Is GIS for Women?
Reflections on the Critical Discourse in the 1990s

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Despite the progress in critical GIS research in recent years [1], geographical discourse is still dominated by dualist thinking that understands GIS largely as a tool for quantitative or empiricist spatial analysis. This dualist understanding of geographical methods - which was partly fuelled by the fierce polemics between critical geographers and GIS users/researchers sparked off in the early 1990s - has represented GIS as a method antagonistic towards critical perspectives and made it difficult for geographers to conceive a role for GIS in critical geographic research. [2] Strangely, while feminist geographers have made significant contribution in refreshing our understanding of the role of quantitative methods in geographical research (e.g. Lawson, 1995; Mattingly and Falconer-Al-Hindi, 1995; McLafferty, 1995; Moss, 1995; Rocheleau, 1995), little has been written to date on the possible role of GIS in feminist research.

In this paper I reflect upon the implications of the critical discourse on GIS in the 1990s for feminist geographic research. I argue that the oppositional polemics of the debate have unintentionally marginalized the contribution of feminists GIS user/researchers and the potential of feminist perspectives for the development of feminist GIS practices. I emphasize the need to go beyond the conventional understanding of GIS as largely a quantitative practice and to recognize the potential of such realization for disrupting the rigid distinction between quantitative and qualitative methods in geographic research. Extending Gillian Rose's (2001) exposition on critical visual methodologies to GIS-created images, I suggest that GIS may be a possible point of departure for enacting critical visual methods in feminist geography. Further, I argue that acknowledging the critical agency and subjectivities of the GIS user/researcher, and the possibility for GIS to be practiced in a more reflexive manner than we previously thought possible would open up new discursive spaces for subverting dominant GIS practices and the power of the oppositional discourse (à la Gibson-Graham, 1994). While recent feminist and critical GIS literatures have explored some of these issues (e.g. epistemologies and reflexivity), the paper foregrounds the critical insights from these literatures in the context of feminist geographic research. It calls for the engagement of feminist geographers in resisting dominant GIS practices and in re-imagining alternative practices that are congenial to feminist epistemologies and politics.

Two Camps, Two Methods

For more than a decade or so, GIS has largely been understood in critical discourse by proponents and critics as an apparatus for positivist/empiricist science or quantitative methods (Schuurman, 2000; Sheppard, 2001). The trajectory of this critical discourse has unfolded in such a way that GIS methods have been understood by geographers largely in binary terms - positivist/quantitative methods versus critical/qualitative methods, and GIS/spatial analysis versus social/critical theory. As the boundary between GIS and critical geographies has emerged in the debate as impermeable (with exceptions such as Miller [1995] and Yapa [1998]), it has become difficult for most geographers to think about GIS in terms other than those invoked in the oppositional polemics of the 1990s. [3] As a result, the possibilities for alternative GIS practices and the critical potential of GIS for feminist research have seldom transpired to date (see also McLafferty and Pavlovskaya in this issue). It is therefore important to re-visit some of the questions raised in the critical discourse and explore how they may significantly bear upon feminist geography: Are GIS methods inherently positivist, empiricist, or quantitative? What ways of knowing and what kind of knowledge are possible through GIS methods, given its many limitations? Are there alternative GIS practices that are more congenial to feminist epistemologies and politics? These issues can be explored in terms of the kind of data, mode of analysis and representations GIS allow.

Although GIS can only handle digital information, recent development of digital technologies has greatly expanded the kind of information GIS can deal with. In other words, "digital" now includes a much wider array of representational possibilities than merely numerical or quantitative data than before. For instance, qualitative data such as digital photos, video and voice clips can be linked or incorporated into GIS. In studies using qualitative methods, subjects' handwriting, hand-drawn maps and other sketches collected through in-depth interviews and other ethnographic methods can also be incorporated in a GIS (e.g. Ismail, 1999; Weiner and Harris, 1999). The use of GIS therefore does not necessarily preclude the use of rich and contextualized primary data of subjects or locales, or the possibility to incorporate multiple views of the world or forms of local knowledges. [4]

Even when the original data used are largely quantitative in nature, transforming these data into various types of visual representations (e.g. 3D scenes) allows, to a certain extent, more interpretative mode of analysis than what conventional quantitative methods would permit. For example, I have used 3D GIS to trace and visualize women's life paths in space-time and explored the impact of the space-time rigidity of their daily activities on their spatial mobility and job location (Kwan, 1999a, b; 2002a). In another study using similar GIS-based 3D visualization methods, the racialized geographies of Portland, Oregon - which show the spatially restricted life spaces of African-Americans throughout the day - were revealed (Kwan, 2000a). When visual representations of individual daily space-time paths are presented together with an interpretative textual narrative that incorporates other information collected from personal interviews, rich and scale-sensitive spatial

stories about what a woman goes through in a particular day and her life situation can be told (Aitken, 2002; Kwan, 2000b). [5]

These examples not only suggest that GIS can be a useful method for illuminating certain aspects of women's everyday lives. They also indicate that GIS can accommodate modes of analysis other than conventional quantitative or spatial analytical methods (such as the interpretation of visual representations of quantitative or qualitative data). I therefore argue that GIS methods cannot be understood simply as quantitative methods or spatial analysis. Although GIS has limitations for revealing or representing the diverse and complex experiences of women's everyday lives, understanding GIS merely as a quantitative/ empiricist method and placing it at the polar opposite to critical geographies or qualitative methods forecloses many opportunities for feminist geographers to critically engage GIS. Instead, the representational possibilities of GIS can be used for enacting creative discursive tactics that disrupt the dualist understanding of geographical methods - where visual images (albeit generated and composed with digital technology), words and numbers are used together to compose contextualized cartographic narratives in geographical discourse.

The Critical Agency of the GIS User

A considerable amount of debate about GIS in the 1990s focused on the nature of GIS technology and its impacts on society. As some critics were preoccupied with the rampant commercialism and military deployment of GIS technology in particular contexts - especially in marketing and warfare - the dominant vocabulary invoked in the critical discourse tended to distantiate itself increasingly from the everyday experiences of many GIS users/researchers (Flowerdew 1998). The subject positions of critics in relation to their object of criticism, largely as outsiders of GIS technology, also render the critical discourse less effective in fostering a productive engagement with GIS users and practitioners (Pratt, 1996; Schuurman and Pratt, this issue). While criticisms about GIS technology and its adverse effects on society have alerted us of the problems associated with the use GIS technology and methods, the possibility for variable outcomes due to the critical agency of their users was seldom recognized. Instead, GIS technology was often treated as an over-generalized technological complex with a transcendent existence that appears to be immutable to localized social construction, individual resistance or subversion and other forms of contests that may shape the final outcome or societal impact of a particular use of GIS technology in a particular context.

As the intentionality, critical agency and subjectivities of those who actually use GIS were excluded from the picture, there is an element of technological determinism in this kind of argument that precludes the possibility for resistance or subversion of dominant practices. Only recently has this view been challenged for its neglect of the role of the actors and their complex interaction with social and political processes in the construction of particular GIS applications or practices. [6] As Nicholas Chrisman (1999) emphasized, it is important to recognize that GIS software and data

do not pre-determine the results. These resources can be put together in many ways for different purposes, and even the simplest GIS operations may permit the creation of many different products. This observation suggests that there are many possibilities for resisting dominant practices. For example, in a recent study on women's daily mobility and access to urban opportunities in Columbus, Ohio, I collected and used original data of individuals instead of relying on secondary area-based data. I developed dedicated GIS algorithms that are not readily available in GIS packages based on the specific research questions I sought to answer (Kwan, 1999a,b). The results were not primarily in the form of maps in the conventional cartographic sense. To a certain extent, tactics like these enable a GIS user/researcher to resist or subvert dominant GIS practices (albeit still within the constraints a particular GIS may impose; see also Pavlovskaya, this issue).

Based on the critical potential of the GIS user/researcher, I argue that we need a more diverse and nuanced reading of the complex relationships among GIS technology, data, social and political institutions, application contexts, and the agency of the actors involved. Such a nuanced critical reflection on GIS would open up many new, and perhaps more fruitful, theoretical and substantive questions about GIS technology and its critical potential for feminist geographic research. For example, how do users' gender and cultural identities interact with their GIS practices? How do their predispositions and subjectivities interact with the meaning and development of their GIS practices and productions?

Women and GIS in Feminist Perspectives

One limitation of the critical discourse on GIS in the 1990s is its failure to engage more deeply with feminist perspectives that bear significantly upon issues pertinent to GIS as a technology or geographical method. This, however, is not to deny that feminist works were drawn upon in the critical discourse (e.g. Aitken and Michel 1995; Roberts and Schein 1995; Sheppard, 1995), but to alert that analyses of the interaction between GIS and feminism have been incomplete. It is now important to recover the full thrust of feminist critiques of science and reflect upon the meaning of feminist research that uses GIS.

My argument here can be illustrated by looking at how some of the most influential feminist works were used in the critical discourse. For example, Donna Haraway (1991) and Liz Bondi and Mona Domosh (1992) were drawn upon to criticize GIS for the objectifying way of knowing and the transcendent vision - or the "god's eye view" - it enables (e.g. Goss, 1995; Lake, 1993). But as Haraway's (1991, p.192) proposition about the possibility for feminists to appropriate such "vision" and to subvert the views of the master subject was ignored, an important aspect of her cyborg manifesto has been lost in the critical discourse (Kwan, 2002b). In a similar vein, Nadine Schuurman (2002) cogently argued that John Pickles's (1993) use of Haraway in asserting that GIS imposes new systems of surveillance misses her emphasis on women's participation in science and technology. Schuurman identifies women's engagement with GIS as an important feminist strategy for "writing the

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cyborg" and warns that failure to do so can adversely impact upon gender equality in geography given recent enrolment and employment trends of women geographers (Schuurman, 2002; see also Hagger, 2000).

Another form of feminist engagement with GIS is to recover the voices of feminist GIS users/researchers who have spoken or can speak from their personal experience on these issues. For instance, Carol Hall (1996a, b) was perhaps the first GIS user/researcher who explored the link between the masculinist culture of computer work and the GIS lab, and the processes through which women's cultural identity is constituted in the dominant technology culture and in turn affects their attitude towards GIS technology. Regina Hagger (2000, p.3) talked about the discomfort she experienced in the GIS lab, which she described as "the domain of the white, middle to upper-class graduate geography students." Feminist voices like these tell us the struggles and life stories of women at various GIS sites but were somehow lost in the debate in the past decade or so. They should be recovered and placed at the center of the critical discourse. Further, studies conducted by feminist geographers using GIS methods provide helpful examples of how GIS may be used in feminist research (e.g. Hanson et al. [1997] on the effect of local context on women's occupational status, McLafferty and Tempalski [1995] on women's reproductive health in New York City; see also the discussion in Kwan, 2002b). The importance and relevance of these contributions by feminist geographers to the critical discourse should be fully acknowledged.

There is thus an urgent need to re-assess the critical discourse on GIS in the 1990s from feminist perspectives, to recover the work of women geographers, and to examine how feminist perspectives may renew our understanding of GIS technology and methods. Given the limited number of studies that have examined GIS technology and methods from feminist perspectives to date, there is a whole series of questions that needs to be answered. For instance, is GIS an inherently masculinist technology or social practice (as Bondi and Domosh [1992] asserted)? How particular subjectivities or gendered identities are constituted through routine interaction with GIS technology? Do women and men interact with or use GIS technology differently? Do they ascribe different meanings or have different attitudes towards GIS technology? How do racial or cultural identities mediate the interaction between gender and GIS technology? What are the implications of all these for feminist pedagogy and how this understanding is relevant to feminist GIS practices? How GIS technology may perpetuate gender inequality or occupational segregation in the information technology labor market and women's status in geography (Hagger 2000; Schuurman, 2002)?

Feminist Reflexivities and GIS

There has been considerable discussion on reflexivity by feminist geographers in recent years (e.g. England 1994; Gibson-Graham, 1994; Gilbert 1994; Moss 1995; Nast, 1998; Rose, 1997; Staeheli and Lawson, 1995). Feminist reflexivities attempt to problematize the relationships among the research, the researcher and the

researched, to acknowledge the partiality and positionality of the knowing subject, and to ameliorate the effect of the unequal power relations in academic research. Two aspects of reflexivity are particularly important in feminist research using GIS methods: (a) reflexivities with respect to the relationship among the research project, the researcher and the researched; and (b) reflexivities with respect to the creation, use and interpretation of the visual representations of GIS productions.

As conventional GIS methods often involve the use of secondary data that introduce considerable observational distance between the researcher and the researched, Sara McLafferty's (1995, p.438) remark that any sense of our connectedness with research subjects in these situations is false should be taken seriously. In addition, Dianne Rocheleau (1995) also warned that the ignorance of women's lived experiences is difficult to avoid when the disembodied vision of GIS/remote sensing becomes the privileged means of knowledge production. Feminist geographers who intend to use GIS in research therefore should pay special effort to deal with the difficulty of the detached and disembodied mode of knowing characteristic of conventional GIS practices. A possible reflexivity tactic is to complement secondary, quantitative GIS data with contextualized, qualitative information collected through ethnographic methods (see Pavlovskaya, this issue). But no matter what kind of data are used, it is important to "locate ourselves in our work and to reflect on how our location influences the questions we ask, how we conduct our research, and how we write our research" (England, 1994, p. 87). Feminist geographers using GIS methods need to be sensitive to the impact of GIS research on the lives of marginalized groups, to the power relations in the research process, and to the relevance and value of the knowledge produced to the researched.

Another aspect of reflexivity important to feminist GIS practices pertains to the creation, use and interpretation of the visual representations of GIS productions. As GIS users/researchers, feminist geographers need to reflect on how they create visual representations, what meanings do they intend to convey through these representations, and how these representations will be viewed and understood by the viewers in specific contexts. Gillian Rose's (2001, p.16) tenets for critical visual methodologies are particularly relevant in this context. She identified three sites which I think can be the focus for practicing feminist reflexivities when using GIS methods. First, there is the site(s) of production where we need to reflect on our own meaning-making tactics. Why certain GIS techniques are used? What kinds of truth does the representation claim? Second, there is the site(s) of the image itself. What knowledges are excluded from our GIS-produced visual representations? Do our particular GIS representations disempower their subjects. Third, there is the site(s) where the image is seen by various audiences. Whose views are not being acknowledged in our GIS representations? How to counter the tendency of our visual representations in producing the objectifying male gaze through subversive practices? Do our representations encourage alternative ways of looking (i.e. different spectator positions) and the production of alternative subjectivities other than that of the master subject? To what extent viewers can contend and renegotiate these meanings in a particular context?

Toward Feminist GIS Practices

Feminist geographers need to revisit the critical discourse on GIS in the past decade with respect to its implications for feminist geographic research and its potential impact on women's status in geography. The confrontational polemics that characterized much of the critical discourse do not seem to have effectively challenged or, more precisely, changed dominant GIS practices in geography to date. Recent critical GIS research has made considerable progress in going beyond the unproductive antagonism of the earlier phase of critiques and in providing a more nuanced reading of the complex relationships between GIS and society. But insights from this research have yet to bear significantly upon our understanding of the role of GIS in feminist and critical geographies.

New ways of thinking about GIS that can help open up new discursive spaces and inform feminist GIS practices are now sorely needed. It is important for feminist geographers to participate in the development of subversive strategies that disrupt the dualist understanding of geographical methods and destabilize dominant and/or masculinist GIS practices. I have described "feminist visualization" as a subversive practice elsewhere (Kwan, 2002b) based on the notion of "recorporealized vision" (Haraway, 1991; Nash, 1996; Nast and Kobayashi, 1996). Other tactics may include decentering conventional GIS methods through combining them with other methods so as to allow the incorporation of contextualized qualitative information; and deciding whether and how GIS methods and data should be used in a particular study based on the research questions instead of letting the technology and existing data determine what to study. The most important of all perhaps is to realize our potentialities as feminist GIS users/researchers in "performing the cyborg" and engaging in creative re-imagining of GIS practices congenial to feminist epistemologies and politics (Gregson and Rose, 2000; Pratt, 2000).

NOTES

[1] See, for example, Stuart Aitken (2002), Sarah Elwood (2002), Rina Ghose (2001), Trevor Harris and Daniel Weiner (1998), Peter Kyem (1999), Renee Sieber (2000), and Daniel Weiner and Harris (2002). These recent contributions have addressed critical GIS issues in ways that transcend the binarized polemics of the earlier period. These issues include the simultaneous empowering and marginalizing effect of GIS, representations of multiple realities and local knowledges, and the scale of power-knowledge.

[2] The lack of attention to the role of GIS in critical geographies at large is still apparent in recent years. The frequent use of the "metaphor of war" in geographical discourse seems to have perpetuated and exacerbated unproductive antagonism instead of leading to concrete actions that attempt to change GIS technology or practices (as elucidated by Schuurman and Pratt in this issue).

[3] This is so despite the progress in critical GIS research in recent years - perhaps because of the focus of this literature on GIS technology and its interaction with society, instead of on GIS as a method and its relationship with critical geographies (although all these areas share many common concerns).

[4] A significant development in recent years is the work by feminist geographers on qualitative GIS that attempts to incorporate women's knowledges and views into GIS (e.g. Ismail, 1999). Their work suggests that there are alternative ways for understanding GIS methods and its role in geographical research.

[5] There are several non-GIS-based examples of this kind of visual narrative. These include Derek Gregory's (1994, pp.251-252) rendering of the daily path of a docker in late nineteenth-century Stockholm using photographs and word-pictures; Matt Hannah's (1997) time-geographic diagrams of the life-path of a prisoner in the panopticon; and Paul Rollinson's (1998) graphical representation of the typical daily path of homeless men in Kansas City. These examples also suggest that GIS can be used to implement a poststructuralist/feminist time-geographic perspective (see my discussion in Kwan [2000c]).

[6] Recent writing on public participation GIS (PPGIS) and the social construction of GIS provides a much more nuanced understanding of the complex relationships between GIS and "society" (e.g. Craig et al., 2002; Elwood and Leitner, 1998; Ghose, 2001; Harris and Weiner, 1998; Masucci, 1999; Sheppard et al., 1999; Sieber, 2000).

References

AITKEN, STUART C. (2002) Public participation, technological discourses and the scale of GIS, in: CRAIG, WILLIAM J., TREVOR M. HARRIS AND DANIEL WEINER (Eds) *Community Participation and Geographical Information Systems*, pp.357-366 (London: Taylor and Francis).

AITKEN, STUART C. AND MICHEL, SUZANNE (1995) Who contrives the "real" in GIS? Geographic information, planning and critical theory, *Cartography and Geographic Information Systems*, 22, pp. 17-29.

BONDI, LIZ AND DOMOSH, MONA (1992) Other figures in other places: on feminism, postmodernism, and geography, *Environment and Planning D*, 10, pp. 199-213.

CHRISMAN, NICHOLAS (1999) Full circle: more than just social implications of GIS. Paper presented at the International Conference on Geographic Information and Society (GISOC'99), University of Minnesota, Minneapolis, MN, June 20-22.

CRAIG, WILLIAM J., HARRIS, TREVOR M. AND WEINER, DANIEL (Eds) (2002) *Community Participation and Geographic Information Systems* (London: Taylor and Francis).

ELWOOD, SARAH (2002) The impact of GIS use for neighborhood revitalization in Minneapolis, in: CRAIG, WILLIAM J., TREVOR M. HARRIS AND DANIEL WEINER (Eds) *Community Participation and Geographical Information Systems*, pp. 77-88 (London: Taylor and Francis).

ELWOOD, SARAH AND LEITNER, HELGA (1998) GIS and community-based planning: exploring the diversity of neighborhood perspectives and needs, *Cartography and Geographic Information Systems*, 25, pp. 77-88.

ENGLAND, KIM V.L. (1994) Getting personal: reflexivity, positionality, and feminist research, *Professional Geographer*, 46, pp. 80-89.

FLOWERDEW, ROBIN (1998) Reacting to Ground True, *Environment and Planning A*, 30, pp. 289-301.

GHOSE, RINA (2001) Use of information technology for community empowerment: transforming geographic information systems into community information systems, *Transactions in GIS*, 5, pp. 141-163.

GIBSON-GRAHAM, JULIE-KATHY (1994) "Stuffed if I know!" Reflections on post-modern feminist social research, *Gender, Place and Culture*, 1, pp. 205-224.

GILBERT, MELISSA R. (1994) The politics of location: doing feminist research at "home", *Professional Geographer*, 46, pp. 90-96.

GOSS, JOHN (1995) Marketing the new marketing: the strategic discourse of geodemographic information systems, in: JOHN PICKLES (Ed) *Ground Truth: The Social Implications of Geographic Information Systems*, pp. 130-170 (New York: Guildford).

GREGORY, DEREK (1994) *Geographical Imaginations* (Cambridge, Blackwell).

GREGSON, NICKY AND ROSE, GILLIAN (2000) Taking Butler elsewhere: performativities, spatialities and subjectivities, *Environment and Planning D*, 18, pp. 433-52.

HAGGER, REGINA L. (2000) GIS: Gendered Information Systems. Paper presented at the Annual Meeting of the Association of American Geographers, Pittsburgh, PA, April 4-8.

HALL, CAROL (1996a) Joining the conversation: feminist theory and GIS. Paper presented at the Annual Meeting of the Association of American Geographers, Charlotte, NC, April 9-13.

HALL, CAROL (1996b) Gender and GIS. Paper presented at the Initiative 19 Specialist Meeting on GIS and Society, National Center for Geographic Information and Analysis (NCGIA), South Have, Minnesota, March 2-5.

HANNAH, MATT (1997) Imperfect panopticism: envisioning the construction of normal lives, in: GEORGES BENKO and ULF STROHMAYER (Eds) *Space and Social Theory: Interpreting Modernity and Postmodernity*, pp. 344-359 (Oxford: Blackwell).

HANSON, SUSAN, KOMINIAK, TARA AND CARLIN, SCOTT (1997) Assessing the impact of location on women's labor market outcomes: a methodological exploration, *Geographical Analysis*, 29, pp. 282-97.

HARAWAY, DONNA (1991) *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York, Routledge).

HARRIS, TREVOR AND WEINER, DANIEL (1998) Empowerment, marginalization and community-integrated GIS, *Cartography and Geographic Information Systems*, 25, pp. 67-76.

ISMAIL, MUNIRA (1999) A multi-ethnic analysis of gendered space amongst rural women in Sri Lanka, PhD dissertation, Graduate Group in Geography, University of California, Davis.

KWAN, MEI-PO (1999a) Gender, the home-work link, and space-time patterns of non-employment activities, *Economic Geography*, 75, pp. 370-394.

KWAN, MEI-PO (1999b) Gender and individual access to urban opportunities: a study using space-time measures, *Professional Geographer*, 51, pp. 210-227.

KWAN, MEI-PO (2000a) Interactive geovisualization of activity-travel patterns using three-dimensional geographical information systems: a methodological exploration with a large data set, *Transportation Research C*, 8, pp. 185-203.

KWAN, MEI-PO (2000b) Human extensibility and individual hybrid-accessibility in space-time: a multi-scale representation using GIS, in: DONALD JANELLE AND DAVID HODGE (Eds) *Information, Place, and Cyberspace: Issues in Accessibility*, pp. 241-256. (Berlin, Springer-Verlag).

KWAN, MEI-PO (2000c) Gender differences in space-time constraints, *Area*, 32, pp. 145-156.

KWAN, MEI-PO (2002a) Quantitative methods and feminist geographic research, in: PAMELA MOSS (Ed) *Feminist Geography in Practice: Research and Methods*, pp. 160-173. (Oxford, Blackwell).

KWAN, MEI-PO (2002b) Feminist visualization: Re-envisioning GIS as a method in feminist geographic research, *Annals of the Association of American Geographers*, 92(4).

KYEM, PETER A. K. (1999) Examining the discourse about the transfer of GIS technology to traditionally non-western societies, *Social Science Computer Review*, 17, pp. 69-73.

LAKE, ROBERT (1993) Planning and applied geography: positivism, ethics, and geographic information systems, *Progress in Human Geography*, 17, pp. 404-413.

LAWSON, VICTORIA (1995) The politics of difference: examining the quatitative/qualitative dualism in post-structuralist feminist research, *Professional Geographer*, 47, pp. 449-457.

MATTINGLY, DOREEN AND KAREN FALCONER-AL-HINDI (1995) Should women count? A context for the debate, *Professional Geographer*, 47, pp. 427-435.

MCLAFFERTY, SARA (1995) Counting for women, *Professional Geographer*, 47, pp. 436-442.

MCLAFFERTY, SARA (2002) Mapping women's worlds: knowledge, power and the bounds of GIS, *Gender, Place and Culture,* 9(3).

MCLAFFERTY, SARA AND TEMPALSKI, BARBARA (1995) Restructuring and women's reproductive health: implications for low birthweight in New York City, *Geoforum*, 26, pp. 309-323.

MASUCCI, MICHELE (1999) Virtuality and reality: "navigating" the power relationships within geographic/information technology partnerships to discover the terrain of empowerment. Paper presented at the International Conference on Geographic Information and Society (GISOC'99), University of Minnesota, Minneapolis, MN, June 20-22.

MILLER, ROGER (1995) Beyond methods, beyond ethics: integrating social theory into GIS and GIS into social theory, *Cartography and Geographic Information Systems*, 22, pp. 98-103.

MOSS, PAMELA (1995) Embeddedness in practice, numbers in context: the politics of knowing and doing, *Professional Geographer*, 47, pp. 442-449.

NASH, CATHERINE (1996) Reclaiming vision: looking at landscape and the body, *Gender, Place and Culture*, 3, pp. 149-169.

NAST, HEIDI (1998) The body as "place": reflexivity and fieldwork in Kano, Nigeria, in: HEIDI NAST AND STEVE PILE (Eds) Places Through the Body, pp. 93-116 (London: Routledge).

NAST, HEIDI AND KOBAYASHI, AUDREY (1996) Re-corporealizing vision, in: NANCY DUNCAN (Ed) *BodySpace: Destabilizing geographies of gender and sexuality*, pp. 75-93 (New York, Routledge).

PAVLOVSKAYA, MARIANNA E. (2002) Mapping urban change and changing GIS: other views of economic restructuring, *Gender, Place and Culture*, 9(3).

PICKLES, JOHN (1993) Discourse on method and the history of discipline: reflections on Dobson's 1983 Automated Geography, *Professional Geography*, 45, pp. 451-455.

PRATT, GERALDINE (1996) Trashing and its alternatives, *Environment and Planning D*, 14, pp. 253-256.

PRATT, GERALDINE (2000) Performativity, in: RON JOHNSTON, DEREK GREGORY, GERALDINE PRATT AND MICHAEL WATTS (Eds) *The Dictionary of Human Geography*, p. 578 (Oxford: Blackwell).

ROBERTS, SUSAN M. AND SCHEIN, RICHARD H. (1995) Earth shattering: global imagery and GIS, in: JOHN PICKLES (Ed) *Ground Truth: The Social Implications of Geographic Information Systems*, pp. 171-195 (New York, Guilford).

ROCHELEAU, DIANNE (1995) Maps, numbers, text, and context: mixing methods in feminist political ecology, *Professional Geographer*, 47, pp. 458-466.

ROLLINSON, PAUL (1998) The everyday geography of the homeless in Kansas City, *Geografiska Annaler B*, 80, pp. 101-115.

ROSE, GILLIAN (1997) Situating knowledges: positionality, reflexivities and other tactics, *Progress in Human Geography*, 21, pp. 305-320.

ROSE, GILLIAN (2001) *Visual Methodologies: An Introduction to the Interpretation of Visual Materials* (London: Sage).

SCHUURMAN, NADINE (2000) Trouble in the heartland: GIS and its critics in the 1990s, *Progress in Human Geography*, 24, pp. 560-572.

SCHUURMAN, NADINE (2002) Women and technology in geography: a cyborg manifesto for GIS, *The Canadian Geographer*, in press.

SCHUURMAN, NADINE AND PRATT, GERALDINE (2002) Care of the subject: feminism and critiques of GIS, *Gender, Place and Culture*, 9(3).

SHEPPARD, ERIC (1995) GIS and society: towards a research agenda, *Cartography and Geographic Information Systems*, 22, pp. 5-16.

SHEPPARD, ERIC (2001) Quantitative geography: representations, practices and possibilities. *Environment and Planning D*, 19, pp. 535-554.

SHEPPARD, ERIC, COUCLELIS, HELEN, GRAHAM, STEPHEN, HARRINGTON, JAMES W. AND ONSRUD, HARLAN (1999) Geographies of the information society, *International Journal of Geographical Information Science*, 13, pp. 797-823.

SIEBER, RENEE (2000) Conforming (to) the opposition: the social construction of geographical information systems in social movements, *International Journal of Geographical Information Science*, 14, pp. 775-793.

STAEHELI, LYNN AND VICTORIA LAWSON (1995) Feminism, praxis, and human geography, *Geographical Analysis*, 27, pp. 321-338.

WEINER, DANIEL AND TREVOR HARRIS (1999) Community-integrated GIS for land reform in Mpumalanga Province, South Africa. Paper presented at the International Conference on Geographic Information and Society (GISOC'99), University of Minnesota, Minneapolis, MN, June 20-22.

WEINER, DANIEL AND TREVOR HARRIS (2002) Community participation and geographic information systems, in: CRAIG, WILLIAM J., TREVOR M. HARRIS AND

DANIEL WEINER (Eds) *Community Participation and Geographical Information Systems*, pp.3-16 (London: Taylor and Francis).

YAPA, LAKSHMAN (1998) Why GIS needs postmodern social theory, and vice versa, in: DAVID RUXTON FRASER TALYOR (Ed) *Policy Issues in Modern Cartography*. (Oxford, Elsevier Science).