: *The purpose of this paper is to position recent GIS & Society applications within the broader context of the historical development of geography's epistemological traditions. In the process, the author draws a parallel between the creation of socially aware GIS applications and earlier attempts by behavioral geography to develop a progressive spatial science. To accomplish this task, the paper outlines the GIS & Society initiative, sketches the general characteristics of an emerging behavioral GIS, and questions the political viability of practices associated with alternative GIS projects.*

Recently, Wright et al. (1997) and Pickles' (1997) considered the merits of defining GIS as either a 'tool' or a 'science'. As their discussion illustrates, GIS practitioners have been less than engaged with questions of epistemology or philosophical perspective. However, a core of GIS professionals and social theorists, known as GIS & Society, have begun to reconsider the trajectory of GIS within the context of previous and current geographic traditions and epistemological debates. In a similar vein, this paper proposes to position GIS & Society applications within the broader context of the historical development of geography's epistemological traditions. To accomplish this, the paper briefly outlines the GIS & Society program, sketches the general characteristics of an emerging behavioral GIS, and questions the political viability of practices associated with alternative GIS projects.

GIS AS SCIENCE

GIS may be a discourse which would include both the science and tool views...The tool view doesn't give enough credit to geography, the science view takes GIS away from geography to stand on its own. (Brown 29 Oct. 1993 16:22 PST, as quoted in Wright et al., 1997)

By referencing the tool-science debate, this paper emphasizes the disjuncture that exists between those practitioners who embrace Dobson's (1983) scientific vision of an "Automated Geography" and those who employ a methodological package known as GIS. While a tool-oriented definition of GIS is valid, GIS is much more than a valuable methodological package precisely because GIS not only re-articulates geographic

theory, but actively expands the independent knowledge base of the information sciences. Consequently, the development of commercial GISs has relied heavily on computer and information science professionals, not geographers (Harris and Weiner, 1996). Indeed, geography's direct contribution to the development of commercial GIS technologies has continued to diminish since spatial technologies were primarily empirical endeavors, such as computer cartography. To that end, 'GIS as a science' is a unique hybridization of geography, computer, and information sciences.

While these comments concerning the epistemological nature of GIS are brief, the most recent account of the tool-science question redefines the debate. Instead of focusing on theoretical concepts such as 'fuzzy logic', the current discussion underscores how a science of GIS does or does not mirror the epistemological diversity of the discipline. That is, the GIS experiment can not merely ignore the numerous '-isms' which have influenced the science of geography. Hence, any science of GIS should--because of its implication for the discipline at-large--engage previous epistemological discussions.

In an attempt to do just that, participants at a 1993 "Friday Harbor" conference, sponsored by the National Center for Geographic Information and Analysis, created research initiative 19 (I-19) which explores the social implications of GIS. Constructed to critically and purposefully engage spatial technologies, the I-19 agenda moves beyond questions of empirics versus theory to examine the significance of GIS's increasingly dominant position at the core of the discipline (Pickles, 1997; Harris and Weiner, 1996; Jordan, 1988). Since GIS technologies have been interpreted as re-centering and privileging logical

positivism, I-19 explores those socio-political relations which GIS technologies legitimize, as well as those positivist critiques a reinvigorated logical positivism may threaten. Consequently, the I-19 critique not only questions many of the familiar assumptions associated with applied geography and logical positivism (e.g., Lake, 1993; Taylor and Johnston, 1995), but contributes to an alternative GIS discourse which incorporates the general themes of positivist critiques.

In addition to serving as a critique of logical-positivism, I-19 wrestles with a variety of issues including cartographic representation, access to information, surveillance, democratization, gender, race, power, and alternate technologies, as well as other themes associated with post-Marxist approaches. With the publication of Pickles' (1995) *Ground Truth* and a special issue of *Cartography and GIS* (1995), I-19 articulates a theory on the social implications of GIS which combines description, analysis, and critique (Pickles, 1997; Harris and Weiner, 1996). In order to understand the significance of a new theoretically informed GIS, the collective research of I-19 can be characterized by two phases: (1) critique and (2) applications. During Phase 1, the critique examines several inter-related issues: (1) Socio-history of GIS, (2) Cartographic Representation, and (3) Information, Democratization, and Participation. Phase 2, applications, explores alternatives to current GISs, as well as the role of emerging technologies.

The socio-historical component of the I-19 agenda documents the evolution of GIS. By siting the development of GIS within existing social, political, and educational institutions, researchers identify those relationships which continue to shape the epistemological trajectory and applied focus of GIS (Harris and Weiner, 1996). With respect to questions of cartographic representation, or more accurately limits to representation, I-19 appeals to an existing body of literature on cartographic representation (see Wood, 1992; Harley, 1989, 1990; Mark, 1996). Besides investigating how GIS portrays reality, social theorists engage ethical questions associated with representing race, gender, class, and scale within a digital landscape (Harris and Weiner, 1996; Weiner et al., 1995).

Finally, the literature on democratization and participation recruits the technological legitimacy of GIS to promote the interests of new social movements, identity politics, and marginalized groups (Craig, 1996). To empower grassroots organizations, GIS & Society pursues research which acknowledges that GIS technologies are embedded in a series of political and

power relationships (Sheppard, 1995; Warren, 1995). By assuring equal access to GIS technologies, information, and related infrastructures, I-19 anticipates disempowered organizations may eventually achieve social, political, and economic parity.

During 'Phase 2', GIS & Society initiated a variety of socially informed or 'alternative' GIS applications.¹ I-19 applications challenge 'objective' GISs by constructing self-consciously political applications which promote the interests of non-dominant groups (Harris and Weiner, 1996). This alternative approach assumes the responsibility of politicizing the 'process' using a 'communicative' or 'contextual' approach (Aitken and Michel, 1995; Taylor and Johnston, 1995; Towers, 1997). For example, recent projects fuse GIS-technologies with emerging participatory research methods to address land reform in South Africa (Weiner et al., 1995), model environmental risk (Leitner et al., 1996), assess local perceptions of risk (Weiner et al., 1996), and promote equitable access to data (Craig, 1996; Brooks et al., 1996).

To facilitate the implementation of this new type of GIS, I-19 employs a full complement of participatory methods (e.g., oral histories, cognitive mapping, 'informatics', and transect walks), as well as emerging media such as the WWW, multi-media 'clips', and hypertext (Harris et al., 1995; Weiner et al., 1996; Aitken and Westersund, 1996; Leitner et al., 1996). The following section considers the epistemological implications associated with GIS & Society applications which use participatory research methods.

PARALLELING BEHAVIORALISM

Since the geography of GIS can not be divorced from the technology, the historical development of 'geography as science' may prove to be a useful guide for understanding 'GIS as science'. Indeed, the social implications of GIS can not be explored without engaging the many critiques of positivism (Pickles, 1997). However, I-19 confronts two deceptively simple alternatives: (1) Rejecting GIS technologies based on previous (humanist/structuralist) and recent (post-Marxist) critiques of logical positivism and (2) Co-opting and reconfiguring GIS technologies to accommodate other worldviews. Despite an early focus on the logical-positivist orientation of GIS (late 1980s), the creation of NCGIA I-19 illustrates a commitment within the

geographic community to seek innovative ways to re-design the traditional GIS model.

As Figure 1 suggests, this commitment has resulted in a significant parallel between the scientific developments of both geography and GIS, behavioralism. However, this is not to suggest the two sciences are identical. Indeed, the evolution of GIS, as a science, is a relatively recent phenomenon. Consequently, the diverse critiques of the GIS model can not so easily be subdivided into three separate communities, as is the case for the broader discipline. Yet, the influences of previous critiques, humanism and structuralism, are embodied within a diverse set of post-Marxist approaches which can broadly be described as post-structural and post-modern.

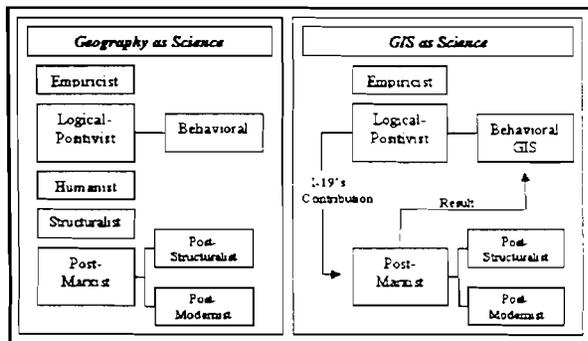


Figure 1.

By recognizing parallels between the two sciences exist, geographers concerned with the social implications of GIS will be able to comfortably position I-19 within (and between) the sciences of geography and GIS. It is within this context that GIS & Society applications represent the re-articulation of behavioralist principals. For example, I-19, like behavioral approaches developed in the 1970s, appeals to a general dissatisfaction associated with spatial science's logical positivist or 'objective' epistemology and nomothetic or 'explanatory' methodology. In doing so, both GIS & Society and behavioral geography annihilate the myth of 'economic man' (e.g., Saarinen, 1979) and reject the assertion geometric primitives (i.e., points, lines, and polygons) represent a single objective reality. Like behavioral geography, I-19 accomplishes this task by embracing two inter-related concepts: (1) space is experienced unevenly by individuals and (2) individuals 'act in' space and 'react to' spatial phenomena in uncertain ways (Cloke et al., 1991; Gold, 1980). As such, objective or ideal realities represented in traditional

GIS models should be modified for not only 'practical reasons' (e.g., better modeling), but political reasons. Consequently, recent attempts at creating an 'alternative' to GIS have resulted in a new behavioral GIS.

However, behavioral GIS faces an inherent contradiction. That is, behavioral approaches stake the epistemologically ambiguous position as serving as both a critique *and* extension of logical positivism. In its most simplistic form, behavioralism's 'neo-positivist' approach has been described using the unfortunate imagery of that of a 'bridge' between positivism and humanism (Gold, 1980; Cloke et al., 1991). However, the 'bridge' analogy fails to acknowledge the institutionally unstable position of any interstitial perspective.

Rejecting the objective reality of 'economic man', behavioral GIS constructs a neo-positivist approach, or 'limited' version of logical positivism, which explores four broad behavioral themes (1) Cognitions of territoriality, (2) Spatial decision-making behavior, (3) Stereotypical representations of space and peoples, and (4) Perception and the planning process (Gold, 1980). In concert, these themes uncover new ways of conceptualizing the subjective world around us based on local or 'peoples' knowledge, which have the potential to enrich and reconfigure the planning process. Within the context of behavioral GIS, new worlds or multiple realities are used to expand or 'qualify' the traditional GIS model in much the same way 'bounded rationality' influenced spatial science. Hence, I-19 proposes a behavioral GIS which expands current capabilities, challenges the authority of 'objective' GIS, and 'communicates' the subjectivity of everyday life. Within this neo-positivist framework, behavioral GISs open new avenues for popular participation and democratization.

To democratize the planning and policy processes, behavioral GISs offer a two-pronged approach towards increased participation: (1) Increasing access to traditional data sets and relevant hardware and (2) Constructing alternative data sets. First, I-19 participants propose a series of projects which increase access to traditional data (e.g., Craig, 1996; Brooks et al., 1996). While increasing access to GIS infrastructures is not an exclusively behavioral concept, grassroots 'GIS cooperatives', 'Information Free Nets', and community-based information exchanges provide groups the opportunity to challenge public policy by questioning the validity of traditional data and/or proposing alternative scenarios based on the same data using alternate GIS routines. Moreover, the 'other' perspectives and

perceptions of grassroots organizations benefit from the legitimacy afforded GIS technology. Hence, I-19 affects political change by promoting an increasingly competitive marketplace of GISs, which in and of itself is not necessarily alternative but representative of western capitalism. Ironically, the promotion of increasingly fragmented or marginalized political positions can be attributed to the very processes (e.g., post-Fordist accumulation) I-19 challenge (Harvey, 1989).

Besides access initiatives, behavioral GIS introduces alternate or non-traditional data-types into rational models. By offering alternate interpretations of everyday life which exist outside of the binary logic of the CPU, I-19 applications challenge current public policy and decision making processes. Within this context, the parallels between traditional behavioral geography and I-19 applications are most striking. The following discussion examines proposals to: (1) Employ new methods to collect alternate data based on local knowledge and (2) Expand the capacity of GIS to represent spatial realities.

To extract local knowledge, behavioral GIS uses an interdisciplinary mix of qualitative and quantitative methods which can be described as participatory research methods (PRMs). PRMs emerged from an activist community of academics and grassroots organizations which recognized local knowledge and politics matter (Park et al., 1993). Today, PRMs are increasingly employed in the belief participation results in better policy (Meyer, 1997; Park et al., 1993). Unlike standardized metrics, PRMs 'extract' complex sociological, ecological, and cultural knowledges which, unlike 'objective' data, underscores the ambiguity and conflict associated with everyday life (Stadler, 1995; Mayoux, 1995; Park et al., 1993). For the most part, the alternate realities of a behavioral GIS take the form of local cognitions of space. These understandings of space are based on cognitive mapping exercises, transect walks, oral histories, and other inter-disciplinary methods which detail how local spaces are experienced, perceived, and conceived by individuals, groups, and communities.

While PRMs provide important opportunities for sharing local knowledge, they may not always result in effective and equitable planning initiatives. First, participatory methods are consensus driven and inherently prone to misrepresenting 'reality' (Stadler, 1995; Mayoux, 1995). By privileging consensus, PRMs imply conflict amongst local actors is either unimportant or nonexistent. Secondly, the 'outsider' may be ill equipped to identify local power structures. Consequently, a failure to evaluate the local environment

may result in a misapplication and/or misrepresentation of data collected; thereby further marginalizing individuals or groups. Third, the associated issue of '*participation as legitimation*' needs to be considered. Consequently, researchers must consider the local dynamics of data collection (Harris et al. 1995). Despite the limitations of PRMs, the prospect of establishing new forms of GIS is both an exciting and necessary task.

While a behavioral GIS introduces new political perspectives, behavioralist approaches have been plagued by methodological concerns. Indeed, the methodological tension that exists between rejecting and co-opting logical positivism may explain the inability of behavioralism to operationalize its planning agenda. With respect to its positivist orientation, Bunting and Guelke (1979) question two behavioralist assumptions: (1) 'multiple realities' can be identified and adequately quantified and (2) perceptions of the environment are directly related to 'real world' behavior. However, it is important to note that while behavioralism may not have addressed these concerns to the satisfaction of the discipline's intellectual core, such concerns should not diminish the strengths and promise of behavioralism's interdisciplinary foundation (Saarinen, 1979; Downs, 1979). Given the nature of PRMs, behavioral GIS must address similar issues. In addition to a positivist critique, humanists believed behavioralism's explanatory focus was ill equipped to understand the human experience. Surely, the diversity associated with post-modernism and post-structuralism will prove equally challenging to proponents of alternative GISs. As these issues illustrate, epistemological 'bridges' have historically met limited institutional success within the discipline of geography.

Besides methodological debates within the discipline, behavioral geographies which advocate specific public policy are confronted with the strict logical-positivist bias of the planning and public policy communities (Yanow, 1990; Fox, 1990). Echoing this sentiment, Gold (1980) attributes behavioralism's frustrated policy initiatives to the sub-discipline's limited planning background. However, that is not to suggest behavioral projects have not successfully contributed to the formal public policy process. Indeed, the work of the 'Hazards School' has reformulated emergency and risk management policies around the globe. Unlike many communities of non-planners advocating policy change, behavioral GIS may be more successful given its technical foundation which inherently promotes the development of a liberal-planning ethos and expert class (Emel and Peet, 1989). However, the prospect of influencing public policy comes at the expense of re-

affirming the basic tenets of logical positivism, contributing to the growing atheoretical body of applied geographic literature, and the possibility of creating new techno-hierarchies within and between marginalized groups. The final section examines ways in which I-19 participants expand on traditional GIS models to promote the policy initiatives associated with 'other' geographies.

Behavioral GIS, Public Policy, & Political Practice

While much of the previous discussion has considered the epistemological and methodological parallels that exist between behavioralism and GIS & Society, I-19 applications have, unlike traditional behavioral geography, been influenced by many approaches, not only humanism. Indeed, the indirect influence of radical political economy and the practices associated with the identity politics of post-structuralism alter behavioral GISs intellectual landscape. The following discussion examines two ways in which behavioral GIS differs from traditional behavioral geography.

First, I-19—unlike earlier behavioral approaches—benefits from the availability of rapidly emerging technologies. This point is important because I-19 participants embrace new technological platforms (in addition to GIS) which may have the potential to capture, reconfigure, expand, and reposition the politics of marginal groups. For example, I-19 participants propose merging a wide range of technologies, such as the Internet, multimedia, and hypermedia, with existing spatial technologies to promote local knowledge, alternate realities, and virtually experience local worlds (Weiner et al., 1996; Krygier, 1996; Froeling, 1996; Aitken and Westersund, 1996). These new technologies are important because they offer the potential to capture and (re)present qualitative data in a manner unavailable to traditional behavioral geography.

While the promise of new technologies should continue to be explored, these new platforms may be detrimental to the existing political practices of grassroots groups.² For example, do new technologies replace existing political practices? Does the legitimacy afforded technology diminish the prospect for sustaining widespread political mobilization? Would technology provide a platform for individuals to promote ethically questionable political agendas? Or, should alternative GISs proposed by such individuals be given the same political 'weight' of grassroots organizations? Consequently, the integration of new technologies should be scrutinized with the same degree of skepticism

associated with the initial I-19 critique.

In contrast to higher tech approaches, Towers (1996) has provided an example of a CPU-less GIS which effectively combines sustained community mobilization to challenge the optimal siting routines of a government GIS. Using a variation on familiar PRMs, he recorded the local dialogue and actively participated in anti-power line initiatives in southern West Virginia. His research details how local groups used place-based knowledge to de-rail a high powered GIS. By integrating local knowledge with "AAA" maps, residents organized to create their own, and arguably more persuasive, GIS using felt tip markers, road maps, and photocopiers. While this example illustrates the utility and value of local knowledge within the context of a GIS framework, it also illustrates GIS is not an end, but a means. Using behavioral techniques, basic analytical principles of GIS (e.g., overlay, split, and buffer), and continued activism, Towers' (1996) participatory experiment illustrates how GIS technologies are inherently context dependent. Put more succinctly, the successful implementation of behavioral GISs requires sustained political practices.

CONCLUDING WITH BEHAVIORAL GIS

The purpose of this paper has been to explore the possible parallel that exists between human geography's neglected perspective, behavioralism, and recent GIS & Society applications. In the process, I have briefly outlined the I-19 program, as well as attempts by participants to develop a progressive alternative to 'objective' GIS. This discussion has focused on behavioral geography and behavioral GIS's shared themes, methodological questions, and epistemological ambiguity. While behavioralism's neo-positivist approach may be unable offer an institutionally viable alternative to traditional GIS, the prospect of establishing a series of explicitly political applications using behavioral techniques which supplement existing political practices is exciting.

Despite inherent barriers which prevent developing a wholly 'alternative' GIS, I-19 applications continue to champion the principles of 'participation' and 'democracy'. Yet, the project's competing intellectual landscapes, social theory and logical positivism, limit the political viability of behavioral GIS. However, that is not to suggest I-19's work is either irrelevant or unimportant.

Indeed, the project will undoubtedly become an integral component of our discipline. However, two areas should be more closely examined: (1) the specific impact of GIS technologies on existing political practices and (2) the accepted notion that technological parity, access to data, and/or GIS training promotes political empowerment.

In conclusion, the social theory community has the capacity to contribute a great deal to the development of grassroots GIS which supplement, reinforce, and expand the political practices of new social movements, identity politics, and marginal groups. Indeed, their re-articulation of behavioral geography underscores a commitment to these ideals and begins this constructive process. Yet, the majority of work has focused too narrowly on the technological limitations and epistemological bias of GIS and not enough on the further development and regulation of existing GIS packages (Openshaw, 1996). Or as Stan Openshaw (1996) suggested GIS & Society is '... a lot of fuss about very little that matters and not enough about that which does!' (p. D-54).

ENDNOTES

¹ 'Alternate GIS' refers to any GIS initiative which challenges the politically empowered positions of traditional GIS applications which portray a single dominant representation of people, place, and the environment (Harris and Weiner, 1996). As such, alternative GISs are intended to 'give voice' or empower the political agendas of 'all user groups' rather than a privileged or dominant segment of society which currently enjoys access to spatial technologies (Harris and Weiner, 1996, p. 4). Finally, alternative GISs may be characterized by alternate methods of data collection and the introduction of technologies which may expand the capacity of GIS to represent qualitative data.

² As Yapa's (1991) discussion of GIS and appropriate technologies illustrates, GIS technology has the capacity to negatively reconfigure local practices. While Leitner, McMaster, Sheppard, and Miller (1996) have recognized the potential of GIS technologies to reconfigure the dynamics of grassroots organizations, most proposed projects focus on the benefits associated with access to spatial technologies.

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