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INTRODUCTION: QUALITATIVE GIS: FORGING MIXED METHODS THROUGH REPRESENTATIONS, ANALYTICAL INNOVATIONS, AND CONCEPTUAL ENGAGEMENTS

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The title of this volume may, for some readers, suggest contradiction, incongruity, or juxtaposition. From its inception, this project has been met with some measure of all three, and with several persistent questions. Why qualitative GIS? Why a mixed methods approach? Why not just 'mixed methods GIS'? What is 'qualitative' in the context of a digital technology? In spite of such questions, efforts to integrate qualitative data and techniques with GIS have been building in recent years (Kwan and Knigge, 2006). Multimedia GIS approaches embed sketches, mental maps, audio, video, or photographs into GIS, often to represent non-cartographic forms of spatial knowledge, such as emotion (Al Kodmany, 2002; Kwan, 2007; Shiffer, 2002; Weiner and Harris, 2003). A growing number of researchers use GIS-based spatial analysis in concert with methodologies more familiar to qualitative researchers, such as focus groups, ethnography, interviewing, or participatory action, thus strengthening research findings by bringing together these different ways of knowing (Cieri, 2003; Dennis, 2006; Pain et al., 2006; Weiner and Harris, 2003). Others are developing ways to use GIS as part of a suite of analysis techniques drawn from qualitative research, whether by adapting GIS software or by using it to carry out inductive interpretive visualization (Knigge and Cope, 2006; Kwan and Lee, 2004; Matthews et al., 2005). Building upon these and other examples, this collection is intended to frame the emerging field of qualitative GIS, profiling the range of ways in which researchers and practitioners are integrating GIS with qualitative research.

Qualitative GIS is one of several approaches to geographic information systems that emerged in response to critiques in the mid 1990s that cast GIS as rooted in positivist epistemologies and most suited for quantitative techniques associated with spatial science (Lake, 1993; Pickles, 1995). These critiques also raised concerns about the difficulty of incorporating non-cartographic spatial knowledge into conventional GIS, and the ensuing potential for exclusion and disempowerment (Harris and Weiner, 1998; Sheppard, 1995). Responding to these critiques, many researchers have taken on GIS in new ways, working to incorporate multiple data and forms of knowledge, extend its representational capabilities to incorporate non-cartographic information, support quantitative and qualitative forms of analysis, and illustrate that multiple epistemologies may be part of GIS-based research. These approaches, including public participation

and participatory GIS, feminist GIS, and critical GIS, share an understanding of GIS as more than only quantitative in the forms of data that may be included, the analyses that may be supported, and the representational practices that may be fostered. These propositions have paved the way for qualitative GIS.[1]

At the level of the technology, it is increasingly simple in most desktop GIS software to store multimedia forms of spatial knowledge (photographs, sketch maps, narrative descriptions) in a GIS database or to hyperlink to them in other locations. But qualitative GIS is more than this. It stands apart from conventional GIS practices, as well as some of the approaches described above, because of the way it engages and conceives of GIS. Specifically, qualitative GIS assumes that geographic phenomena, their relationships, and their meanings are produced and negotiated at many different moments in GIS development and application: in spatial data, in data structures, in spatial analysis techniques, in the meanings fostered or foreclosed in GIS-based maps and applications. As this collection will illustrate, this assumption enables approaches to GIS that foster new collisions with qualitative analysis techniques, qualitative forms of data, and new conceptualizations of how meaning is negotiated in and through different aspects of GIS, including its software, data structures, and visualizations (cartographic and otherwise). Further, qualitative GIS is predicated upon multiple representations and modes of analysis, hybrid epistemologies, and researchers' critically reflexive efforts to draw on these multiplicities in ways that enable more robust explanation. In the remainder of this introductory chapter, we further detail this framing of qualitative GIS, outline some of its foundations and practices, and situate its origins in and contributions to geographers' long-standing reliance on mixed methods.

WHAT IS GIS AND WHAT CONSTITUTES 'QUALITATIVE'?

Identifying the emerging field of qualitative GIS, characterizing its differences from other approaches to GIS, and explaining its intellectual and political significance require some initial discussion of what is meant by 'GIS' and what is meant by 'qualitative'. GIS research and practice over the past decade constitutes GIS in multiple ways, and geographers' conceptions of qualitative research are similarly multi-faceted. This complexity produces many ways of bringing GIS and qualitative research together, and generates a diversity of sites and practices through which qualitative GIS might emerge.

For more than a decade, GIS research and critiques have conceptualized GIS in several ways (Pickles, 1995). Geographic information systems are, in one understanding, digital technologies for storing, managing, analyzing, and representing geographic information. Typically, such a system consists of data models; structures for representing geographic entities and their characteristics in digital form; data structures for storing these data; the data themselves (together with the ontologies, categorization schemes, and other elements that are part of these representations); software for query, retrieval, analysis, and mapping; and the hardware used to support these functions (Chrisman, 2002).[2] But simultaneously, GIS is understood as a collection of practices for producing and negotiating geographic knowledge through the representation and

analysis of spatial data. These practices are constituted by GIS software producers and the predominantly private sector industry that creates GIS software; geography and other academic disciplines that create and validate certain ways of encoding spatial data in a GIS, or using GIS in research; and the ever-diversifying 'community' of GIS users who create various GIS practices (Pickles, 1995). From this perspective, GIS is constituted through its representational, analytical, and epistemological approaches, all of which are understood to be shaped by the social, political, and disciplinary norms and institutional practices from which they emerge. This conceptualization of GIS owes much to the efforts of researchers to respond to claims about an 'inherent' positivism in GIS and explain how the social and political impacts of GIS might be produced (Pavlovskaya, 2006; Sheppard, 1995), as well as to feminist geographers' critical reflections upon the social, political, and institutional construction of knowledge in research (Lawson, 1995; Mattingly and Falconer Al-Hindi, 1995; Moss, 1995). Our notion of qualitative GIS is rooted in this hybrid understanding of GIS as technology, methodology, and situated social practice.

What, then, counts as 'qualitative' in our account of qualitative GIS? First, data or forms of evidence in research may be qualitative. Qualitative data are not simply those data that are non-numerical. Rather, we argue that data may be qualitative in part by virtue of the rich contextual detail they provide about social and material situations. Ethnographic interviews, for instance, tend to elicit responses from interviewees that describe conditions, relationships, and processes in detail. If we were to ask neighborhood residents how a local community development initiative has changed their neighborhood, some might describe changes to the built infrastructure, some might relate stories of how local residents' ability to impact neighborhood planning has changed, and others might describe how new residents have moved in, altering social relations in the neighborhood. The interviewees' responses are qualitative data because each narrative likely communicates rich descriptive detail about these shifting social and material conditions and processes.

But it is not only the presence of rich contextual descriptive detail that constitutes data as qualitative. Rather, data may also be qualitative if they contain or provide interpretations of the situations or processes that they describe. For example, in the ethnographic interview responses described above, the words chosen and the stories related by the interviewees will almost certainly evidence their own interpretations or the meanings they draw from particular events or conditions. One person may describe a newly constructed grocery store in the neighborhood as an example of positive changes that improve food security for low-income households in the community, while another may describe the same site and characterize it as a harbinger of gentrification – a potential threat to these same low-income households.

These forms of evidence are qualitative because they not only encapsulate a description of material change, but also offer interpretations of the meanings or impacts of that change.[3] As well, these data are qualitative because we can use them to understand situated and negotiated knowledge. That is, the different meanings developed in the two interviewees' characterizations of the grocery store are surely *also* being contested and negotiated among neighborhood residents, and so these two pieces of evidence provide a researcher insights into the social and political situations of the

neighborhood. Further, the researcher might examine the identities, experiences, and interests of the two interviewees to understand how these factors affect the meanings they provide – understanding how their respective explanations provide differently situated knowledges.

Thus, it is not only data that may be qualitative, but also analysis. That is, we also understand as qualitative those forms of analysis that are intended to draw out the situated interpretive detail of qualitative data. Analytical techniques such as grounded theory, discourse analysis, or content analysis, for example, work with qualitative forms of evidence to tease out their negotiated meanings and situated knowledges. Techniques such as coding (systematically categorizing data to identify themes and patterns) and the triangulation of multiple data sources are associated with qualitative research because they enable researchers to examine the contradictions, commonalities, and nuances of data that are rich in contextual and process-based detail. Practices such as the iterative or recursive examination of multiple forms of evidence in conversation with one another are also characteristic of qualitative analysis. And finally, as has been well developed in feminist researchers' writing on qualitative methods, a hallmark of qualitative analysis is its critical reflexivity upon the knowledge production process, specifically how research designs, forms of data, analysis techniques, disciplinary politics around epistemologies, and research relationships (such as the position of the researcher *vis-à-vis* the participants) tend to produce particular forms of knowledge, conclusions, politics, and power relations (Mattingly and Falconer Al-Hindi, 1995; Moss, 2003; Nast, 1994).

These understandings of GIS and qualitative forms of data and analysis foreshadow the multiplicity of engagements that might constitute qualitative GIS. We understand as qualitative GIS those approaches that seek to integrate qualitative forms of data into GIS, develop and support qualitative approaches to building knowledge and explanation with GIS, use GIS in research that emerges from multiple or hybrid epistemologies, and theorize previously unrecognized forms of social knowledge that may be present in GIS applications. These approaches are quite different in the way they bring together GIS and qualitative research, but all go beyond treating qualitative methods as 'add-ons' to essentially quantitative projects rendered in a GIS. Instead, they offer substantive shifts toward framing questions, collecting data, analyzing results, and representing findings in a truly integrated way. They intersect GIS and qualitative research with the goal of integrating multiple forms of evidence or ways of knowing, in order to explain *how* spatial knowledge, patterns, relationships, and interactions are produced, and with what sorts of social and political impacts.

POSITIONING QUALITATIVE GIS AS A MIXED METHODS APPROACH

The core commitment of qualitative GIS to *integrating* multiple forms of knowledge and the findings from various techniques is also at the heart of mixed methods research. This integrative way of building robust explanations in research is what positions qualitative GIS as a mixed methods approach. Distinguished from 'multiple methods' projects in

which different methods are practiced in parallel, *mixed* methods projects weave together diverse research techniques to fill gaps, add context, envision multiple truths, play different sources of data off each other, and provide a sense of both the general and the particular. In these approaches, insights gained from one technique, subject group, or data source may be examined recursively with other findings, and the path of research may be shifted in response (Cresswell, 2003; Jiang, 2003; Robbins, 2003). Different techniques may produce complementary explanations for phenomena, while other times (and equally valuably) they may produce contradictory explanations, leaving the task of understanding how and why these multiple versions of 'truth' intersect (England, 1993; Nightingale, 2003; Pavlovskaya, 2002; Rocheleau, 1995; Tashakkori and Teddlie, 2003). Mixed methods have been especially important in geography research, given the strong presence of research questions that require investigating interrelated human and physical processes, understanding cognitive and social processes, or examining interscalar relationships and processes. For example, accounting for the role of structures such as political economy or gender, while also understanding how and why they may play out differently in various contexts, is precisely the sort of integrative project that would necessitate relying on multiple forms of evidence and diverse epistemologies (ways of knowing).

Mixed methods approaches are rooted in several assumptions about knowledge and epistemologies in research that we suggest are also critical for qualitative GIS. First, mixed methods research tends to treat knowledge as always partial (no one can know the 'whole truth') and situated (knowledge depends on our situations and positions), whether it is the forms of evidence that researchers 'gather' or the knowledge that they produce in their analysis, interpretation, and representation of these data. From this perspective, differently situated knowledges and multiple ways of examining evidence can inform more robust understandings of complex processes or phenomena. Second, mixed methods research is premised on the notion that epistemology and methodology are related, but that this relationship is neither fixed nor singular. A realist, positivist, or constructivist epistemology need not prescribe a given methodological orientation, or only one approach (qualitative or quantitative). Indeed, some scholars contend that mixed methods research forwards unique hybrid epistemologies. Inherent in efforts to bring together multiple ways of knowing, they contend, is an assumption that multiple epistemologies may be valid ways of fostering understanding and explanation *for particular purposes and in specific circumstances* (Elwood, 2009a; Knigge and Cope, 2006; Maxcy, 2003). Finally, a great deal of mixed methods research rests on the assumption that the knowledge making we do in research is inherently political. The manner in which researchers interpret tensions or contradictions among data or methods and weave together different approaches has social and political consequences, especially because different forms of data, representation, and analysis are frequently afforded different levels of intellectual and political authority (Elwood, 2006; McCann, 2008; McLafferty, 2002). All of these propositions underscore the importance of researchers' critical agency in bringing together multiple epistemologies, modes of analysis, and forms of knowledge.

Emerging efforts to intersect GIS and qualitative research share many of these same commitments. The chapters in this collection illustrate the persistent methodological and epistemological multiplicity of qualitative GIS, and the authors' efforts to work

with GIS in ways that foster debate, multiple readings, and iterative interpretation, with sustained critical reflection upon methods and outcomes. Qualitative GIS involves conceiving of GIS as social and political practice, as discipline- and industry-inscribed ways of making knowledge, and as an assemblage of hardware, software, data structures, and procedures for working with digital spatial data. This conceptualization of GIS allows us to consider GIS-based knowledge production as something that is occurring explicitly and implicitly in several sites: spatial data, data structure, spatial analysis, cartographic representation, and the application or use of any of these phenomena in social and political practice. This multi-layered reading of how knowledge is produced in GIS suggests that the 'qualitativeness' of qualitative GIS may be advanced in many ways: by integrating qualitative and quantitative representations of spatial knowledge; by engaging multiple modes of analysis; and by incorporating GIS and digital spatial data in research that is premised upon multiple epistemologies.

Building upon these notions of multiple or hybrid epistemologies, qualitative GIS emphasizes the infinitely creative and political possibilities of bringing together multiple ways of knowing and making knowledge. Qualitative GIS is in part defined by purposeful and critical engagements with different aspects of *fixity* that may be part of GIS practice. Because of its basis in computing and the centrality of cartographic representation and analysis, GIS tends to 'fix', to pin down, knowledge, representations, or meanings at particular moments. A map, for instance, may be fixed at the moment of hard copy production, or fixed at the moment that it is presented with a specific interpretation, or fixed at the moment that it is witnessed or interpreted by a map user. Geographic knowledge is fixed when it is encoded into a GIS-based data structure as digital spatial data. Any spatial knowledge, relationship, or analysis must be able to exist in 'code space' – captured, represented, or expressed in programmable digital forms – if it is to be part of a GIS (Schuurman, 2006). But the varied practices that constitute qualitative GIS share an assumption that while some kinds of fixity are inherent and unavoidable in GIS, there exists a great deal of room for strategic deployments of this fixity, and for iterative adaptations of fixed representations or practices. Qualitative GIS critically examines the implications of these moments of fixity, and intentionally engages them for specific purposes. Imperative in this view is the understanding that any effort to fix meanings (or to disrupt them) is inherently power-laden, inseparable from the performative, representational, or analytical practices through which these meanings are produced.

From these conceptualizations of GIS and its knowledge-making possibilities, there are many ways that GIS-based knowledge production might *be* qualitative, and many positions in the layerings of GIS from which a qualitative GIS might be activated. Amidst the diversity of emerging practices, we discern three closely related approaches to qualitative GIS. Some of the interventions and innovations that mesh GIS and qualitative research focus upon GIS-based representations, including spatial data, maps, or other visual representations. Others focus upon the forms of analysis that can be carried out in connection with GIS, considering how it might be part of knowledge production practices more common to qualitative research. Still other forms of qualitative GIS are reflexively conceptual or theoretical, examining GIS through theoretical frameworks that can highlight or provide insight into qualitative forms of knowledge or knowledge

making that are part of GIS research and practice, yet often overlooked. This tripartite framing of qualitative GIS approaches specifies how this emerging field goes about developing different aspects of 'the qualitative' in research with and about GIS.

QUALITATIVE GIS: REPRESENTATIONS, ANALYTICAL INTERVENTIONS, AND CONCEPTUAL ENGAGEMENTS

As noted earlier, qualitative GIS owes much to more than a decade of creative and critically reflexive engagement with GIS on the part of diverse scholars, especially efforts to challenge assumptions about the association of GIS with quantitative methods or a positivist epistemology (Kwan, 2002; Pavlovskaya, 2006; Schuurman, 2000; Sheppard, 1995). These efforts to decouple assumed linkages between GIS and specific methodologies or epistemologies have created space for qualitative GIS because they began to rewrite the discipline-inscribed narratives that create and reinforce such associations. Thus, we open with a chapter in which Pavlovskaya offers such a rewriting. She positions GIS amidst epistemological struggles in geography, to show how and why its basis in cartography and computing became linked to spatial science and quantitative research, and traces the critiques that have enabled its reconstruction toward a wider range of methodologies and epistemologies. In challenging the assumed quantitative orientation of GIS, she shows that GIS in fact comprises complicated layerings of analytical, representational, and political practices that are more than only quantitative. Her discussion of openings for qualitative representations or ways of knowing foregrounds the approaches to qualitative GIS around which the following three sections of the text are structured: 'Representations', 'Analytical Interventions and Innovations', and 'Conceptual Engagements'.

The first section profiles qualitative GIS approaches that are advanced through representations, whether in spatial data, maps, or other visual representations that can be produced with or embedded into a GIS. Here, we understand representations in the context of a GIS to be those artifacts that stand in for some 'real world' geographic phenomena or relationships – a spatial dataset, a map, a single data attribute characterizing some geographic phenomenon – but also the multiple meanings negotiated through these artifacts. These approaches to a qualitative GIS involve stretching the existing limits of GIS-linked representations to incorporate qualitative information, as well as their untapped potential to incorporate and produce multiple forms of knowledge. A qualitative GIS is attentive to how these representations can produce openings and closures for researchers to include multiple politics, experiences of the world, or ways of engaging the same information.

Schuurman's chapter is premised on the notion that the spatial data in a GIS are themselves representations of characteristics in a complex 'real world'. She illustrates a persistent problem that emerges when these characteristics are represented as data, through measurements, categorization schemes, and attributes. In this representational moment of translation, important qualitative information is lost. The data no longer bear information about the original purpose of their collection, the institutional imperatives that may have influenced the categories chosen, or the nuanced semantics through

which 'real world' characteristics are encapsulated in their categorization schemes. These contextual details are imperative for understanding how spatial data may or should be analyzed, integrated with other data, or applied to inform research questions or policy decisions. Further, she develops an approach for including some of this valuable qualitative knowledge with spatial data, by expanding existing metadata structures that are used in spatial databases to incorporate information about the data.

Elwood focuses on a different representational aspect of GIS: maps as representations of complex spatial knowledge. She suggests that these representations are flexible and fluid, holding the potential for map makers and map users to interpret and reinterpret them to produce different meanings. As such, she suggests that these cartographic representations emerging from GIS practice are also constitutive. As maps are presented and performed, they shape the meanings, identities, and characteristics that individuals and groups may assign to individual places, and even produce the places that are there to know.

In Chapter 5, Corbett and Rambaldi also focus on the capabilities of GIS-based representations to encompass and foster multiple meanings, experiences, and knowledges. Drawing examples from community mapping initiatives in the global South, they show that the capacity of GIS to include diverse local knowledge and experiences may be expanded by weaving together GIS-based maps with an array of other visual media, including sketch maps, three-dimensional models, or paintings. They emphasize that the emergence of complex social knowledge from community mapping depends not just on these multimedia representations, but upon richly interactive processes of knowledge production in community mapping – such that participants examine, negotiate, and communicate their spatial knowledge and experiences together as they are producing maps, models, or other visual representations. Their account of community mapping contributes to a qualitative GIS repertoire through its critical attention to how multiple situated knowledges might be included and fostered through approaches to GIS that push beyond its conventional representational practices.

The second section focuses on qualitative GIS practices that are activated through the modes of analysis that are employed. These analytical interventions integrate GIS as part of the inductive interpretive techniques that are often used to tease out the situated contextual meanings of data, especially qualitative data. Qualitative GIS that is fostered through analysis tends to integrate multiple forms of data – maps, photographs, interview transcripts, field notes, sketches – in order to explore the differences, contradictions, and points of agreement among and between them. Here we see again a strong mixed methods influence, in the emphasis upon integrating multiple forms of evidence and multiple ways of knowledge to gain greater insights than might be possible through more singular perspectives or approaches.

One such analysis-rooted approach to qualitative GIS is Knigge and Cope's (2006) 'grounded visualization'. Grounded visualization is an iterative reflexive engagement with multiple forms of data (GIS-based spatial data and maps but also photographs, field notes, and other evidence) that integrates exploratory visual methods with analysis practices drawn from grounded theory. In their chapter for this collection, they show how a grounded visualization approach can support a

scale-sensitive analysis that is attentive to the scale of *spatial data*, the scale of *social and political processes*, and the scale of *cartographic representations*, in ways that foster greater insight into the situations that are evidenced in these data, processes, and representations. Drawing examples from a study of urban community gardening, they illustrate how the iterative, recursive engagement with differently scaled data, processes, and representations that is part of a grounded visualization approach can illuminate contradictions and tensions over 'vacant' urban land and develop stronger explanations of the institutional, political, social, and economic structures and relationships that produce them.

Knigge and Cope's chapter shows us that GIS may be integrated with qualitative analysis without necessarily altering GIS software itself. However, the companion chapter in the second section illustrates that software-level interventions are another productive way of integrating qualitative analysis techniques with GIS. Jung presents ways of incorporating qualitative forms of data *and* qualitative data analysis techniques into GIS software and data structures. He describes several techniques he developed to link GIS software with computer-aided qualitative data analysis software (CAQ-DAS), in this case using the package ATLAS.ti. Jung's innovations enable the georef-erencing of qualitative representations such as photographs or sketches so that they may be stored directly in GIS data structures, and storage of qualitative codes assigned by the researcher in the process of analyzing these data. These qualitative codes are used to connect the GIS software with qualitative data analysis software, such that the researcher has simultaneous access to the extensive data storage, representation, and analysis capabilities of both systems and can use these linkages to create analyses that are enmeshed at new levels.

The final section of the book outlines a third important strand of qualitative GIS: reflexive conceptual engagements with GIS research and application. These contribu-tions do not center upon the practical considerations of integrating qualitative data or analysis techniques with GIS, or on the everyday challenges of data collection, analysis, synthesis, and representation. Rather, they contribute to qualitative GIS by developing new conceptual frameworks that illuminate previously unexamined aspects of the knowledge and knowledge making that are part of GIS research and practice. Some of these conceptual engagements directly examine qualitative GIS, while others illuminate qualitative aspects of more conventional GIS research and practice, using new conceptual readings of GIS to recover and uncover some of its tacitly qualitative elements.

Aitken and Craine's chapter offers the latter sort of conceptual engagement, illustrating how reading GIS practice through new theoretical frames can reveal ways of knowing that are ever-present in GIS but have not typically been recognized. Their *affective geovisualization* technique examines GIS-based visual representations with concepts drawn from non-representational theory, to show how these visualizations activate non-representational ways of knowing, such as emotion or affect. Their way of engaging both the representational and the non-representational in GIS is a promising response to recent calls for qualitative methods to do more than only read representations (such as maps, interview transcripts, or photographs) as texts that negotiate meanings (Crang, 2005). Affective geovisualization also contributes to qualitative GIS by highlighting the productive flexibility of GIS for fostering multiple ways of knowing.

Wilson's chapter offers a reflexive conceptual engagement with qualitative GIS itself. He situates qualitative GIS within a genealogy of different critical GIS approaches, reading these trajectories with concepts from feminist theory and method, especially feminist studies of science and technology. This reading of qualitative GIS research enables Wilson to characterize its unique approach to knowledge production and research practice – a 'techno-positionality' that is attentive to the influence of institutional and disciplinary practices, to the active agency of the researcher within the ethnographic relationships of GIS in practice, and to the power and potential of reworking GIS software and data structures. Techno-positionality is a critically reflexive interaction with GIS that engages 'the machine' on its own terms, while simultaneously seeking to create openings for new ways of knowing and for overlooked forms of knowledge making that might be present in GIS research and practice. Wilson urges the development of a qualitative GIS that continues to interrogate how engagements with GIS in research are enabled differently through multiple positions, with different implications for knowledge creation, epistemology, social implications, and political outcomes.

The conceptual engagements with GIS that are developed in this third section return us to the multiplicities and hybridities that are central to qualitative GIS. The contributing authors in Section 3 treat GIS as a collection of analysis and representation techniques, as a set of research practices that are embedded in multiple disciplinary accounts of and struggles over knowledge making in research, and as a set of social and political practices that engage with the broader world. They show that GIS might be both studied and practiced from multiple epistemological perspectives, even within a single project. They point to multiple nodes where the 'qualitative' in qualitative GIS might be activated – in the socio-political or institutional contexts of GIS creation and use, the knowledge creation processes in which it is embedded, and the modes of analysis it is used to create. Finally, they demonstrate a hallmark of qualitative GIS that threads through all of the chapters in this collection: its persistent critical reflection upon the contributions and silences of different ways of knowing, and the social and political power of different forms of representation and analysis.

NOTES

1   Pavlovskaya's and Wilson's chapters in this volume develop in much more detail how qualitative GIS has emerged from these 'GIS and society' critiques, and how it may be situated within the new forms of GIS research and practice that have responded to them.
2   Of course, new developments such as online mapping and spatial services or wireless GPS enabled handheld devices are altering this understanding of what constitutes a GIS, and many of these new technologies offer exciting possibilities for integrating multiple qualitative representations of geographic knowledge into digital technologies. For more detailed discussion, see Miller (2006), Sheppard (2006), Goodchild (2007), and Elwood (2009b).
3   It is not only textual or linguistic forms of evidence that can be qualitative by virtue of containing negotiated interpretive meanings. A photograph, map, or other visualization may be qualitative by virtue of the interpretations of place produced by its creator, and those meanings may be advanced as users of the image continue to interpret and use it themselves.

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