

Capturing

Forthcoming, 2014 in *The SAGE Handbook of Human Geography*.

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Wilson, Matthew W., and Sarah Elwood. forthcoming, 2014. "Capturing." In *The SAGE Handbook of Human Geography*, edited by Roger Lee, Noel Castree, Rob Kitchin, Victoria Lawson, Anssi Paasi, Chris Philo, Sarah Radcliffe, Susan Roberts and Charles Withers. London: Sage.

Introduction

Capture is fundamental to human thought, action, and culture. Traditions of storytelling aggregate captured human experiences, just as these captured moments enable institutions of human knowledge. Within human geography, the term takes on a particularly lively meaning. To draw a line is to capture a space, conceptually, metaphorically, physically. The concept of capture draws in the troubled histories of the instrumentation of Geography, for instance in state-making projects of colonialism and militarism. Indeed, the mapmaking sciences inherit this tradition of capture and struggle continually with its implications (see the debate surrounding the Bowman Expeditions).

However, capture is also constitutive. It not only serves to control and discipline, but it also enables the creative impulse. Therefore, capture and create are humanist directives. And the basic human capacity to map is perhaps the greatest way in which to capture and create. Take three examples of the ways in which human geographies are currently being captured through mapmaking: map art, mapping user-generated content, and collaborative, crowdsourced mapping. In *Everything Sings*, Denis Wood (2010) demonstrates the mapmaking process of observation, selection, symbolization, while presenting a powerful critique of the representational prowess of the mapmaker. The maps he and his students

produce of a neighborhood in Raleigh, North Carolina, document the forgotten everyday and mundane, reanimating our cartographic senses through geovisualizations of things not traditionally recognized as mapping-worthy, such as the potential paths of squirrels moving about in neighborhood spaces. Relatedly, Alexis Baghat and Lize Mogel (2008) show how cartography might constitute reaction, in *An Atlas of Radical Cartography*. Experiences and observations are captured, such that new creations are possible. For instance, contributor Pedro Lasch's artistic map of North, Central and South America tries to visually capture the un-capturable geohistorical and sociocultural complexity of 'Latindidad' – an abstraction that constitutes neither identity, nation, nor race yet bears aspects of all three.

A second example: the Floating Sheep collective and Columbia University's Spatial Graphics Lab motivate yet a different reading of capture in mapmaking. Here, these researchers examine social-spatial phenomena using Internet-based content such as the locations of Flickr photos and geo-enabled 'Tweets'. These user-generated geographies are largely collected in absence of direct engagement with the individuals that populate the study. Their spatial traces, for instance left by individuals uploading photos or 'Tweeting', are aggregated to create sweeping visualizations of human activity, making visible the more mundane practices of the everyday and drawing out our now ubiquitous relationship with the Internet.

Finally, OpenStreetMap (OSM) demonstrates the possibility of collaborative, crowd-sourced mapping, where individuals submit and edit geospatial data and the collective works to evaluate content for public consumption. OSM, like Wikipedia, has served to challenge more mainstream content providers. For instance, as Google rolls out new content licensing agreements for the popular Google Maps content, some dot-com companies are moving to OSM content to avoid user fees. And while some in the GIScience industries critique the

possibility of attributal and positional accuracy, others tout the self-correcting processes of crowd-sourced, Internet-based content (see the conversation with Michael Goodchild and Andrew Turner in Wilson et al. forthcoming).

Each of these three types of capturing highlights different problematics in mapmaking. The first demonstrates the sustaining critical energies of the critical cartography movement as a perpetual, creative suspicion of the power of the line. In doing so, cartographers like Wood and Mogel take up conventional cartographic techniques; however, they enroll these not to cloak the decision-making of map design, but rather, to render these design decisions as visible and explicitly saturated with political intent. To capture in mapmaking, then, is to make political. The second example employs another notion of capture, to visualize user-generated, web-based content, understood as volunteered or 'volunteered' (the notion of volunteering in this context is fraught; much of the web-based geographic content deemed 'volunteered' has been captured from individuals without their knowledge and consent. See Harvey forthcoming). These neogeographies, when aggregated, capture the weight of everyday movements for some of us, while remaining silent on those under-connected others. The third example presents capture as radical action (at least initially), to subvert mainstream holders of spatial knowledge by collectivizing it, understood as democratic or 'democratic'.

Here, we argue that the nature of (cartographic) capturing for geographers is in flux, being transformed through new collisions of technologies and epistemologies, and new modes of capturing/knowing the world through spatial data. Indeed, in all this, we are in the midst of an ongoing new inhabiting of GIScience by human geographic theory and practice. For instance, the lines of opposition between the sovereign map and populist map are no longer so neatly drawn, as populist maps created by neogeographers are largely doing so with

the new mapping juggernauts (Google, Apple, Microsoft, and an evolving Esri). In this new normal, we draw attention to contemporary moments of capture in mapmaking, recognizing the deep traditions of capture that are central to remote sensing technologies as well as land surveying, geodemographics, and communication technologies more generally. Indeed, mapmaking is inextricably bound to a project of capturing, even as the dynamics of participation are shifting. However, this chapter also suggests that capturing, while perhaps best figured by mapmaking technologies, is actually inherent to all practices of knowledge production, representation, and pedagogy.

In what follows, we begin by tracing the contemporary moment of mapmaking and critical human geography, to rethink the ‘in the beginning there was Friday Harbor’ origin story of the current critical mapping movement (a crutch we are guilty of using in our own writing; for a history of the GIS & Society tradition, see Schuurman 2000)¹. Then, in three sections, we consider the more central elements of capturing in mapmaking – representation/data, analysis/interpretation, and production/collaboration/participation/communication – to examine how these act as hinges between mapmaking and critical human geography. We conclude by offering our perspective on a renewed agenda that draws in the work of critical GIS as well as the digital humanities, software studies, and a growing critical technology studies within Geography.

¹ While prior engagements between critical human geography and cartography and GIScience were in evidence before then, many framings of the origins of critical GIS begin with a 1993 workshop in Friday Harbor, Washington, sponsored by the National Center for Geographic Information and Analysis. A collection of papers in *Cartography and GIS*, edited by Sheppard and Poiker (1995) speaks to many of the contributions, participants, and research agenda items that emerged from this gathering.

1. Junctures

My argument is that a certain form of critical spirit has sent us down the wrong path, encouraging us to fight the wrong enemies and, worst of all, to be considered as friends by the wrong sorts of allies because of a little mistake in the definition of its main target. (Latour 2004, 231)

As research around critical GIS becomes a more permanent fixture within the discipline – represented perhaps by growing number of universities with faculty and graduate students advancing this subfield – the question of the appropriate target of critical sensibilities is productively raised. The opportunity becomes to reflect upon the origin stories we tell ourselves, to reconsider and renew the critical impulse, as urged by Sheppard (2005). As Latour argues above, those that take up the critical banner must be mindful of the implications of critique.

Therefore, we begin our approach to the question of capture from the perspective of critical GIS in order to draw upon its distinct but related entanglements with critical cartography. Indeed, moves to interrogate the knowledge/power effects of representation so central to critical cartography are also core to the critical GIS movement, adding questions of objectivity, neutrality, collaboration, participation, and problematization of automated spatial systems of capture, surveillance, and control. We view the contemporary critical mapping movement as evidence of an intermingled practice and scholarship drawing together critical cartography and critical GIS. Therefore, in this section, we re-read the GIS & Society tradition through the lens of contemporary mapmaking moments, to examine the criticality of mapping from a broader perspective than is perhaps typical in critical GIS to date.

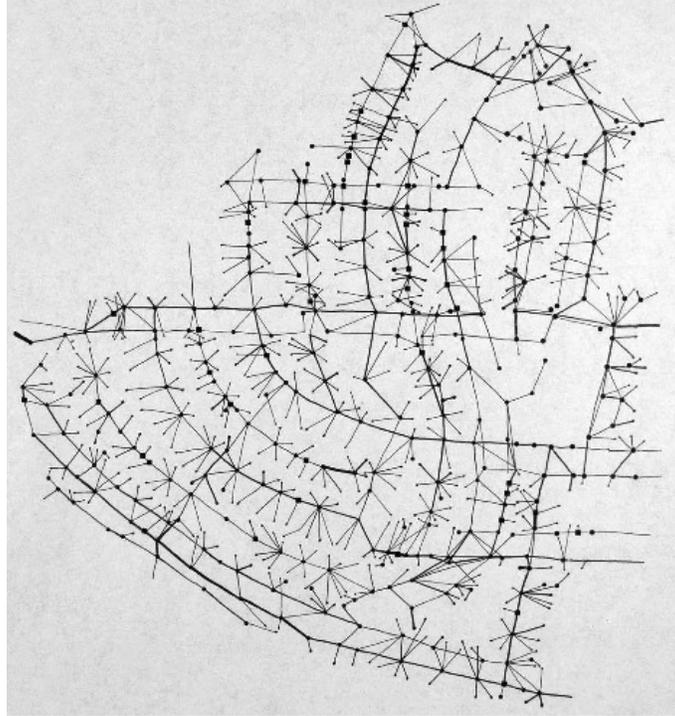


Fig. 1. “Overhead Atlas” or “Squirrel Highways”, from *Everything Sings: Maps for a Narrative Atlas* by Denis Wood, Siglio, 2010. © Siglio

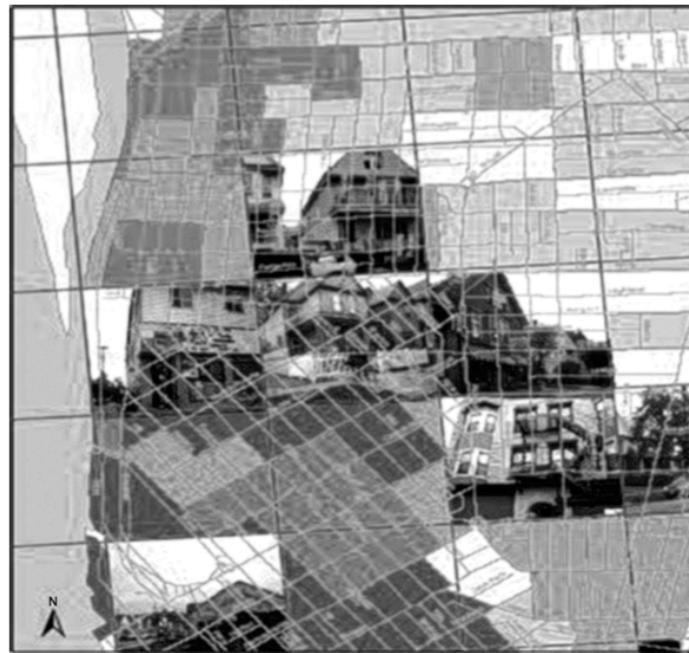


Fig. 2. “Using the imagined grid to visualize qualitative images: neighborhood images with thematic map of demographic data” by Jin-Kyu Jung from “Software-level integration of CAQDAS and GIS” in M. Cope and S. Elwood (Eds), *Qualitative GIS: A Mixed-Methods Approach*. Sage, 2009.

In *Squirrel Highways*, above (Fig. 1), Denis Wood produces a map using rather conventional mapmaking techniques: observation in the field followed by geographic representation. And yet, if this map is placed in front of students in a contemporary mapmaking class, they might likely consider it more a piece of art than a map. For these students, mapmaking is all about data; the representation is something that Google or Esri just ‘does’. Similarly, maps produced by Jin-Kyu Jung (2009), in what he calls computer-aided qualitative GIS (Fig. 2), serve to dislodge more conventional understandings of cartographic representation. The maps produced enact juxtapositions that rub against Euclidean spatial analysis, by embedding interpretation (in this instance in the form of photographs taken by children to represent their meanings of ‘community’) directly within the geospatial database. These manifestations play with the clean boundaries of geospatial science and representation, by making visible that these very boundaries – clean and neat, computational, accurate or inaccurate – are *produced*.

When the integrative, boundary-questioning intellectual work of critical human geography collides with mapmaking, new knowledges and meanings are produced. These contemporary moments are perhaps a far cry from the staunch claims to epistemological irreducibility in the early 1990s (Lake 1993, Pickles 1995), for better or worse. Indeed, the newest critical mapping work at the intersection of GIScience and critical human geography should be read alongside nearly any post-enlightenment movement within scholarship. In other words, the histories of the critical mapping tradition perhaps begin too recently. Productive parallels can be drawn from the trenches of radical geography in the 1960s and 1970s, from Bill Bunge and Peter Taylor, from feminist geography and methodological

critiques, from Eric Sheppard and Vicky Lawson and critiques of quantification, among others.

Our point is that the critical human geography and mapping nexus is substantively different today than in the late 1990s or early 2000s. New narratives of the ‘first encounter’ between traditional geographical capturings and their critical reworkings allow us to discern a much longer trajectory of epistemologically and politically complex geographical encounters with capture. Consider, for example, the emphasis on place, materiality, and power/knowledge that occurred in the context of a mainstream quantitative and nomothetic milieu in the discipline of the 1960s. Indeed, prior to the first shots of the ‘GIS wars’ of the 1990s, radical geographers advocated engagement as a strategy for knowledge production. Bill Bunge, trained at the University of Washington at the center of the quantitative revolution, emerged as an advocate of community-centered learning. In reflecting on *Fitzgerald* (1971), he quips on the scholarly work of that time:

We are in the computer center watching the printout to see if it is raining outside. If the ghetto burns down we will not know it because it does not show on the symap. If it is not in the census, it is not sensed. If remote sensing is efficient, and it is, why does it follow, and it does not, that intimate sensing is not? We have become so situational that we have lost sight of the site unless we can cite it in a senseless census. (Bunge 1974, 488)

Bunge sought to raise the importance of place, not as a return of the areal studies or regional geographical traditions that sparked the quantitative revolution (see Taylor 1976), but as a renewed commitment to the places of study as sites of theoretical emergence and relevance. He pushes back on forms of capture that are not experiential, with a deep suspicion of the mainstays of the scientific side of the discipline: remote sensing and the census. This

rethinking, in Heyman's (2007, 100) words, brought about "a geography explicitly concerned with progressive politics, on the one hand, and a critique of the positivist assumptions of quantitative geography, on the other."

Additionally, calls for a materialization of political geography by Peter Taylor (1982) can be seen as a foreshadowing of a particular ethic of the GIS & Society agenda. And while within this agenda, Taylor is perhaps most credited for his "GKS" article of 1990 that sparked the Openshaw-Taylor debates (Openshaw 1991, 1992; Taylor and Overton 1991), his work in the late 1970s and early 1980s sought to re-narrate a political geography "as part of a wider concern for the overall structure of society and economy". Here, we can then trace the placing of GIS as an object of study – as one that has a social-political history – to these earlier moves to materialize human geographic inquiry. For instance, some argue like O'Sullivan (2006) that the political economy of spatial technologies has yet to be fully taken up (see also Leszczynski 2012).

Inquiry itself was shifting, necessitating new positions on method and epistemology. And again, we can look slightly outside of the GIS & Society tradition to see how these concerns were rippling across human geography. Lawson (1995, 450), a feminist economic geographer, in a special issue of *The Professional Geographer*, "Should women count?"², set out a challenge to wholesale rejections of particular methods, writing "that qualitative methods are no more essentially feminist than quantitative techniques are essentially masculinist." Indeed, counting could be used as a basis for understanding difference. Eric Sheppard, a key proponent of and oft commentator on the GIS & Society agenda, disentangles method from epistemology in ways that surely impacted his contributions and critique of GIS:

² See also Mattingly and Falconer-Al Hindi (1995), McLafferty (1995), Moss (1995), and Rocheleau (1995).

Many of my cohort chose between them [quantitative and socialist revolution], as have many since, but I clung to the unfashionable belief that no such choice was necessary; that “scientific” epistemologies and quantitative techniques need to be analyzed for their social biases, and harnessed to political ends, rather than exorcised as signs of the devil’s work.

(Sheppard 1995, 283)

Certainly, that quantitative work could be explicitly political sets the stage for a similar move with GIS, providing the foundation for an engaged critical GIS. And within the mapping traditions more generally, this meant opportunities for forms of capture that were, in the least, cognizant of the implications of mapping or, further, politically attuned as a medium to express protest, to struggle, and to represent the unrepresented.

Of course, this is not an exhausted treatment of the various disciplinary shifts that prop up a contemporary critical mapmaking agenda. But we offer it to highlight the ways in which earlier and contemporary movements toward a critical human geography provide an important setting for the emergence of a critical GIS, as well as the most current critical reworkings of geographical capture evident in qualitative GIS, the geoweb, new forms of map art, neogeography, and a host of other emergent phenomena or practices. The theoretically-rich interrogation of and engagement in place, the raised importance of the materiality of society, and a considered enrollment of methods as an expression of politics all situate our narration of contemporary intersections between critical human geography and mapmaking. In what follows, we examine these intersections as they are currently expressed in representation and data, analysis and interpretation, and production and participation.

2. Representation and Data

Within the mapping disciplines, the concept of representation connotes both product and practice. GIS use often entails creating physical and digital map products as well as engaging in representational action. Indeed, representation is an ethic (if not *the* ethic) of the mapping tradition – a fundamental principle of conduct. And yet, representation is an always limiting practice and product: certain things/people/stuff are made visible, while others are made invisible. This particular crisis of representation, understood as the partiality of all mapping processes, haunts mapmaking even as it also enables its critical edge. To select, to make visible, to draw a line, is to constitute, to render distinct, to make special. Maps, as representations, draw us and draw us in, causing us to lean forward, to make connections, to find ourselves. I am, here.

As perhaps the smallest unit of representation, data informs and forms these practices. Data matter and have matter (Wilson 2011). They are material, discursive, significant as well as banal. For instance, techniques of remote sensing create data, by systematically capturing characteristics about Earth's surface from a distant, often disembodied vision. This vision can be passive or active, either capturing reflectance of sunlight or emitting signals that are then captured upon return. The census is also a technology that captures, one technique of a whole geodemographic pursuit that continually tracks a population: its habits and patterns, its stasis and mobilities. Here, these forms of capture might be understood as a scientific process of objectively representing the world. However, as Kitchin et al. (forthcoming) argue, different epistemologies of mapping are possible and perhaps more appropriate: “mappings unfold through a plethora of contingent, relational and contextual practices” (14). Indeed, even remote sensing, a rather rigid interplay

of scientific instrumentation, can be rethought through notions of contact, touch, and sensation (see McCormack 2010).

More simply put, how a mapmaker conceptualizes and approaches data influences the whole endeavor. Lou Cabeen, writing about a series of artworks entitled *Apparition Series* (Fig. 3), describes her representational process:

These drawings are made with gold pencil and graphite on USGS topographical maps. They document apparitions of the Virgin Mary that have occurred in the continental US since 1945. The lattice-like circles radiate from the precise locations of these apparitions. I often juxtapose opposites in my work in this case the scientific mapping of the known with the numinous experience of vernacular devotion. (2009)



Fig. 3. “Apparition Series: Watsonville West”, Lou Cabeen, 2009.
Photo credit: Lynn Thompson

Cabeen is certainly working with data. She manipulates the precise location of apparitional sightings on the surface of USGS topographic maps, themselves a familiar product of centuries-long surveying techniques. These data capture. They hold within their bits and

bytes: field notes and lines, the diverse knowledges of expertise and experience – spiritual, observational, and scientific in one.

However, representational techniques also invoke the non-visual: producing the sonorous, the tactile, and the emotional/affectional. Teri Rueb works in the media of sound and GPS. In her 2007 installation of *Core Sample* (Fig. 4), she describes the contours of this more-than-representational work in Boston:

Core Sample is a GPS-based interactive sound walk and corresponding sound sculpture that evokes the material and cultural histories contained in and suggested by the landscape of Spectacle Island. [...] a former dump and reclaimed landfill park visible just off the coast. The two sites function dialogically, questioning what is seen versus what is not seen, what is preserved and recorded versus what is suppressed and denied. (2007)

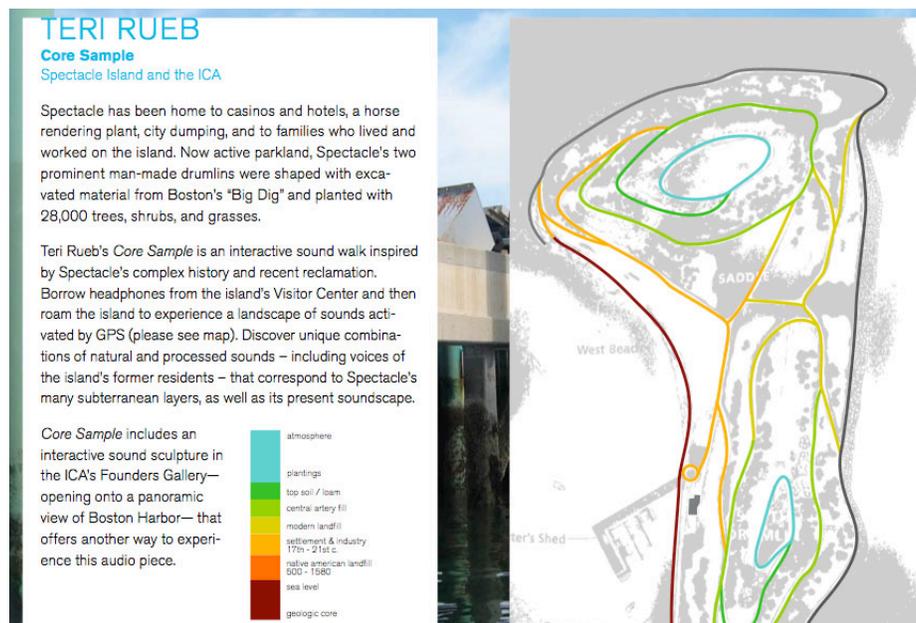


Fig. 4. "Core Sample" by Teri Rueb, 2007.

As participants walk this landscape, what is not seen becomes audible. Sounds and interviews begin to play as individuals cross invisible, digital boundaries on the former landfill. Rueb's mappings constitute new experiences of place, by exhuming the social and political histories at specific places, playing them back to the wandering listener. Perhaps no less a representational practice than the maps of Cabeen, or of Wood and Jung, these GPS sound maps work to record and make available previously unseen (and unheard) local knowledges.

The mapmaking literature has only begun to interrogate the more-than-representational ways in which knowledge accretes and is captured. Kwan (2007) points to developments in feminist GIScience as a foundation for critical attention to the rationalizing gaze of mapping technologies (see also Kwan 2002; McLafferty 2002, 2005; Pavlovskaya 2002, 2004; Schuurman and Pratt 2002). Indeed, as Del Casino and Hanna (2005) have argued, mapping technologies are both representation and practice, and as such, necessarily enroll the more-than-representational. Jason Young and Michael Gilmore (forthcoming) similarly take up these issues of affect/emotion in their participatory mapping work with people of the Peruvian Amazon. Participatory mapping produces maps, but also produces emotion, and these emotions/affects should inform representational practice, according to Young and Gilmore.

The politics of capturing as a representational practice is multiply different across cases. At a certain abstraction it may be difficult to distinguish the participatory mapping techniques of the Bowman Expedition (see Herlihy 2010) and that earlier example of participatory GIS by Weiner and Harris (2003, see also Weiner et al. 1995). Both projects involved participatory mapping of land use by members of an indigenous community; both projects involved external funding bodies that undoubtedly required reports/deliverables to

be disseminated. Yet the specific institutional contexts/politics of these two initiatives are importantly different, as are the specific processes and practices of disseminating the geographical knowledges and representations captured in participatory mapping, engendering very different responses to these two projects. All participatory mapping endeavors intrinsically contain certain anxieties and potential conflicts around questions of who can speak for whom, who can consent to release knowledge for representation and dissemination, and how to most appropriately mitigate the forms of knowledge extraction, of capturing, that may occur.

As a non-neutral action, the work of capturing also scales differently in different locales. This is exaggerated in the context of a hyper-networked world, where elements of data can travel the globe nearly instantaneously. The speed of information transfer can make local knowledge already global from the moment it becomes encoded/circulated electronically. Yet simultaneously, these same digital modes of circulating knowledge can amplify activists' abilities to voice concerns around capture via (spatial) information technologies. The rhizomatic nature of these technologies enabled concerns about the Bowman Expedition, founded or not, to reverberate throughout an activated community of residents, scholars, and activists (Bryan 2010; Cruz 2010). At the same time, this hyper-networked world alongside the shifting contexts of US global hegemony, has given rise to a revaluing of subjective knowledge to systematize the 'human terrain' and recruit anthropologists and human geographers as new ethnographers for the US military. Just as critical human geography collides with the GISciences (themselves a longstanding heir of defense technologies, see Smith 1992), it seems the methodologies of human geographers – qualitative interviewing, participant observation, ethnography – are the prized tools of post-national warfare.

Importantly however, the work of capturing is also increasingly mundane, teetering on the category of data mining. For instance, the Floating Sheep collective plays with this edge, scraping user-generated Google placemarks to poke fun at the contortions of Internet-based user-generated content that enable untenable arguments about Santa Clause and Satan, the PBR-belly of America and the price of marijuana (for instance see Zook and Graham 2010). That these visualizations appear scientifically-authored produces the joke – that maps mask their messy production and imperfect data capture. Floating Sheep uses the ‘master’s tools’ to create humor in a parody of cartographic processes. Alternatively, Edwin Chou (forthcoming) enrolls geoweb content to increase the temporality of population measures. By querying and scraping web-based people searches, Chou extends the representative power of the US census, offering both higher resolution temporal as well as spatial data, and enrolling private sector and citizen-generated data content in the service of improving what was formerly a central state-based informational enterprise.

Chou’s work highlights a central issue in the rise of ‘big data’: that information about individuals is being collected regardless of consent. Massive amounts of information are assembled with automated systems that scrape the Internet assembling datasets used for geodemographic services, such as hyperlocal product marketing. On one hand, these developments may be seen simply as an extension of trends set in place in the 1970s and 1980s as advances in computing allowed for integration and detailed (spatial) analysis of very large databases (see Goss 1995). Yet the data mining techniques being used today to acquire and analyze the ‘big data’ circulating via the Internet seem to us to signal a distinct shift in the scope, scale, and nature of capture. In this new environment, data acquisition and integration are more automated than ever, and are extensible across a seemingly infinite range of different sources.

Still, these moments of capturing highlight different directions in the scholarly assessment of the geoweb. For some in GIScience, Chou's method presents a potential problem in data quality – around issues of data integration, accuracy, and general reliability of geodata on the web (see Goodchild 2007; Wilson and Graham in review). However, from the perspective of critical human geographers, this kind of work troubles the boundaries between formal and informal knowledge work, problematizes the state as a geodata enterprise, and decenters informational authority, as well as continues to stoke concerns around privacy, surveillance, and cyborg geographies (Elwood and Leszczynski 2011, Leszczynski 2012; Crampton 2010; Wilson 2009).

3. Analysis and Interpretation

But of course, there is a problem here. Knowing two hundred novels is already difficult. *Twenty thousand?* How can we do it, what does “knowledge” mean, in this new scenario? One thing for sure: it cannot mean the very close reading of very few texts—secularized theology, really (“canon”!)—that has radiated from the cheerful town of New Haven over the whole field of literary studies. (Moretti 2000, 208, emphasis his)

For Franco Moretti, analysis and interpretation in the field of literary studies has the potential to be radically transformed by digital technologies. Moretti advocates an alternative way of reading – to read at a distance – as the accumulation of digital texts enables the exploration of new research questions. In *Graphs, Maps, Trees*, Moretti (2005) examines visualization tools as opportunities to build abstractions that ‘read’ across entire oeuvres. For instance, the mapping of the location of protagonists in Parisian novels as they relate to the Seine, provides a new way to understand the spaces of narrative. These examples are

illustrative of some of the newest directions in critical capturing praxis: the quest for new ways of engaging the ever-growing wealth of digital spatial data. In particular, these new directions involve bringing together interpretive and analytical modes previously considered orthogonal or incompatible – qualitative and quantitative, inductive and deductive, humanistic and scientific. So too do they collide analysis techniques with forms of data in previously unthinkable ways, as for example efforts to bring quantitative techniques to bear upon massive digital data sets to try to discern how social meanings are being negotiated – traditionally the domain of qualitative interpretive methods applied to small textual data sets (see also Gahegan and Pike 2006).

The emergence of digital spatial data has made possible a number of similar moves within Geography, albeit beginning nearly half a century ago. Analysis and interpretation for some arenas of Geography has long hinged on digital captures. Previous methods of map interactivity, to roll out or unfold the map, to use a gazetteer, to wayfind and trace a least-cost path, were re-tooled as digital spatial data were assembled and made more broadly available (McHaffie 2002). Indeed, the incredible costs of digitizing spatial information previously trapped by the paper-based map meant that methods for digital spatial analysis became a later development (Goodchild 1987). As a result, the analytical and interpretive capacities of mapping technologies expanded application-by-application. Spaces became machine-readable and spatial analysis emerged as an automated process of computation.

Certainly, this was not the earliest moment where geographical analysis was largely computational, and it will not be the last. The so-called ‘quantitative revolution’ centered within the University of Washington Department of Geography recognized the possibility for machine-based analysis of social data (Barnes 2012) and research questions sought to identify patterns across a range of social activity. And perhaps this interest in identifying

patterns from social data is re-emerging in the wake of 'big data', where groups like Floating Sheep analyze millions of geoweb data elements to produce meaningful (often humorous) representations. Among other things, the contrast between such early machine-based analyses of social data and Floating Sheep's parodies of analysis/representation remind us of the mutability of specific capturing methodologies to a multiplicity of epistemologies.

As the conceptual insights of critical human geography continue to collide with geovisualization techniques, new analytical methods are constituted: qualitative GIS, geonarrative, geohumanities, spatial ethnography, soft GIS, participatory mapping, etc. These approaches enroll the iterative and contingent practices of critical methods, where the map is but one vehicle of research among many. In this way, the map is significant yet continually de-centered as part of a constellation of knowledge work. This modesty of mapmaking has the potential to reconfigure power geometries of the god-trick (following Haraway (1991), mapmaking that presumes infinite vision and total knowledge), to constitute the map as an always-partial process of representation, as a potentially divisive as well as aligning social action.

Knigge and Cope (2006) present a specific analysis and interpretation as part of a mapmaking process that is informed by critical human geography. Their 'grounded visualization' praxis looks to iteratively develop representations of place in ways that remain connected and contingent, as opposed to abstract and distanced. Grounded visualization weaves together multiple forms of evidence and analysis through an iterative interpretive process of working with maps, photographs, field notes, interviews, and more, productively engaging contradictory findings or ambiguity across representational techniques to build new insights. Other geographers have encoded a similar multi-evidence, multi-epistemology approach into existing analytical technologies through software adaptations such as

computer-assisted qualitative GIS (CAQGIS, Jung 2009) or a GIS-supported geonarrative tool (Kwan and Ding 2008) that enable digital environments to capture in multiple or hybrid ways. In all of these approaches, images, movies, sound files, and drawings can mingle with more conventional and Euclidean representations of space, allowing the researcher to embed their interpretations of place into a geospatial framework: a qualitative GIS (Cope and Elwood 2009).

In a similar move, historical GIS use geovisual narration of traditional humanistic forms of evidence to aid readers in seeing things they otherwise would not. For instance, Ian Gregory (2008) uses conventional GIS methods to analyze historical data from the Registrar General's Decennial Supplements of England and Wales about infant mortality in the late 19th century. This use of GIS extends the historical method, to bring analytical power to a discipline conventionally focused on the linearity of narrative. The map breaks up this form of storytelling, constituting renewed ways of examining historical documentation. In a related manner, but colliding different evidence and interpretive encounters, Kim (2011; forthcoming 2013) uses interviews and participant observation to record and spatially analyze the shifting uses of public sidewalk space and assembles them into almost-cartographic sequences of images and quotes, to begin to consider shifting uses of these public spaces. Her maps enroll the power of maps as objective instruments of government, yet problematize this practice by using it to make visible that which has conventionally been 'off the map' in every way – the spatial praxis and political-economies of (illegal) street vending.

In a related way, Kwan (2007) puts geospatial technologies and their typically analytical or calculative manipulations of digital spatial data to work in the service of an emotive and affective epistemological encounter.

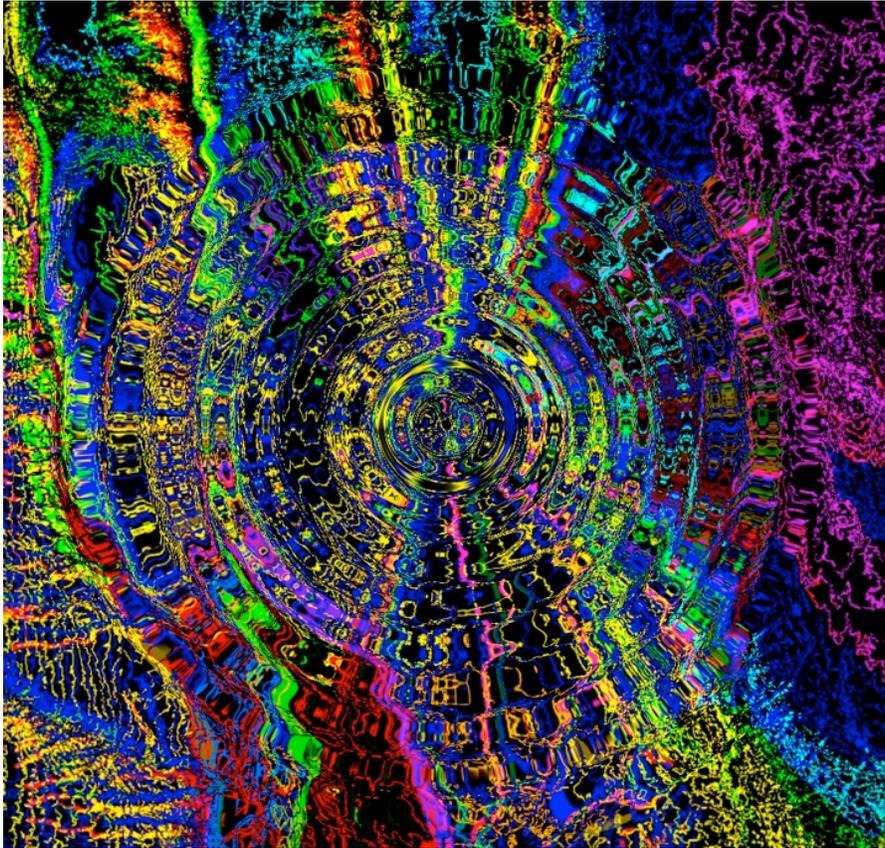


Fig. 5. “Contour Lines” by Mei-Po Kwan, from *Affecting Geospatial Technologies: Toward a Feminist Politics of Emotion*. *The Professional Geographer* 59 (1):27-34, 2007.

By enrolling the various photographic filters that can be applied to digital spatial data, Kwan (2007, 28) argues she is able to demonstrate her “discontent with the use of GT [geographic technologies] in wars and international conflicts that result in large numbers of civilian casualties”. In the visualization entitled *Contour Lines* (above, Fig. 5), she takes a mainstay of geographic representation, the topological contour line, and applies a ‘ripple’ filter that serves to evoke, perhaps, the reverberations of the represented landscape. Kwan plays with these techniques of spatial representation and analysis in order to produce new sensibilities of working with and through spatial media. As critical human geographers continue to

explore the use of geovisual techniques as part of critical analysis and interpretation, GIScience also adapts to serve these applications.

Along similar lines, Elwood and Mitchell's (2012) work with children's mapping highlights the mutability of conventionally-Euclidean map representation, and their openness to hijackings by mapping actors with different agendas. When asked to capture the sites and spaces of their everyday movements and activities by marking them on a base map of their school area, the children instead mapped emotional and remembered geographies. These geographies, rendered with no attention to traditional cartographic conventions, included their frustration and anger at being represented as failing people at a failing school, the pain of loss over much-loved spaces no longer accessible to them, the embodied joy of running or reading, self-doubts or worries about how others perceive them in certain spaces of the school (the principal's office, the sports locker room). Such disruptions – whether rendered by the academic as GIScientist in search of new ways of knowing with geospatial technologies, or the child as non-Euclidean cartographer – are analytical and interpretative. They deploy cartographic and geo-technological practices in the service of capturing more (or other) than what has traditionally been caught through these platforms and disciplinary practices.

4. Production and Participation

As discussed in the previous sections on representation and on analysis, mapmaking captures us – both as a record of human and more-than-human phenomena and as the possibility of constructing new knowledge of spatiality. Additionally, there is a third affordance of the ways in which mapmaking captures – that of the processes of production and participation, that inevitably captures our everyday thought and action. In using the concept of production,

we intend to highlight shifts in the practices of mapmaking, specifically as these technologies are brought to bear on critical human geographies. Generally understood, this has meant a transformation in participation. This is not to say that mapmaking has only now become participatory, presuming a pre-collaborative past. Indeed, as Wood (2012) argues, mapmaking is largely predicated on collaborative practices, from surveying citizens to state-sponsored mapping programs. However, departing slightly from Wood, here we suggest that new mapping technologies have produced an environment where the qualities of knowledge are exhumed and made suspect by a broadened range of expertise and experience.

This new environment of engagement in mapmaking can be discussed in terms of alternative forms of cartographic production such as OpenStreetMap (Haklay et al. 2008), political interrogation and simulation such as congressional redistricting (see Crampton 2008; forthcoming), as well as emergent forms of civic engagement and digital/cartographic participation such as geoweb activism in China that pursues strategies for rendering resistant or alternative mappings in the face of strict censoring and restrictions on citizen organizations (Lin forthcoming). Indeed, beyond framing this engagement as citizen science (Goodchild 2007), we recognize the developments of the digital spatial humanities (Bodenhamer et al. 2010), geovisualization as media (Aitken and Craine 2009), and immersive public pedagogies (Elwood 2009). These diverse opportunities reconfigure the relationship between critical thinking and technical expertise, between the practices of critical human geographies and mapmaking. This reconfiguration elevates practice as the site of criticality itself (see Kitchin 2008 and Kitchin and Dodge 2007).

Cartographic production has perhaps moved from mapmaking to map-interaction, in which very few decisions about conventional map-design are made. Lisa Parks (2009) for example, describes the cartographies of Google Earth's multimedia Global Awareness layers

as a sort of visual framing that guides user interactions with map content. For the majority of these ‘vernacular maps’ rendered through online mapping platforms or APIs, the mapmaker is transformed into a map user – albeit one that can manipulate an interactive map and add data that they may find from other online sources or personal experiences. This has led some, like Wood (2003), to argue that cartographic relevance has lapsed in the wake of GIS itself. Others, like Crampton (2009), argue that these developments have actually increased the significance of cartographic training. Perhaps both are correct. Nonetheless, the division of labor in mapmaking has become more pronounced. The elements of design in many web 2.0 maps have largely been decided by software engineers, while the manipulation of the data has the potential to be the purview of the map users, although with specified constraints.³ Not only are the geovisual expressions of spatial data capture now different, so too are the processes and social/political economic relationships of these capturings.

However, Google Maps must be considered as an example with a broad appeal. With this popular mapping application, users can set up “My Places”, or personalized maps that can be shared with social networks or embedded on personal webpages (see Fig. 6). The resulting map, if it could be called one, is a set of user-generated points, lines and areas that users place on top of a base-map layer that Google establishes: either a street-map layer or an imagery layer or some hybrid. The question of what features display at particular scales is addressed by the Google Maps application. Many thousands of these maps have been produced, called map mashups (Miller 2006 and see the Google Maps Mania, <http://googlemapsmania.blogspot.com/>), which has cataloged these mashups since the API

³ Of course, there are exceptions such as OpenStreetMap, MapBox, and to a lesser extent, GeoCommons.

was released in 2005). This is a different form of cartographic production, marked by an increased interactivity and fast assembly – a slippery map.⁴

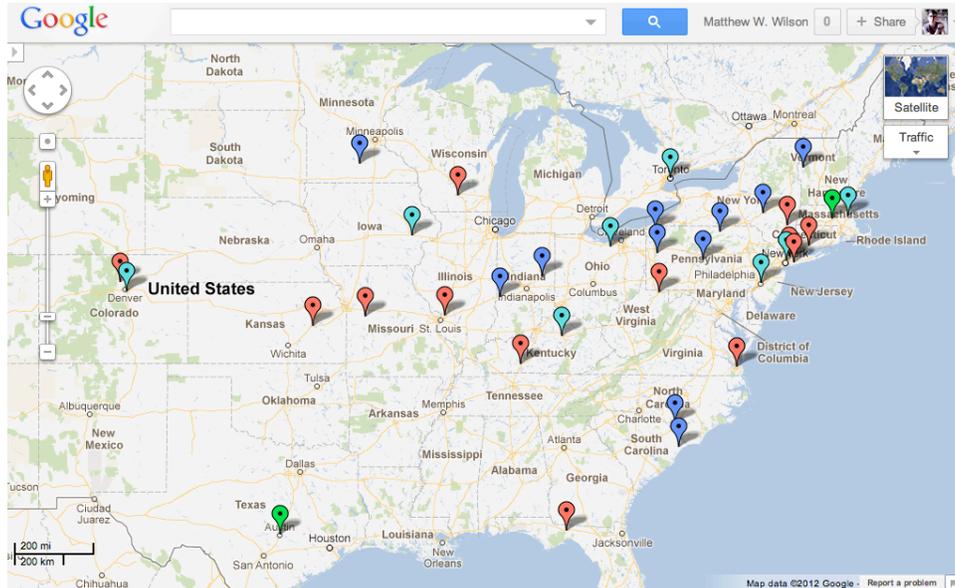


Fig. 6. Google Maps allows users to create “My Places”, a personalized map of points, lines and areas.

As a result, these maps are momentary assemblages and may fade from human memory even as they persist in some obscure hyperlink. Capturing, in these ways, is no longer durable or fixed. These map productions are perhaps less important than the process of their creation – for it is in these processes that new knowledges are forged, where familiar places are made anew. This perspective is deeply rooted in critical human geography, which has tended to see cartographic productions as, on the one hand, revelatory, and on the other, as temporary moments of simplification and fixity. These maps are not end points in the march of enlightenment. Indeed, such maps hide more than they reveal, including the

⁴ Perhaps related to the trend toward increasing interactivity for individual map users, cartographic representation is also increasingly individualized as Google and other geospatial services providers seek ways of providing individuals with dynamic maps tailored to their own activities, preference and daily movements (for further discussion, see Parsons 2012).

numerous individuals who produced the street lines and created scale-dependent visualization algorithms, and those who surveyed the landscapes and analyzed the satellite images or stitched them together.

As critical human geography continues to take up the tools of digital mapmaking, including GIS, cartographic production is transformed as are concepts of participation. These new online mapping tools are perhaps more exclusionary than their paper-based predecessors, given the increasingly sophisticated technologies and digital networks that enable their interactivity. Of course the acquisition of digital knowledge remains deeply impacted by the digital divide (Graham 2011), albeit in some new ways. Access to web-based mapmaking tools increasingly demands significant bandwidth and browser-end functionality. Therefore, the question of ‘who participates?’ is just as relevant for user-generated map data as it is for user-generated Wikipedia entries. The newest forms of collectively-authored digital cartographic knowledge are arguably no less partial than their state-based predecessors. Instead, there are multiple partialities, multiple contingencies, which produce something like Google Maps. Critical human geographers have the potential to provide the perspectives and language to situate these productions, in ways that do not simply ignore their significance, to look the other way.

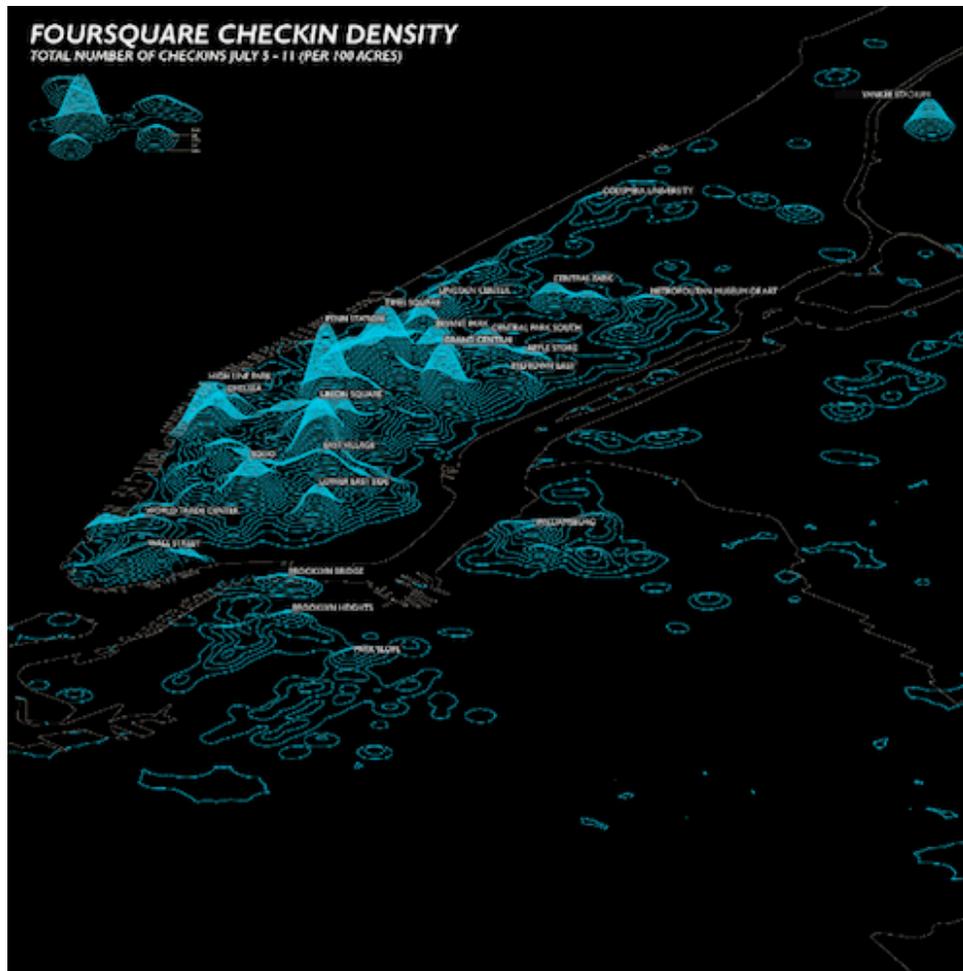


Fig. 7. “Here Now” (by Sarah Williams and Juan Francisco Saldarriaga and courtesy of the Spatial Information Design Lab, 2011) visualizes check-in data from one week in Manhattan.⁵

Against this backdrop, participation is multiply understood. In *Here Now* (Fig. 7), a project by Sarah Williams (2011) at Columbia University’s Spatial Information Design Lab, participation might be understood broadly as composed of unknowing individuals, wherein check-in data from their social-spatial networks were scraped to produce visualizations that, in aggregate, provoke questions about the significance of social media and ‘big data’ (see

⁵ “Density of Foursquare Check-ins” was developed for the “Here Now! Social Media and the Psychological City” Exhibition at Columbia University’s Graduate School of Architecture Planning and Preservation (November 2011) by Sarah Williams, with research associates Georgia Bullen, Francis Tan, Juan Francisco Saldarriaga (Project Manager), and Noa Younse

boyd and Crawford 2012). In the Counter-Cartographies Collective (3Cs) at the University of North Carolina-Chapel Hill, participation may be understood as a drawing together of a small group of liked-minded individuals committed to a political agenda and the mapping practices that might enable such an agenda. Together, they have produced counter maps of the specific knowledge economies of the university and the tensions between globalization and the militarization of borders. Within the literature on participatory mapping, the concept of participation follows more conventional notions of civic or political engagement directly in the mapping process, particularly around community-based work (Elwood 2006; Ghose 2007; Wilson 2011a) and indigenous mapping (Harris 1998; Young and Gilmore forthcoming).

As tools that enable participation or tools made possible only through participation, mapmaking technologies enrolled from a critical perspective challenge more conventional notions of ‘empowering’ individuals to use mapping tools to represent their local knowledges. In a world of volunteered geographic information and neogeographical mappings, participation might indicate coerced or unknowing participants or the uncouneted individuals that produce the code and datasets that underlie mapping technologies or those that actively seek out mapping technologies to represent the underrepresented. In other words, the contemporary practices that produce maps are not so radically different as perhaps are our more sustained capacities for unpacking or critiquing the proliferation of representations that mapmaking practices are enabling.

5. Conclusions

New approaches to address spatial data privacy are needed. At the very least, it is necessary to increase public awareness of the problem which will enable

people to try to secure their data privacy. Volunteered (geo)slavery is a fact of modern day life. (Obermeyer 2007, 3)

Nancy Obermeyer, at a specialist workshop on volunteered geographic information (VGI) in 2007, argued for increased attention to the ways in which spatial data about the general public are increasingly collected and aggregated beyond their knowledge. The ways that these technologies and practices capture all of us, often without our knowledge, are at the forefront of a critical geographic engagement of the contemporary techniques and technologies of spatial (data) capture. Indeed, location-based services (LBS) account for a major portion of mobile technology development and investment, and yet critical human geographers and critical GIS scholars are just beginning to track and situate these trends (Wilson 2012). Here, we might extend Obermeyer's provocation toward the political economies and ecologies that prop up VGI and LBS. There is a 'geo-slavery' of the privileged (by way of their data) and a 'geo-slavery' of industrial labor (of the residential factories that produce the hardware that makes this all possible). Again, mobile devices like the iPhone capture us; their processes of manufacture and utilization hold people around the globe captive.

Therefore, this chapter has been an attempt to scratch the surface of the multiple notions of capture in mapmaking, to articulate the new junctures that make possible a critical mapping practice as well as to review the contemporary state of play around spatial data and representation, analysis and interpretation, and production and participation. While certainly not exhaustive, this chapter has provided a space to assemble and react to the productivity of an ever-changing critical-technical nexus in Geography, as we have argued that the continued application of GIS and mapping technologies within critical human geography have actually served to destabilize the technological practices of the GISciences.

Moving forward we recognize a rapidly expanding research agenda into the histories of these technological artifacts, an aspect of the mid-1990s NCGIA Initiative 19 research agenda that is only now beginning to be addressed (O'Sullivan 2006; Sheppard 1995, 2005). Along these lines, we characterize two broad approaches to an historical approach in the study of mapping technologies: an archaeology and a genealogy (in a Foucauldian sense, see Legg 2005 for a discussion of these methodological approaches in critical human geography). An archaeology of these tools narrates a history that extends from specified origins, whereas a genealogy of these devices is a mapping of the present or contemporary moment – a tracing of the conditions that make the present possible. McHaffie (2000, 2002), Chrisman (2005, 2006), and Barnes (2012) have provided excellent examples of a more archaeological approach in understanding the post World War II developments of automated mapping tools. Genealogies have unpacked the discourses that condition global positioning systems (Roberts and Schein 1995), location-aware technologies (Kinsley 2010; Wilson 2012), the geoweb (Leszczynski 2012; McConchie 2012), Google services (Dalton 2012), web-server farms (Bauch 2012), and visualization technologies more generally (Ash 2010). These historical approaches work to critically discuss the affordances and constraints of the technological artifacts that we use to capture social-spatial phenomena, written not from a position of technological determinism, but from the perspective that technology and society are inextricably bound, contingent, and co-constitutive processes.

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