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## New spatial technologies, new social practices: a critical theory of the geoweb\*

Geography, GIScience, and society at large continue to grapple with the implications of newly emerging geospatial media – an ever-expanding range of interactive Internet and mobile technologies that enable collection, compilation, mapping, and dissemination of spatial data by vast numbers of people. The so-called ‘geoweb’ presents fundamental challenges for three or more decades of GIScience theory and practice developed in relation to conventional geographic information systems, and re-situates a number of the concerns of critical GIS scholars with regard to the societal significance of geospatial data and technologies. In this paper, I show how some of the longstanding concerns of critical GIS scholarship can illuminate several of the fundamental arenas of societal transformation stemming from the geoweb: Global and local social relations around privacy and surveillance, socio-technological practices of activism and civic engagement, and the education of citizens prepared to engage a geoweb world. I use examples from my own recent research in each of these arenas to characterize the specific nature and implications of these transformations and to point to the pervasive presence of social, political, and technological inequalities in each arena. One of the most important legacies of critical GIS scholarship to carry forward into geoweb research and practice is its deep attention to and intervention in inequalities and exclusions wrought through digital spatial data and technologies. Creating a more just society in the face of new spatial technologies demands our ongoing effort to sustain these commitments.

For us as researchers, educators, and citizens the rise of new geographic technologies over the past half decade or so is nothing short of revolutionary. Specifically, I refer to the ever-expanding range of interactive Internet and mobile technologies that enable collection, compilation, mapping, and dissemination of spatial data by vast numbers of people. For instance, I refer to the GoogleMaps API – a freely available web-mapping service that allows nearly anyone with an Internet connection to compile and visualize information on a map and share it widely. We’ve seen these kinds of map mashups used for coordinating austerity protests in the UK, sharing data on environmental impacts of natural gas fracturing, or disseminating map-linked artworks that protest evictions for urban redevelopment in China.

I also include applications like crisis mapping, another use of these new digital tools. In crisis mapping, volunteers use open source tools to build digital spatial datasets for relief workers and government following a natural disaster. The classic example of this is Open Street Map’s crowdsourced base map of Port-au-Prince, produced within hours of the 2010 Haitian earthquake. Other crisis mapping efforts collect and map real-time, on-the-ground observations of citizens, such as countless Ushahidi applications used for monitoring of voter intimidation, political violence, and other problems. These new spatial applications also include location-based services. We’re

seeing a growing number of location-based services that engage us and our smart phones in what I think of as ‘geosocial’ applications – geographic services that let us publicize our presence at particular locations and learn about the presence of others we know or would like to. A classic application here is FourSquare, while Twitter and Facebook are both increasingly focused on disseminating geosocial apps like this.

These examples demonstrate the component parts of what I’ll refer to tonight as the ‘geoweb’, including:

- New forms of data and representation, like geo-tagged text/images; or geovisualization that is not strictly cartographic,
- New ways of producing geographic data such as crowdsourcing and mash-up, and
- The hardware/software components that enable all this.

### 1 Geoweb

Claims made about the geoweb in recent years run the gamut from utopian to dystopian. The geoweb has been heralded as a democratization of cartography, a leveling of the digital divide, and a ‘liberation technology’ capable of undergirding progressive social movements. It has been decried for advancing new forms of harassment and surveillance, and for worsening already unequal access to the information and forums necessary for civic participation.

But the geoweb also poses a tremendous challenge for GIScience theory and practice of the past three decades. First, the nature of the geographic

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\* The corresponding 4th Erlangen Lecture in Cultural Geography had been given by Sarah Elwood July 15, 2013 at the Department of Geography, FAU Erlangen-Nürnberg

dimension of the data can be more complex. GIS is rooted in modeling absolute location on the surface of the earth, with geographic locators that can ultimately be expressed in quantitative terms. With the geoweb, the geographic component of a given data artifact can be linguistic and location may be relative. So, a place name, "Rice Lake" can be used as a geographic identifier, or a location expressed as 'near Rice Lake'. Any use of these kinds of data in a digital environment – whether for analysis, data integration, or mapping – is much more challenging given the semantic complexity of these identifiers.

Second, data structures are vastly different and this has implications for functionality. The geoweb is not based around the relational database and tabular data structures of conventional desktop GIS. Of particular importance, the geoweb does not have the same tight linkage between the map and the data. In conventional GIS, every object in your map has linkages to the database behind it. That is the basis of many of the analytic operations you can do in a GIS. In the geoweb, we can have one without the other. We can have a map object that we can see but isn't linked to an extensive database we can query for our analysis. Or we can have a collection of geo-referenced data that are not linked to a geovisualization, such as the geo-tagged tweets that are created when you use Twitter's geo-tagging service.

Third, conventional measures and practices for ensuring accuracy and reliability of data are not generally appropriate to the geoweb. The traditional approaches were built around a top-down structure for producing and vetting spatial data, such as the practices of agencies like UK Ordnance Survey or the US Geological Survey, and their assurances of a certain degree of reliability. User generated content in the geoweb as a radically bottom-up form of data development, and new accuracy and reliability approaches have been needed. A number of really interesting approaches are emerging, including practices such as automated or algorithmic techniques that flag or throw out impossible data, as well as Web 2.0 techniques like user ratings for data objects or whole data sets.

But these more technical aspects of GIScience are only part of the picture when we think about the implications of the geoweb. Equally important are the broader societal impacts – for citizenship, for civic participation, for privacy, for the digital divide. These are themes I will focus on in the remainder of this lecture. In doing so, I will draw on an important component of the intellectual tradition of GIScience over the past 2 decades: The central propositions and concerns of critical GIS. Further I will argue that while GIS and the geoweb are quite different things, the central social and political theorizations of critical GIS

offer a productive framework for better understanding the societal impacts of the geoweb. CriticalGIS emerged through the late 1990s and early 2000s, in response to a series of concerns raised about GIS by human geographers, cartographers and GIScience scholars themselves. Over the years, critical GIS has spawned new methodological approaches such as participatory and qualitative GIS.

## 2 Critical GIS

One of the most important conceptual innovations to emerge from critical GIS is its re-theorization of what we think a GIS is. Of course, on one level, a GIS has been and continues to be a digital system for storing and representing spatial data. But critical GIS conceptualizes GIS as also a complex array of social/political practices associated with the production, regulation, and use of geographic information; and as a way of knowing and way of making knowledge – including the analytical methods we deploy through GIS, the visual representations we produce, the meanings that are advanced. Through this conceptualization, the critical GIS tradition reminds us that geospatial data, geographic technologies, and geovisual representations are non-neutral. They are always steeped in and tend to advance the interests of particular institutions and social groups, often society's most powerful people and places. Further, critical GIS scholarship reminds us that in a deeply unequal world, our attention to the role of geographic technologies in reproducing inequalities is imperative, as is our active engagement in efforts to use these technologies to combat inequality in a variety of ways.

More broadly, I would argue that these commitments can form the basis of a critical theory of geotechnologies that can extend beyond conventional forms of GIS, and in so doing, can help us better understand the societal significance of the geoweb. I will outline the core dimensions of such a critical theory of geotechnologies, and highlight some of what I think it suggests about the societal transformations being wrought through the geoweb. I am not suggesting a radical break or absolute transformation. We are situated at a moment in which GIS-based technologies and geoweb technologies co-exist and are comingled in daily practice. But nonetheless the geoweb represents some significant changes.

## 3 Critical theory of geotechnologies

First, a critical theory of geotechnologies would conceptualize these technologies as complex arrays of social and political practices, including institutional

and political-economic roles and relations. Bringing this principle forward to interrogate the geoweb draws our attention to, among other things, a decline in the role of the public sector and the rise of the private sector: Spatial data and map production has for many years been the primary domain of government, especially national states. Of course this has carried its own problems, such as legacies of colonial exploitation. But the geoweb is re-situating the private sector as a newly prominent actor in the production of spatial data. The devices, data, and applications that constitute the backbone of the geoweb are disproportionately produced by for-profit companies. This has countless implications, but I would draw your attention to two especially important ones. The profit model of companies such as Twitter or Google relies on sale of advertisements. There is very little explicit interest in or focus upon spatial data production and handling per se. Further, state-based efforts to regulate the practices of these global corporations are extremely heterogeneous – which implications that I will discuss in more detail below.

Second, a critical theory of geotechnologies foregrounds social and political relations constituted through the creation and sharing of spatial data, including who produces the data, how data can or cannot circulate, who may or may not have access to it and under what conditions. Brought to the geoweb, this set of propositions illuminates the comparatively un-structured, unrelated, or ‘footloose’ nature of data production and sharing in this new environment. Of course, spatial data sharing has long been part of the GIS world, yet this was at least by intent mediated by data standards, national spatial data infrastructure rules and practices, and so on. A world of bottom-up, user-generated and user-modified data, produced and circulated online, presents a newly footloose circulation of data. In particular, 3rd party data re-use is a newly prominent concern. For instance, a short-lived application called ‘Please Rob Me.com’ used data mining techniques to capture real time data being published by individuals on their social media platforms. It integrated this information with online data detailing individuals’ addresses, and then released time-space profiles indicating when these people were not at home. As you can imagine, the ability to do things like this raises a number of concerns.

Third, a critical theory of geotechnologies asks us to consider the social and political consequences of the kinds of visual representations these technologies are used to create. So, for example, scholars have written a tremendous amount about the assumptions of objectivity and truth that are associated with maps, because of their linkage to longstanding notions of scientific rationality. If we bring this concern with the politics of visual representation to the geoweb,

it calls to our attention to new and important forms of geovisual representation that are not traditionally cartographic, introducing some different issues and concerns. Consider for example, the kinds of geo-located photo panoramas that are available from Google Street View. These images are captured by a vehicle driving down the street and photographing any person or object that happens to be there, then redistributed in photo panoramas that offer a supposedly true representation of particular presences or behaviors, linked to a specific location. The kinds of conclusions that are drawn from these images raise all kinds of potential problems, depending on the assumptions behind our interpretations. A Swedish politician, several years ago, was accused by the press of having an affair, on the evidence that he was seen in a Street View image, walking down the sidewalk with a woman who was not his wife – later shown to be a member of his staff. There are countless other examples of this kind of problem, many of them more serious in their potential consequences for the individuals in the image.

But further, in bringing concern with the politics of visual representation to the geoweb, we see that in many applications, traditional cartographic techniques are being re-worked toward different goals. Take for example, cartographic abstraction techniques like categorization. Usually, categorization is used to simplify your data so that you can discern patterns. In many geoweb platforms, such as Ushahidi’s web maps, categorization is a tool for users to explore the data on the map – it structures user exploration, not data representation primarily. So the legend tools in an Ushahidi map control interactivity and display, rather than primarily showing a categorization scheme used to simplify the data. The same is true of multimedia map points, such as placemarks on GoogleMaps. The GoogleMaps API allows a mapmaker to associate a variety of other forms of representation with a placemark, so that when a map user clicks the placemark, she is linked to these other digital representations – text, video, photographs, and so on. These multimedia map points are not accomplishing cartographic representation in a traditional sense. Rather they are a portal or a frame through which users explore other resources linked to the map object.

Finally, a critical theory of geotechnologies asks us to consider the forms of power that are linked to and invoked in the production and use of geovisual representations. The historical linkages between maps, science, and technology are an especially important aspect of this form of power/knowledge. Because of these close associations, for activists and citizens, maps often stand in as a symbol or demonstration of expertise and authority. Precisely because a map was something that not everyone could produce, GIS-

based maps have often been used by less powerful actors and institutions to assert their own expertise, or try to challenge the authority of others. Yet by their very nature, geoweb mapping platforms are meant to be broadly accessible, nearly vernacular tools, and as a result, they lend themselves to different kinds of citizen roles or knowledge-making roles. They don't have the same power to position the map maker as 'expert', in the manner that GIS-based maps have sometimes been used to do. In short, their epistemological politics are different, as are the kinds of activist strategies they enable.

#### 4 Critical theories of geotechnologies and the geoweb

Using critical theories of geotechnologies to examine the geoweb, I have highlighted four important transformations that begin to come to light. Of course there are others, but these are four that I think are proving to be particularly significant. Now, I will turn to thinking about some of the societal implications of these changes. Specifically, I want to explore how they are playing out in two arenas that many of us are concerned with as geographers, as educators, as citizens: First, a transformation in geoprivacy, and second, new forms of geographic activism (or geo-activism) and spatial citizenship.

From much of the above, we can argue that the geoweb is implicated in the emergence of new forms of privacy harm. Google Street View imagery for example, offers far more immediate, less abstracted representations of our bodies, behaviors, and (assumed) characteristics than has been possible in conventional geospatial databases and cartographic representation. In a GIS-based world, extracting information about individuals required a great deal of technical skill to carry out data merging, reverse geocoding, and so on. Geoweb applications that, for example, attach location to our Tweets, open the door to new surveillant possibilities. These individual pieces of data may, for instance, be compiled and reassembled into more complete time-space trajectories. Techniques to protect against these forms of privacy harm are notoriously problematic. Automated techniques like facial blurring are unreliable. Report-a-problem widgets put the onus on the individual and try to solve a problem after it has already happened. Even knowing what third party data users are collecting and compiling is difficult, let alone regulating these activities.

We also see a new globally uneven privacy regime emerging in relation to geoweb data and technologies. Some of the most prominent examples here come from national efforts to regulate Google's applications. StreetView in particular has caused a lot of

outrage and new regulation, but the response has been uneven. In Japan, the national government insisted that Google reimage the entire nation, lowering the camera height so as not to photograph above people's garden walls. Yet Switzerland's identical request was denied. Google blurs imagery of some sites deemed sensitive by the US, but declined similar requests by South Korea. There is a great deal more work to be done to both characterize this uneven geoprivacy landscape, and to understand the mechanisms that lie behind it.

At the broadest level, I would argue that geoweb technologies are part of a transformation of the social contract around privacy. Privacy is less a property or a 'thing' than it is a societal agreement. This agreement is reinforced by institutions and individual practices that establish the kinds of information that should or should not circulate, who should have access to it and so on. In many legal and governmental contexts, privacy is conceived as what we have a 'reasonable expectation' of keeping from public view. In this sense, web-based geographic applications that broadcast our locations and activities – especially when we ourselves do this broadcasting – lay the groundwork for a dramatic reworking of these 'reasonable expectations' and hence, the social contract around privacy.

Now to the second point. The geoweb is also implicated in transformations of what I think of as 'geo-activism' and 'spatial citizenship'. By this, I mean ways that citizens use geographic information, maps, and spatial technologies in their efforts to influence their surroundings. GIS and conventional cartography remain central to this, but geoweb platforms are becoming a ubiquitous part of geo-activism and spatial citizenship in many parts of the world. For example, we see local governments in many U.S. cities beginning to use geoweb platforms to facilitate 'citizen participation' and allow mechanisms for citizens to supposedly connect directly to local government. The services offered by a company called 'CitySourced' are a good example. CitySourced is a mobile phone app in which citizens can submit a geotagged photo or report of an infrastructural problem like trash, illegal dumping, broken street lights, and so on. They can then track local officials' response and resolution of the problem. We also see NGOs and activist groups increasingly using the geoweb to communicate their message, build allies, and engage potential funders. The geoweb is part of activist efforts that include advocating for and building children's playgrounds, publicizing state-based violence, or facilitating citizen science that informs environmental justice movements.

In terms of the societal impacts of all this, there are countless issues for us to be attentive to. Geoweb activism extends beyond the sort of "Science-Expert" paradigm that characterized a great deal of GIS-based

activism. Some activists are using geoweb tools to advance their politics through visual art. Others use humor or parody to make their point. For example, in protesting Google Earth and StreetView imaging, citizens around the world have done everything from writing obscenities in their fields using hay bales, to gathering naked or in costume on the street when the Street View van was scheduled to appear.

A great deal of GIS-based activism focused on using GIS to show broader spatial patterns, regional impacts and so on. Activists used these strategies to try to combat claims that locally-situated individuals could not know or understand broader needs and processes. In contrast, geoweb activism is resuscitating a role for individual testimonial and individual witnessing – allowing these perspectives to be compiled and disseminated on a scale never before possible. Indeed, “Ushahidi” – one of the more prominent geoweb toolkits for activists – is a Swahili word that means ‘testimony’. In contrast to the science-expert paradigm, I would argue that we are seeing the rise of the ‘transparency’ paradigm through geoweb-based activism. Activists and NGOs increasingly stake the believability of their claims not on the scientific legitimization of the data, but on the ability of users to be able to interact with, see, and evaluate data and claims for themselves.

So in these activists’ geoweb efforts, you’ll see assertions that stake the credibility of the data on users’ ability to see it for themselves, or by asserting that an account was directly observed. Many Ushahidi platforms, for example, employ a system that flags some data submissions as from ‘eyewitnesses’. FracTracker, a U.S.-based NGO that fights natural gas fracturing, asserts the credibility of its crowdsourced data sets with the slogan “Trust by having full access to the source.” I am not arguing that the rise of the transparency paradigm is necessarily a good thing or a bad thing, or even that it actually is transparent. My point is that this is a distinct departure from conventional data politics that staked the credibility of information on its verification by a recognized authority, often a government agency. Some NGOs and activists go even farther, arguing that transparency is an essential part of their mobilization strategy, that their map-mashups engage and mobilize citizens because citizens can see their contributions reflected in the online map. Whether or not this is actually so, the NGOs’ belief in it surely shapes their geo-activist practices.

## 5 Conclusion

I want to conclude by offering a number of cautions about these transformations in the paradigms and

practices of geo-activism and spatial citizenship. For crisis mapping, persecution monitoring and witnessing through the geoweb, I wonder the extent to which they actually foster changes in political process or reduce persecution. For local government uses of the applications like CitySourced, we must ask whether the local knowledge generated through these interfaces is actually integrated into local state decisions or actions. Does it instead simply channel citizens into constrained and controlled forums that are more tractable for government? We must further ask whether we may be seeing a change in the forms of action understood to constitute activism or engagement. Geoweb-based activism is often presented to the prospective user as ‘easy’ or ‘fast’. They emphasize how undemanding it will be to participate. As groups continue adopting new spatial media at a dizzying pace, it is imperative to examine whether these practices are emerging alongside more demanding forms of collective action, or whether they signal a decline in these modes of political and social practice.

Finally, and most importantly, we must remain attentive to the ways in which the geoweb re-situates the digital divide. For all the talk of increased and near-ubiquitous access to mobile phones, the Internet, mapping technologies, and geographic information, the terrain of meaningful access remains starkly uneven. Further, technology-mediated forms of inequality are rooted in far more than just access to hardware and software. One of the most important legacies of critical GIS scholarship is its deep attention to inequalities and exclusions wrought through digital spatial data and technologies. Creating a more just GI society in the face of new spatial technologies demands our ongoing effort to sustain these commitments. One of the most important ways that many of us can contribute is through our work as educators. Yet our GIS-focused curricula is almost certainly unprepared to educate spatial citizens ready to actively and effectively engage the geoweb and its social and political transformations. While I do not have a ready-packaged set of solutions to this challenge, this conference offers us a great opportunity to think together about what these pedagogies might look like, and what role we can play in preparing the next generation of spatial citizens.

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## Zusammenfassung

### Neue raumbezogene Technologien, neue soziale Praktiken: Eine kritische Theorie des Geoweb

Sowohl die Wissenschaft der Geographie und Geoinformation als auch die breite Öffentlichkeit tut sich immer noch schwer, die gesellschaftlichen Auswirkungen der neu aufkommenden raumbezogenen Medien zu verstehen – dabei handelt es sich um eine immer größer werdende Ansammlung an interaktiven Internet- und Mobiltechnologien, welche die Sammlung, Zusammenstellung, Kartierung und Verbreitung räumlicher Daten durch eine große Zahl von NutzerInnen erlauben. Das so genannte „Geoweb“ stellt eine grundsätzliche Herausforderung für die Geoinformationswissenschaften (GIScience) dar, deren Theorien und Praktiken sich seit drei Jahrzehnten von dem Hintergrund konventioneller GIS-Systeme entwickelten. Fragen nach den gesellschaftlichen Implikationen raumbezogener Daten und Technologien, die in Arbeiten der kritischen GIS (critical GIS) formuliert wurden, stellen sich im Geoweb auf neue Art und Weise. In diesem Beitrag zeige ich, inwiefern die Tradition der kritischen GIS-Forschung geeignet ist, einige der zentralen gesellschaftlichen Veränderungen im Kontext des Geoweb herauszuarbeiten: dies sind Fragen von Privatheit und Überwachung in globaler und lokaler Dimension, sozio-technische Praktiken von Aktivismus und zivilgesellschaftlichem Engagement sowie Fragen der Medienkompetenz in einer zunehmend durch das Geoweb geprägten Welt. Ich nutze hierfür Beispiele aus meiner eigenen aktuellen Forschung für jeden dieser Bereiche, um die Charakteristika und Implikationen dieser Transformationen zu beschreiben und auf die umfassenden sozialen, politischen und technologischen Ungleichheiten in diesen Bereichen hinzuweisen. Eines der wichtigsten Vermächtnisse der kritischen GIS-Studien für die sozialwissenschaftliche Auseinandersetzung mit dem Geoweb ist die hohe Aufmerksamkeit und die Einmischung in die Ungleichheiten und Ausschlüsse, die mit digitalen Geodaten und Geotechnologien (re-)produziert werden. Um eine gerechtere Gesellschaft zu schaffen, bedarf es andauernder Bemühungen, um dieses Engagement aufrechtzuerhalten.

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