GeoJournal (2013) 78:935–948
DOI 10.1007/s10708-013-9488-8

Tracing contingencies: analyzing the political in assemblages of web 2.0 cartographies

Christian Bittner · Georg Glasze · Cate Turk

Published online: 27 June 2013

Abstract Our paper presents a theoretical approach to critical research on web 2.0 cartographies. Within the geoweb, dynamic and collaborative web based maps have become a popular medium for collating and communicating geographic information. Web 2.0 cartographies are often promoted as facilitating public participation and democratizing geographic knowledge. Such claims demand a closer look at the processes through which people do engage in these cartographic projects and the multiple actors, institutions, norms and technologies at work. In the context of 'theorizing the geoweb', here we propose conceptual tools for analyzing these myriad interactions within web 2.0 cartographies. We understand web 2.0 cartographies as assemblages of subjects, materialities and practices, or 'actor networks'. Yet explorations of actor-networks describe *existing* relations and as a consequence tend to overlook what has been excluded or lies outside of such assemblages. In order to overcome this blindness we suggest bringing together actor-network theory with the concepts of hegemonic discourses, contingency and the political from Chantal Mouffe and Ernesto Laclau. These two political theorists stress the idea that specific social realities become fixed, sedimented and perceived as natural while other possible social realities become marginalized. Using the example of the dynamic 'Palestine Crisis Map' (an Ushahidi Crowdmap) we demonstrate a methodology that emphasizes sensitivity towards moments of exclusion and struggle, where the political unfolds. Theorizing the political in this way extends the processual approach within Critical Cartography and offers a conceptual basis for critical research on the social dimensions of web 2.0 cartographies and geoweb practices.

Keywords Critical cartography · Web 2.0 cartography · Geoweb · Actor-network theory · Theory of discourses and hegemonies

C. Bittner · G. Glasze (✉) · C. Turk
Friedrich-Alexander University of Erlangen-Nürnberg, Erlangen, Germany
e-mail: gglasze@geographie.uni-erlangen.de

Introduction: social dimensions of the geoweb

With the geoweb comes a boom of new cartographic representations and practices which change the ways spaces are constituted, (re-)presented and appropriated. Commercial virtual globes like Google Earth, voluntary mapping projects like OpenStreetMap and map mashups like Ushahidi crisis maps are examples of how the geoweb brings a swathe of new information, new representations and new actors onto the screens of our everyday lives. In simplest terms, the geoweb can be thought of as the combination of geographic information with web based content (Rehrl 2010). Far more than the sum of its

component technologies, the geoweb is a complex socio-technical assemblage of "technologies, data, and practices… often with an implied emphasis on Web 2.0-based frameworks and services, especially those that emphasize user interactivity and user generation of content" (Elwood and Leszczynski 2011: 6f).

Insofar as shifting techno-social assemblages can be captured and described at a moment in their evolution, several authors have sought to explain the technological and social dimensions of the geoweb. Haklay et al. (2008), Gartner (2009) and Crampton (2008) have analyzed the new technological possibilities, new sets of practices and new constellations of actors associated with the geoweb. Elwood (2010a) summarizes recent research about the geoweb as including studies about: "the social and political construction of data and technologies"; and "subjectivities and social relations" produced through cartographic practices. Leszczynski (2012) has added a rather structuralist perspective on the geoweb by exploring the political economic frameworks of its emergence. Furthermore, Elwood and Leszczynski's (2012) recent work on the 'knowledge politics' of new spatial media draws attention to how the contents and forms of web 2.0 cartographies, such as the use of interactive visualizations, are engaged (by activist groups) to advance knowledge claims.

Many authors have been positive about the potentials of the geoweb for social engagement and collaboration. In 2006 Turner coined the term 'neogeography' to encompass "people using and creating their own maps, on their own terms…sharing location information with friends and visitors" (Turner 2006:3). Goodchild has defined possibilities for networks of human sensors or citizen scientists to collaborate in the production of 'volunteered geographic information' (2007). Both welcome a more public production of geographic information beyond the established and exclusive limits of academic geography and institutionalized state-run and commercial cartography. Gartner (2009:74) reads these developments as a "democratization" of cartography.

Yet there has also been work that questions such an evaluation of the geoweb. Several authors have been concerned with patterns of inclusion and exclusion, addressing questions of usability, the role of professional standards, and possible demographic biases within the geoweb, particularly those resulting from digital divides (e.g. Crampton 2008, 2010:137ff; Farman 2010; Graham 2011; Stephens 2012). Haklay's (2013) critical examination of the discourse around the democratizing effects of a neogeography is exceptionally illuminating. He takes up Elwood's (2008) call to enrich the research agenda on volunteered geographic information with concepts from critical, participatory and feminist GIS. Arguing for a reflection on what is actually meant by democracy he draws on concepts from the philosophy of technology to show that the euphoria around the participatory promises of the geoweb is widely unfounded once we adopt a constructivist perspective on the underlying technologies. Even though many people can use geoweb tools to create or modify geographic information, few can actually create or modify these applications. Haklay introduces a "hierarchy of hacking" to differentiate between degrees of participation (Haklay 2013: 63). Democratization in the geoweb can only be achieved if the respective technologies can be modified (or hacked) by users to serve their own interests—what Haklay terms "deep technical hacking".

Haklay concludes with the appeal:

> To fulfill the democratization potential of neogeographic practices, a concerted effort is required to integrate new groups in society in the design and development of technological objects and systems, and an ongoing effort to reach out to those who are underrepresented. (Haklay 2013: 67)

By adopting this normative compass Haklay promotes projects that explicitly work to include otherwise marginalized groups, not only in the production of geographic information but also in the work of designing geographic information technologies and defining practices.

Building on this work, we too see the importance of considering processes of exclusion and inclusion in the geoweb—but we would like to go deeper than 'deep hacking' with our theoretical approach. For even explicitly inclusive practices are subject to compromises and conventions, which on another level can work in exclusive ways. In order to do this we suggest taking up the non-essential notion of the 'social' as developed by the political theorists Laclau and Mouffe (1985) in their theory of discourses and hegemonies. In everyday life, social realities (like organizations,

collective and individual identities, or techno-material arrangements) may be taken for granted, but Laclau and Mouffe regard them as *discursively* constituted, that is made up of linguistic and non-linguistic articulations of specific elements (practices, subjects, materialities etc.). Hegemonic discourses are those that have been successful in excluding other possible articulations. For Laclau and Mouffe social realities are discourses that have become 'sedimented' that is to say, they have been fixed and normalized at a specific historical moment. Yet the flip side of this is that social realities are also contingent, for every aspect of the social was once, and could again, be contested. Hence 'the political' is conceived of by Laclau und Mouffe as "the moment of the institution of the social" (Laclau 2005: 154). This differs from the widespread use of the political as limited to specific actions or a specific sphere of the society.

We consider the theory of discourses and hegemonies inspires empirical research that considers questions of giving voice and silencing, inclusion and exclusion, hegemony and marginalization. In particular the emphasis on 'the political' and moments of 'sedimentation' provide theoretical tools for examining how hegemonies are being established within geoweb practices and alert us to what is included in or excluded from these emerging social realities.

In this paper we focus on processes of inclusion and exclusion within web 2.0 cartographies, in particular. Considering web 2. 0 cartographies as a subset of geoweb phenomena, where a mapping interface is the central tool for imparting geographic information, we use the term 'web 2.0 cartographies' (plural) to describe the assemblage of map-makers and map users, cartographic representations, data, technologies (software and hardware), as well as specific conventions and norms, associated with a given mapping tool. This means that our analysis not only draws on the literature of what might be called 'critical geoweb studies' referred to above, but also the rich literature of critical cartography.

In the next section we will show why critical cartography has already set the stage for a critical analysis of web 2.0 cartographies. We discuss how three key conceptual approaches are especially useful for tracing the complex assemblages of web 2.0 cartographies. In the subsequent section, we then go on to describe in greater detail how Laclau and Mouffe's concept of 'the political' provides a theoretical basis for analyzing practices in web 2.0 cartographies with a focus on mechanisms of exclusion. Following this we discuss the methodological operationalization of our theoretical approach, using a set of concepts drawn from actor-network theory (ANT). The potentials and challenges of such a theorization and methodological operationalization are exemplified in a case study analysis of a web 2.0 map mashup: the Palestine Crisis Map. In so doing we present the utility of our theoretical approach, demonstrating how the theory of discourses and hegemonies and an attention to processes of inclusion and exclusion allows a richer understanding of this web 2.0 mapping project. Further, we extend the discussion to possibilities for a more sophisticated analysis of web 2.0 cartographies and the geoweb more generally, conceiving of web 2.0 cartographies as new hegemonic, specific articulations which exclude and silence other possible articulations.

Theorizing cartographies

In our analysis of web 2.0 cartographies a mapping interface or map is at the center of a socio-technical assemblage. Our work thus draws on a legacy of theoretical reflection on maps and cartographic practices, which can be broadly subsumed under the umbrella of critical cartography. Beginning with the break from the dominant paradigm of cartography, which conceptualizes maps as mimetic and (as much as possible) objective representations of the real world, critical cartography has theorized cartographic practices through several conceptual approaches or paradigms (Glasze 2009; Dodge et al. 2009). Kitchin et al. (2012) provide a tabular overview of the transition between these different "ontologies of cartography" (2012:3), which is useful in demonstrating how key theorists, Robinson (1952), Harley (1989), Pickles (2004), Wood and Fels (2008) and Dodge and Kitchin (2007) have variously approached the ontological security and truth claims of cartographies. We draw on three of these approaches in our analysis of exclusions and inclusion within web 2.0 cartographies.

Firstly, there is the idea of maps as socially produced and thus (re)presenting specific perspectives. This approach draws on Harley's (1989) conceptualization of maps as texts that can be

deconstructed to show the ideologies that influence how maps are made and how they serve specific interests. It provides a basis for analyzing the social embeddedness of cartography and is therefore still fruitful and inspiring for theorizing and researching the discursive constitution of specific geographies in web 2.0 cartographies.

The second conceptual approach examines the discursive constitution of specific geographies (and social realities) through maps. Harley (1989) identifies an 'internal power' of the cartographic process and thereby shifts attention to the constitutive effects of maps and analyzes how maps delimit, name and thus constitute specific geographies (see also Pickles 1992: 193): Which projections are used? What is shown on the map—what becomes silenced? What is emphasized, what is centered etc.? The power of maps to (re)produce specific geographies is central to Wood and Fels (1992, 2008) concept of maps as making 'propositions'. These authors have shown that maps and cartography do not only reproduce given social realities but that they also (re-) constitute specific social realities. Wood gives the example of school district maps as defining where people are supposed to send their kids, where "once a map has been published it is pretty much taken for a description of the way things actually are" (Wood 2010: 2–4). Applying this approach to our analysis of web 2.0 cartographies we need to consider the ways these maps work to represent particular arguments or (re)constitute specific geographies.

The third stream of conceptual work within critical cartography we see as relevant to our research is what Kitchin et al. (2012) identify as 'processual' approaches. This term refers to research which imagines cartography as assemblages of practices, technologies, norms, (re)-presentations and so forth, which are dynamic, always 'in the making' and producing new ways of being in the world. The contingency of cartographic processes such as data collection, assigning of categories, and the different circumstance of map use (the same map being used in different ways in different circumstances) mean that maps as they are put together, reworked, folded or read, are constantly in a state of becoming. Examples include: research about 'analog' cartography, such as Laurier and Brown's (2008) ethnomethodology and close description of tourists manipulating and sharing maps in central Edinburgh; Del Casino and Hanna's (2006) research on the performativity of the ongoing consumption and production within dynamic 'map spaces'; and November et al. (2010) work on a 'navigational' mode of cartographic practice, emphasizing the way maps consist of multiple correspondences between objects and spaces, in a manner that is processual rather than a simple moment of mimetic one-to-one correspondence.

Dodge and Kitchin (2007) conceptualize maps as 'ontogenic', considering their very ontologicial status to be fluid and subject to continual reworking. The implications of such ontological instability for research about cartography are manifold, as Del Casino and Hanna remark:

> This theoretical shift suggests that the objects of our analyses are not simply maps but are instead the myriad interconnections that make the production and consumption of map spaces a process of both authoring and reading simultaneously. (Del Casino and Hanna 2006: 51)

This supports our research agenda of identifying assemblages of 'myriad interconnections' and revealing the networks of practices and negotiations through which actors and cartographic objects continually (re)produce each other.

Critical cartography thus provides three key conceptual approaches that are relevant to our study web 2.0 cartographies: (1) maps as socially produced; (2) the discursive constitution of specific social realities *through* maps; and (3) cartographies as assemblages of practices, technologies, norms, (re-)-presentations etc. which are dynamic and processual. The dynamism and fluidity that Kitchin and Dodge ascribe to all maps, is particularly obvious within web 2.0 cartographies that are continually produced and reproduced, re-worked, re-published, mashed-up and updated. A map printout in web 2.0 environments is not much more than a temporary fixation of many fluid and interactive components.

In the following we demonstrate how the theory of discourses and hegemonies and the concept of the political as developed by Laclau in Mouffe help us to understand contingency and processes that both fix and contest meaning within such dynamic arrangements. Discourse and hegemony theory allows a critical examination of *how* web 2.0 cartographies are constantly being produced by—and at the same time (re)produce—specific contingent social realities.

Theorizing the political

The theory of discourses and hegemonies as developed by the political theorists Laclau and Mouffe (1985) conceives every social reality as discursively constituted by hegemonic articulations. Laclau and Mouffe bring together poststructuralist thinking from Derrida, Lacan and Foucault (especially the notion of discourse), with the neo-gramscian concept of hegemony. The main points of their theory might be summed up as follows: the social world is constituted through articulations that arrange and combine elements (linguistic and extra-linguistic) in stable discourses. They call the "structured totality resulting from the articulatory practice" discourse (Laclau and Mouffe 1985:105). *Hegemonic* discourses are effective to the extent that they marginalize other discourses and thus determine the design of the social world.

In everyday life, social realities (such as organizations, collective and individual identities, techno-material arrangements) are often taken for granted. Laclau and Mouffe conceive these social realities as 'sedimented discourses', that is to say as fixed and normalized at a specific historical moment. Laclau and Mouffe take the notion of 'sedimentation' from Husserl to name the institution of a specific social reality:

> Insofar as an act of institution has been successful, a 'forgetting of the origins' tends to occur, the system of possible alternatives tends to vanish and the traces of the original contingency to fade. (…) This is the moment of sedimentation. (Laclau 1990: 34)

Yet, these discursive structures can never be finite. Meanings and all social realities are open for change. Everything that seems natural, granted, unquestionable and given—social realities—has once become sedimented and fixed. This means that every aspect of the social was once and could be again contested and thus is political. This emphasis on contingencies in all social structures is the core of Laclau and Mouffe's notion of the political. It is conceived in a widespread sense, not as limited to specific actions or a specific sphere of the society but as "the moment of the institution of the social" (Laclau 2005). The political unfolds in contingent antagonistic struggles for hegemonic articulations of discourses, where the social reality becomes sedimented and other discourses become marginalized and excluded.

From this perspective, the emergence of the geoweb can be read as contingent constitutions of specific new social realities, an unfolding of the political. New actors become involved in map-making and -use and others are excluded, new technologies enable the creation of specific maps and specific functions and impede others, new rationalities of map-making and -use emerge and become naturalized. As our case study of the Palestine Crisis Map will demonstrate in more detail, features of the geoweb such as standardized geodata formats, the principle of map mashups or our use of certain geospatial services can be read as sedimented discourses, enacted through successfully stabilized assemblages.

The important role of Google maps for example has appropriately been described by Dalton (2012) as 'google geo discourse'. Clearly, those fixed social realities are not only contingent, but also always in the making and contested—here, in the case of GoogleMaps, they are obviously contested by the development of competing mapping services from Apple Maps or OpenStreetMap. It is these struggles that we conceive as the political, and that we want to analyze with respect to web 2.0 cartographic practices. As our case study will demonstrate, this conceptual framework can be applied not only for the exemplified economic 'macro-struggles' in the geoweb, but also in smaller contexts. It is exceptionally useful because it moves beyond a mere theorization of semiotic constitutions of meaning and considers also the articulation of practices and materialities in (re)constituting social realities (Laclau 1990:100).

Still, Laclau and Mouffe have not without reason been criticized for being 'human centered' and for viewing the political "as bearing merely on the 'organization of human coexistence'" (Featherstone 2008:6). In fact the notions of 'sedimentation' and processes of instituting and fixing a specific social reality are seldom illustrated in the writings of Laclau and Mouffe (Mouzelis 1988). The role of materiality and the extralinguistic in general for establishing, codifying or consolidating specific social realities is largely neglected as well in their work, as well as in most empirical studies which try to operationalize Laclau and Mouffe's perspective. As elaborated in the following section, we believe that ANT offers a methodological framework to fill this gap by enabling empirical studies on the political that include extralinguistic and material elements of the social.

ANT as a methodology for tracing the political in web 2.0 cartographies

Actor-network theory (ANT), which originated in science and technology studies, conceives the social as assemblages of hybrid (human and non-human) actors. Actor networks are the associations of sign systems, materialities, technologies and subjects. There are significant conceptual analogies between the theory of discourses and hegemonies and ANT. Both are to a large extent inspired by the semiotic structuralism of Saussure and the advancement and critiques most often labeled as poststructuralist (Belliger and Krieger 2006:23–24; Hostaker 2005). Which is why ANT has been termed "material semiotics" (Kontopodis and Niewöhner 2010:10–1), "semiotics of materiality" (Law 1999:3–4; Law 2007:2) or "relational materiality" (Crawford 2005). Following the ANT-argument of symmetry between human and non-human actors, the social is not limited to humans, but also includes the sphere of materialities (Law 1992:381 ff).

In this section we discuss why ANT helps to operationalize the concepts of contingencies and the political for empirical research. Furthermore we argue that ANT's methodological approach to the role of technologies is promising for the study of complex technological assemblages like web 2.0 cartographies. There are four conceptual aspects of ANT that are helpful for the design of critical, empirical research on web 2.0 cartography:

Firstly, ANT can deal with the overwhelming complexity of geoweb phenomena by looking not for discrete empirical objects, but rather for complex networked assemblages of manifold human and non-human features (Kontopodis and Niewöhner 2010:17–8; Latour 1986, 1999, 2005). We can regard all elements contributing to web 2.0 maps: such as programmers, users, energy flows, legal frameworks, languages, hardware, software, satellite systems, electricity and communication infrastructures, industrial standards, computers, GPS devices, coordinate systems, algorithms, operating systems, as playing their role in a map's constitution.

Secondly, ANT is able to incorporate the role of technologies, which is essential to understanding how geoweb phenomena actually work. This is because ANT assumes a certain degree of symmetry between human and non-human agents where material artifacts are treated as equal co-producers of social relations. This is probably the most distinctive and most debated feature of ANT. Materiality has agency in the sense that it enables or prevents certain things to happen. Technology does not simply help people to pursue their predefined interests, it can also create opportunities for new interests. Geolocation services on mobile smartphones may induce new desires for exploring a city. Or as Latour puts it in his famous example of people and guns: "each artifact has its 'script', its 'affordance', its potential to take hold of passersby and force them to play roles in its story" (Latour 1994:31).

Thirdly, ANT offers the concept of the 'black box' to designate assemblages of actants cooperating so effectively and smoothly that they tend to be taken for granted and their compositional nature gets forgotten. The assemblage disappears behind a single unit, what Law terms 'punctualization' (Law 1992:384–385). This concept can explain asymmetries between actors because bigger actors (e.g. international organizations or companies) succeeded in stabilizing many transactions in black boxes, which allows them to appear as a huge single homogenous actor (Belliger and Krieger 2006:43; Latour 2005:39; Law 1992: 384–385; Law 2007:8). Opening black boxes demands from the researcher an attitude of agnosticism "abandoning any a priori assumptions of the nature of networks, causal conditions, or the accuracy of an actant's accounts" (Callon 1986:221; see also Crawford 2005:2). This widening of focus is necessary because it is in the nature of black boxes to evade our attention. The investigation of the black boxes of web 2.0 cartographies brings insights about the hidden processes behind established conventions or the internal networks within institutional actors. The technical infrastructure known as the 'world wide web' for example is as much a black box as the mapping platforms OpenStreetMap, Ushahidi or 'the crowd' that generates all that data (see our case study later in this paper).

Fourth, if ANT is concerned with how actants establish relations and regular patterns of repeated circulations within the network, it has to pay attention to the respective *actions* rather than the actors alone. If we follow the actors with proclaimed agnosticism and we overcome subject-object dichotomies, then we have to focus on the *processes* in which networks are being *performed* and *how* relations are being *enacted* (Kontopodis and Niewöhner 2010:10; Law 2007:12–3). This phase of analysis is very much process-related, tracing

"[p]erformativity which (sometimes) makes durability and fixity" (Law 1999:4). What is the story behind the information that ends up in standardized spatial databases? How are decisions made on categorization, data formats and rendering algorithms? ANT allows us to explore how users actually do map, how disagreements are resolved, how software packages are employed, and the sorts of processes that connect and stabilize actors into 'black boxes'.

ANT can help to operationalize the theory of discourses and hegemonies by taking into account the role of materialities and technologies for stabilizing specific social realities (see also Latour 1986: 270–272). It tells us to look for black boxes, that is to say punctualized assemblages which have been stabilized and tend to be taken for granted. The ANT-concept of blackboxing can be read as a methodological translation of Laclau and Mouffe's concept of sedimentation. Hegemonic discourses are stabilized and reproduced not only through systems of linguistic and symbolic signifiers, but also through black boxes of materialities and practices.

However, because ANT seeks to describe network relations that *are being* enacted, it runs the danger of ignoring relations that *might have been* enacted but for some reason were prevented. By describing existing networks we focus on relations that have been successfully established and thereby miss the marginalized others that actor-networks always produce (Star 1991; Amsterdamska 1990; Hetherington and Law 2000; Law 1999:5; Lee and Brown 1994). This blindness of ANT to questions of hegemonies, of inclusions and exclusions can be avoided when we bring in the critical perspective of the theory of discourses and hegemonies, which draws attention to potential social realities which are marginalized and suppressed (Bridgman and Willmott 2006:8; Hostaker 2005; see also Law 1992:389). Hence our combination of the poststructuralist theory of discourses and hegemonies and ANT as methodological framework, we argue, allows critical research on the assemblages of web 2.0 cartographies with sensitivity towards moments of struggle, disagreement and contingency, where the political unfolds.

In order to operationalize this approach, we return to the three approaches within the critical cartography literature that we referred to above, and incorporate them within our ANT-inspired methodological approach. Remembering that maps are not only socially produced but also (re)produce social realities, we can imagine a web 2.0 cartography as a system of two interconnected assemblages (see Fig. 1).

On the one hand we have the actor-network(s) producing the map. As described above, a map is the product of manifold elements, including people, materialities, institutions, norms and standards. Since the map also (re)produces social realities, the assemblages do not stop with the map. We can also follow its engagements and impacts, how it is embedded and employed in different contexts and assemblages. The map itself can be understood as a temporary fixation, a fluid artifact, yet momentary stable, constantly being produced and reproduced, producing and reproducing. Of course, there are interconnections between the assemblages leading to and away from the map. This is especially relevant in a web 2.0 environment, where strict separations of production and use are neither reasonable nor possible (see Bruns 2008). Although we agree with the theoretical concept of 'bridging the binaries' of production and consumption (Del Casino and Hanna 2006) our approach requires a separation of both spheres for heuristic reasons. We suggest using the map as a gateway, hinge or bottleneck between them. From the map we can follow the actors in both directions and see where they lead us, what networks they span. If interconnections between the two sides indeed emerge, it will be possible to identify them. As an illustration of how such an analysis might proceed, in the following section we describe a case study example of web 2.0 cartographies. The case study is not intended to provide a comprehensive analysis of the mapping example, rather to illustrate how the complementary approaches of ANT and Laclau and Mouffe's theories of discourses, hegemonies and the political help to understand the contexts, effects and the exclusions of this mapping project.

How to trace the political? The Palestine Crisis Map as an explorative case study

The Palestine Crisis Map is a web 2.0 map that portrays reports of human rights violations in Israel/Palestine, from May 2011 to the present (a screenshot of this map is shown in Fig. 2). Each report is geolocated and represented as a dot on the map, color-coded according to the categories (such as 'detentions', 'exile and isolations', 'home and livelihood security' and so forth) on the right hand side.

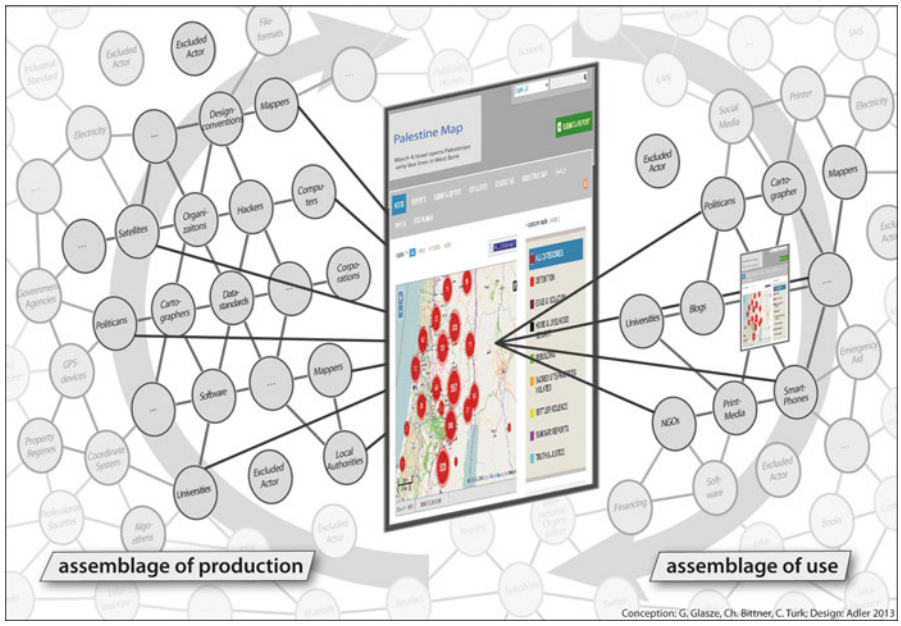

Fig. 1 The assemblages of production and use for web 2.0 cartographies

The numbers in the big dots stand for the respective amount of aggregated events. By zooming into the map, the big dots become disaggregated, until on a local level each dot represents only one event. By clicking on a single dot, one can access information about the event in question.

The Palestine Crisis Map is public, dynamic and represents data collated from multiple sources. Furthermore it is made with generic (Ushahidi 'Crowdmap') software designed to produce web 2.0 maps.

The map inspires several questions. What is the 'crisis' in Palestine being portrayed here; and how

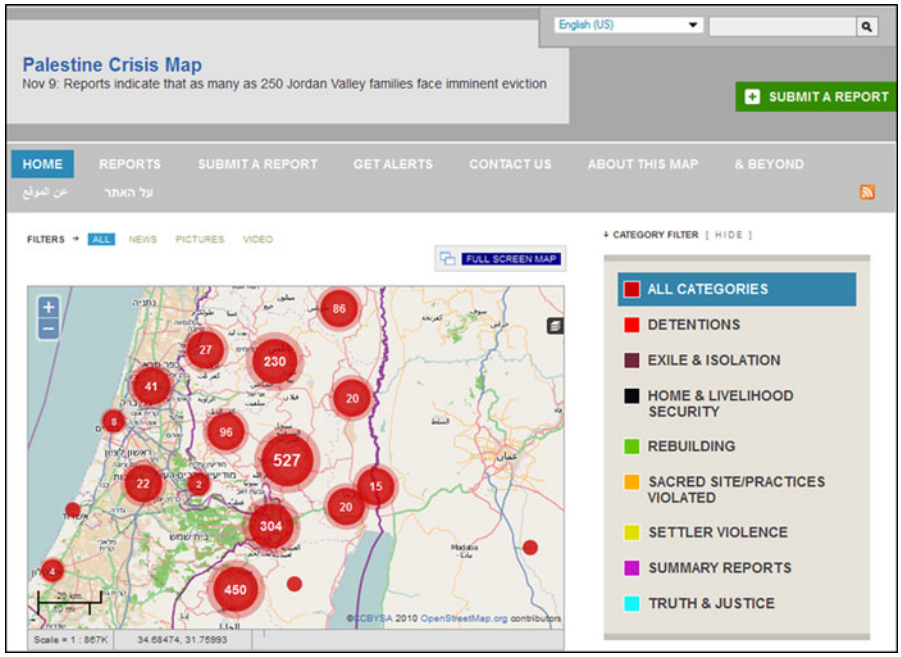

Fig. 2 Palestine Crisis Map (https://bindup.crowdmap.com/main 11/2012)

does the spatial arrangement of this data inform us about it? Who has put these reports together and what messages do they want to convey? In our analysis we set out to trace the political within the processes of making and using this map. In so doing we wanted to reveal what kinds of logics and processes work to produce the map; how these processes affect what is presented and what is omitted in the map (including its database and website); and hence, what sorts of propositions are being made through the map, such as how it influences what people think about Israel/Palestine. Drawing on the theoretical and methodological frameworks outlined in the previous sections, our analysis consisted of three basic steps: (1) revealing the network or the 'assemblage' within which this map sits; (2) questioning hegemonies, conventions and norms (opening 'black boxes' within the assemblage); and (3) examining processes of decision-making, inclusion, exclusion and marginalization (the relations between actors in the network and considering what has been left out of the network). In this section we describe how we have undertaken these three steps in our analysis of the Palestine Crisis Map, thereby suggesting how empirical research from our theoretical perspective can be conducted. In conclusion we will discuss how this approach could be extended.

Taking the map as a starting point our research sought to reveal the assemblage of actors associated with the map. Quite practically this meant recording and noting the human and institutional actors responsible for the creation of the map, the technologies, software and codes that are used for the map, the sources of the data, the knowledges and norms that guide cartographic practices and so forth, expanding outwards, noting that each of these actors is themselves embedded within networks. Furthermore web 2.0 maps are dynamic, changing constantly as their databases are maintained, actors engage or disengage, or the software is updated. So as we revealed our network we also had to bear in mind that this is a contingent configuration of actors that is continually changing. In order to analyze this dynamic assemblage of technologies, institutions and human actors, we employed a mixed-method approach (such as suggested in, Elwood 2010b) drawing on quantitative analyses of databases, qualitative interviews and analysis of code. The rhizomatic nature of actor-networks prohibits a single epistemological scope and the choice of method rather depends on the respective parts of the networks and the evidence available. Each method helped us in some aspect to go through the three steps of identifying actors, opening black boxes and examining conflicts, inclusions and exclusions.

For example, we performed a quantitative analysis of the database of 'reports' of 'human rights violations', i.e. the sources of the information that becomes the dots on the map. It became clear that the author/map curator checks several online news sources for relevant stories, geolocates and categorizes them to feed data into the map. Between May 2011 and late September 2012, over 2000 such reports had been accumulated within the map. Our research showed that seventy percent of these reports have been sourced from the English language section of Palestinian news websites (Ma'an[1] 32 %, WAFA[2] 19 %, PIC[3] 11 % and IMEMC[4] 10 %). The most important non-Palestinian source is the website of Haaretz,[5] a center-left Israeli newspaper. Altogether, over 100 different sources had been used (generally Palestinian news sites or pro-Palestinian NGO web pages), although most of them only once or twice. This quantitative analysis not only extended the number of actors within the assemblage of the map, it also permitted us to pry open the concept of 'reports of human rights violations' as it has been defined through this mapping process. The selection (and exclusion) of news sources directly affects how the 'crisis' appears in the Palestine Crisis Map.

In order to find out more about this selection of sources and moreover to reveal more about the origins and context of the map, we contacted the map author and conducted both written (email) and oral interviews. The Palestine Crisis Map was set up by a retiree from San Francisco, USA, who had worked in Information Technology until her retirement in 2007. Due to years of voluntary involvement in the US-based Christian pro-Palestinian organization FOSNA,[6] she was asked by the Rebuilding Alliance[7]

[1] http://www.maannews.net (11/2012).

[2] http://english.wafa.ps/index.php (11/2012).

[3] http://www.palestine-info.co.uk (11/2012).

[4] http://www.imemc.org/about (11/2012).

[5] http://www.haaretz.com/ (11/2012).

[6] http://fosna.org/ (11/2012).

[7] http://rebuildingalliance.org/ (11/2012).

(another US-based pro-Palestinian organization) to establish a map to visualize house demolitions by the Israeli army as well as rebuilding efforts in the West Bank and Gaza, in order to raise awareness and funds. This information about the origins of the map not only leads to questions about how the original intent has been carried through, but it also extends the actor-network of the Palestinian Crisis Map, connecting us into activist networks, as well as the news sources through which they are informed.

Another entry point to the actor-network(s) of the map is the source code of the webpage. In the head of the html file (main.html) we can find several references to script files (mostly java script libraries), hosted on external servers. Those scripts bear the code which enables (and restricts) the interactive behavior of the website and the map interface. Highly relevant is the library ushahidi.js, containing the code of the Ushahidi platform.[8] Again, an examination of the context within which this code is produced and the standards it sets, opening the Ushahidi 'black box', provides us with a richer picture of how this particular software and code influences the map. Ushahidi was originally created as a crowdsourcing tool to map otherwise unreported outbreaks of violence in Kenya 2008. Since then the application has been improved and its breakthrough came after the disastrous earthquake in Haiti in 2010, where it was used to map needs and resources in order to assist with humanitarian aid logistics. Ushahidi has developed to a non-profit software provider, offering technologies to gather, process and visualize geospatial data, focusing on crowdsourcing mechanisms for crisis maps. Today there are countless Ushahidi based maps on the web, dealing with natural disasters or escalating political conflicts, but also with many other issues. The platform Crowdmap[9] is a hosting service for Ushahidi maps which facilitates users with little or no coding skills to deploy the Ushahidi technology and set up web mapping projects. This is how the Palestine Crisis Map was implemented. The creator of the Palestine Crisis Map contacted the Ushahidi community and got support from a central member of the Crisis Mappers network,[10] who has been involved in numerous Ushahidi mapping projects.

[8] http://ushahidi.com/ (11/2012).

[9] https://crowdmap.com/ (11/2012).

[10] http://crisismappers.net/ (11/2012).

The code of Ushahidi, especially on the standardized Crowdmap platform, also determines how an issue is portrayed through a crisis map, reducing a highly complex political configuration like the Israeli–Palestinian conflict to red dots on a map (Bittner et al. 2011). Following these logics, certain events in the context of a crisis (like acts of violence, detentions or demolitions) are (geo)coded, forwarded through a chain of translations and end up as discrete quantifiable objects in a database. The conflict is represented by spatial patterns of these objects, explorable via a geobrowsing interface on a website. This process is conducted at the expense of much context and complexity because the story that connects the dots is spared from this picture. What can we actually learn from a crisis map that helps us to understand a political conflict? It doesn't show us multiple perspectives on the issue; it stays silent about contested identity politics or about the emotional impacts of discrimination on an everyday level. While Ushahidi no doubt employs innovative technologies to bring data onto a map, it is also limited regarding forms of content which are difficult to categorize and geolocate.

Even the layout of the Palestine Crisis Map webpage is widely predetermined by the Crowdmap software. In order to create a 'crowd' map in its simplest form the user has only to choose a theme, a standard view for the base map (subset, zoom level) and categories for whatever the map is supposed to show. Facing the problem of creating suitable categories, the map's creator soon felt the need to widen the focus of the map from demolitions and rebuilding efforts to a more comprehensive set of categories around human rights violations in Palestine/Israel:

> I believed that focusing solely on demolitions/rebuilding would artificially truncate the view of the existing 'matrix of control' and resulting demographic changes taking place over time. (Palestine Crisis Map creator/curator, Email interview, October 2012)

She therefore introduced new categories and subcategories in relation to the Israeli occupation, among them 'detentions', 'deportations', 'settler violence' or 'issues of truth and justice'. In so doing the map's creator transformed the idea of mapping demolition/rebuilding, to one that addressed her image of the Israeli–Palestinian conflict. Her guideline, the concept

of the 'Matrix of Control' refers to the multifaceted nature of Israeli control over Palestinians.[11]

Activist discourses are also reproduced through the use of Ushahidi, which brings in its agenda of empowerment, transparence, authenticity and authority from the crisis mapping community (see Elwood and Leszczynski 2012 for a more detailed discussion of the knowledge politics and visual strategies associated with the Ushahidi platform; and Bittner et al. forthcoming). It is interesting to reflect that the very name of the project 'Palestine *Crisis* Map' could well stem more from this '*Crisis map*ping' discourse than from the idea of a 'Palestine Crisis'.

However preliminary our sketching of a small subset of the network is, we think we are able to draw two cautious conclusions from this case, which are also relevant for wider discussions on web 2.0 cartographies and the geoweb. Firstly, the assemblage of the map was not established by coincidence, nor was it predetermined from the outset. It is rather a contingent combination and reproduction of certain discourses. The impulse to create the map was clearly inspired by strong US pro-Palestinian activist discourses. This specific view on the Israeli–Palestinian conflict has been processed by the logics of what we could term the 'crisis mapping discourse'. Second, now that we have started to open the black boxes within the assemblage surrounding the map, we can identify a few moments of exclusion. Detecting which actors actually are involved in the actor-network enables us to look for omissions, and consider silenced actors that do not participate in the network. Interestingly, to date, neither any Palestinian nor any Israeli have been actively involved in the Palestine Crisis Map. The reports on the map are actually not crowdsourced via direct contributions from voices on the ground in Israel and Palestine. The project seems to be in the hands of activists based in the United States (for the moment at least, for there are plans to trial 'bounded crowdsourcing' initiatives by soliciting reports from trusted sources living in Palestine and associated with the NGO which initiated the map). We might also raise questions about the target audience of the map, since its contents are almost exclusively in English language. The reports stem mostly from Palestinian journalists writing for an international readership. So, by analyzing data sources and sorting processes, it becomes clearer which voices do actually speak to us through the map. The crisis map draws upon a certain section of Palestinian society and their voices are selected and categorized by one US activist before entering the map, to represent a 'Palestine Crisis'.

By extending our investigation beyond the frame of red dots mashed into a map, into the website, the platform, the code, the data sources, the curator(s) and the initiator(s) we have (re)assembled a network of actors represented by and working on the Palestine Crisis Map. In the process we opened a couple of the black boxes and questioned discourses which have become sedimented within the context of making web 2.0 maps (with the Ushahidi software, in particular). We also examined the processes through which actors connect within the assemblage and the sorts of decisions that lead to certain perspectives being included or excluded. As we see above, analyzing lines of code can be as helpful as qualitative interviews and we consider ethnographic research to be just as necessary as statistical explorations of geodatabases in taking research into web 2.0 cartographic assemblages further.

There are three key ways in which we would extend this analysis. Firstly, by traveling/unraveling much further into the network we could open many more black boxes and identify further hegemonic discourses, inclusions and exclusions. For example, the use of the basemap from OpenStreetMap[12] is particularly interesting given the analyses by several authors (e.g. Haklay 2010; Neis and Zipf 2012) that describe the uneven distribution of contributors within this complex online map-making community. We would also like to further investigate the structure and distribution of internet infrastructures (Aouragh 2011; Tawil-Souri 2012) and the role of standards and guidelines established by organizations like the World Wide Web Consortium[13] or the Open Geospatial Consortium.[14]

Secondly, it would also be useful to conduct a longer-term analysis incorporating the dynamics of

[11] The concept of the 'Matrix of Montrol' stems from Jeff Halper, a US-born Israeli peace activist and director of The Israeli Committee against House demolitions (http://www.icahd.org/ (11/2012)).

[12] http://www.openstreetmap.org/ (11/2012).

[13] http://www.w3.org/ (11/2012).

[14] http://www.opengeospatial.org/ (11/2012).

the network. The above analyses only relate to a certain timeframe in the evolution of the Palestine Crisis Map. The sort of mapped 'actor network diagram' we might get by sketching out relations between actors is only a freeze frame of cartographic processes that live, spark, fizzle, and emerge as we study them. This is a strong ground why we need a theory that examines the political. If we are going to consider cartography as a set of processes then we need nuanced approaches to analyzing the dynamics of interactions and negotiations, not just in terms of the contingencies of practice but also how they contribute to the formation or sedimentation of discourses. Indeed, this is true for all cartography, not just dynamic participative web 2.0 cartographies.

Thirdly, our approach should also be extended to include more about the assemblages of map *use* (the right hand side of Fig. 2). In our discussion here we have primarily been concerned with the assemblage of those involved in the production of the map, or the technologies and logics on which it has been based. A more comprehensive analysis of the impact of the map and the effect it has on social processes would be obtained by following it further through the networks—who is citing the map? Is the information used to make decisions? Is the map read as a representation of the conflict and by whom? The ease with which information is recycled and adapted in the digital age may see a map such as this surfacing on other people's blogs or in news reports. The core dataset may even be worked into another map. Tracing the assemblage in both directions enables us to consider both the interests at work in producing a map and the interests it serves.

Conclusion: analyzing the political in web 2.0 cartographies

This paper explores a theoretical approach for critical empirical research on web 2.0 cartographies, as an important subset of the geoweb. By critical research we mean explorations that question given social realities and sensitize for patterns of marginalization and exclusion. In order to achieve this we have turned to critical conceptions of cartographies which alert us to consider the social contexts in which maps are produced and further, the way maps (re)produce social realities. Critical Cartographers have also reminded us of the ontological insecurity of cartographies, that maps change as they emerge and are used in different contexts and that attention to performative and processual aspects are important.

We brought this understanding of cartographies together with the non-essentialist notion of the political from poststructuralist theory of discourses and hegemonies of Laclau and Mouffe (1985). This theory conceives 'successful'—that is to say hegemonic—discourses as social realities which become fixed, sedimented and perceived as natural while other possible social realities become marginalized. The moment of the institution of a specific social reality is conceived as 'the political'. From this perspective, web 2.0 cartographies can be read as a contingent (re)making or sedimentation of specific discourses, social realities—an unfolding of the political.

As a methodological framework we deployed central aspects of actor-network theory, which can help to operationalize the theory of discourses and hegemonies by taking into account the role of materialities and technologies for stabilizing specific social realities. It tells us to look for black boxes, punctualized assemblages that have been stabilized and tend to be taken for granted. Hegemonic discourses have their material expression in black boxes, stabilized actor-networks. They could be different and they have been established at the expense of marginalized and silenced others. To identify those who are excluded, critical research on the geoweb has to look for moments of contingency, of struggle and contention. The theory of discourses and hegemonies shares with actor-network approaches a non-essentialist notion of social realities but in addition helps to sensitize empirical research for the possible, marginalized and unrealized social realities.

Drawing on this theoretical and methodological background our analysis of web 2.0 cartographies consisted of three basic steps: (1) revealing the network or the 'assemblage' within which a map sits; (2) questioning hegemonies, conventions and norms (opening 'black boxes' within the assemblage); and (3) examining processes of decision-making, inclusion, exclusion and marginalization (the relations between actors in the network and considering what has been left out of the network). Our explorative case study of the Palestine Crisis Map demonstrated how we can use these three steps to reveal 'the political' within web 2.0 cartographies. On the screen, this map shows the 'crisis' in Palestine by way of geolocated and categorized news

reports. By extending our investigation beyond the frame of red dots mashed into a map, into the website, the platform, the code, the data sources, the curator(s) and the initiator(s) we have (re)assembled a network of actors represented by and working on the Palestine Crisis Map. In the process we opened a couple of the black boxes and questioned discourses which have become sedimented within the context of making web 2.0 maps (with the Ushahidi software, in particular). As a result we gained a greater appreciation of the contingency of the map, the dominance of activist and 'crisis mapping' discourses, and were able to identify decisions that led to the inclusion of some voices (Palestinian based journalists writing for international audiences) and the exclusion of others (residents of Palestine and Israel).

The case study also showed why this theoretical and methodological approach is useful in geoweb research. The ability to zoom into specific decisions, order them within larger assemblages and consider the discourses and hegemonies at work could well be applied in other contexts. Laclau and Mouffe's work offers a theoretical basis for analyzing the very 'processes' (i.e. negotiations or struggles) around which the 'processual' approach is based. Our approach thus extends Kitchin, Gleeson and Dodge's recent work by offering a set of theories which can help to better understand how cartographies and cartographic practices emerge (Kitchin et al. 2012). Our suggestion may also be used to provide a theoretical extension to the sort of 'inductive analysis' that Elwood and Leszczynski (2012) employ in their recent work on 'knowledge politics of new social media'. Finally, we hope that these theories can enrich the wider discussions around the 'democratizing of geographic knowledge' with the geoweb. Building on Haklay's (2013) critical reflections on what democracy means in this context, which point towards questions of participation, we have provided a theoretical approach that helps to conceptualize and to analyze exclusions within web 2.0 cartographies.

We have shown how the critical approaches developed in critical cartography and critical geoweb studies can be extended by bringing in a perspective which is rooted in the theory of discourses and hegemonies and a research design which is inspired by ANT. This approach enables an analysis of the deeply political character of the specific assemblages which are currently being built in web 2.0 cartographies and which change the (re-)production of geographic knowledges, social realities and, in the end, the worlds we live in.

Acknowledgments The authors would like to acknowledge and thank the special issues editors and the three anonymous reviewers for their detailed and helpful comments. Furthermore we extend our thanks to Pauline Probst for her assistance with data analysis and to the creator/moderator of the Palestine Crisis Map for her considered reflection on her project.

References

Amsterdamska, O. (1990). Book review. Surely you are joking, monsieur latour! science in action, by Bruno Latour. *Science, Technology and Human Values, 15*(4), 495–504.

Aouragh, M. (2011). *Palestine online. Transnationalism, the internet and the construction of identity*. London: I. B. Tauris.

Belliger, A., & Krieger, D. (2006). Einführung in die Akteur-Netzwerk-Theorie. In A. Belliger & D. Krieger (Eds.), *Anthology. Ein einführendes Handbuch zur Akteur-Netzwerk-Theorie* (pp. 13–50). Transcript: Bielefeld.

Bittner, C., Michel, B., & Turk, C. Turning the spotlight on the crowd: Examining participatory ethics and practices of crisis mapping. Accepted for print by ACME (forthcoming).

Bittner, C., Michel, B., Glasze, G., & Turk, C. (2011). Krisen- und Konflikt-Karten im Web 2.0. Ein kritischer Blick auf die neuen Krisen und Konfliktkarten. *Geographische Rundschau, 63*(11), 60–65.

Bridgman, T., & Willmott, H. (2006). Frameworks for understanding organizational change—the case of a major ICT outsourcing contract. *The Journal of Applied Behavioural Science, 42*(1), 1–17.

Bruns, A. (2008). *Blogs, Wikipedia, second life, and beyond. From production to produsage*. New York: Peter Lang.

Callon, M. (1986). Some elements of a sociology of translation. In J. Law (Ed.), *Power, action and belief. A new sociology of knowledge?* (pp. 196–233). Boston: Routledge and Kegan Paul.

Crampton, J. (2008). Cartography: Maps 2.0. *Progress in Human Geography, 33*(1), 91–100.

Crampton, J. (2010). *Mapping. A critical introduction to cartography and GIS*. Malden: Blackwell.

Crawford, C. S. (2005). Actor network theory. In George. Ritzer (Ed.), *Encyclopedia of social theory* (pp. 1–3). Thousand Oaks: SAGE Publications.

Dalton, C. M. (2012): *Mashing-up maps. Google geo services and the geography of ubiquity*. Dissertation. University of North Carolina at Chapel Hill, Chapel Hill. Department of Geography.

Del Casino, V., & Hanna, S. P. (2006). Beyond the 'Binaries': A methodological intervention for interrogating maps as representational practices. *ACME: An International E-Journal for Critical Geographies, 4*(1), 34–56.

Dodge, M., & Kitchin, R. (2007). Rethinking maps. *Progress in Human Geography, 31*(3), 331–344.

Dodge, M., Kitchin, R., & Perkins, C. (2009). Thinking about maps. In M. Dodge, R. Kitchin, & C. Perkins (Eds.), *Rethinking maps. New frontiers in cartographic theory* (pp. 1–25). London: Routledge.

Elwood, S. (2008). Volunteered geographic information: Future research directions motivated by critical, participatory, and feminist GIS. *GeoJournal, 72*(3–4), 173–183.

Elwood, S. (2010a). Geographic information science: Emerging research on the societal implications of the geospatial web. *Progress in Human Geography, 34*(3), 349–357.

Elwood, S. (2010b). Mixed methods: Thinking, doing, and asking in multiple ways. In Dydia. DeLyser (Ed.), *The SAGE handbook of qualitative geography* (pp. 94–113). Los Angeles, London: Sage.

Elwood, S., & Leszczynski, A. (2011). Privacy, reconsidered: New representations, data practices, and the geoweb. *Geoforum, 42*(1), 6–15.

Elwood, S., & Leszczynski, A. (2012) New spatial media, new knowledge politics. Transactions of the Institute of British Geographers. doi:10.1111/j.1475-5661.2012.00543.x.

Farman, J. (2010). Mapping the digital empire: Google earth and the process of postmodern cartography. *New Media Society,*. doi:10.1177/1461444809350900.

Featherstone, D. (2008). *Resistance, space and political identities*. Malden, MA: Blackwell Pub.

Gartner, G. (2009). Web mapping 2.0. In M. Dodge, R. Kitchin, & C. Perkins (Eds.), *Rethinking maps. New frontiers in cartographic theory* (pp. 68–82). London: Routledge.

Glasze, G. (2009). Kritische Kartographie. *Geographische Zeitschrift, 97*(4), 181–191.

Graham, M. (2011) Cloud collaboration: Peer-production and the engineering of the internet. In S. Brunn (Ed.), *Engineering earth* (pp. 67–83). New York: Springer.

Goodchild, M. (2007). Citizens as sensors: The world of volunteered geography. *GeoJournal, 69*(4), 211–221.

Haklay, M. (2010). How good is volunteered geographical information? A comparative study of OpenStreetMap and ordnance survey data sets. *Environment and Planning B, 37*(4), 682–703.

Haklay, M. (2013). Neogeography and the delusion of democratisation. *Environment and Planning A, 45*(1), 55–69.

Haklay, M., Singleton, A., & Parker, C. (2008). Web mapping 2.0: The neogeography of the geoweb. *Geography Compass, 2*(6), 2011–2039.

Harley, J. B. (1989). Deconstructing the map. *Cartographica, 26*(2), 1–20.

Hetherington, K., & Law, J. (2000). After networks. *Environment and Planning D, 18*(2), 127–132.

Hostaker, R. (2005). Latour—semiotics and science studies. *Science Studies, 18*(2), 5–25.

Kitchin, R., Gleeson, J., Dodge, M. (2012) Unfolding mapping practices: A new epistemology for cartography. Transactions of the Institute of British Geographers. doi:10.1111/j.1475-5661.2012.00540.x .

Kontopodis, M., & Niewöhner, J. (2010). *Das Selbst als Netzwerk. Zum Einsatz von Körpern und Dingen im Alltag*. Bielefeld: Transcript.

Laclau, E. (1990). *New reflections on the revolution of our time*. London, New York: Verso.

Laclau, E. (2005). *On populist reason*. London, New York: Verso.

Laclau, E., & Mouffe, C. (1985). *Hegemony and socialist strategy. Towards a radical democratic politics*. London, New York: Verso.

Latour, B. (1986). The powers of association. In J. Law (Ed.), *Power, action and belief. A new sociology of knowledge?* (pp. 264–280). Boston: Routledge and Kegan Paul.

Latour, B. (1994). On technical mediation—philosophy, sociology, Genealogy. *Common Knowledge, 3*(2), 29–64.

Latour, B. (1999). On Recalling ANT. In J. Law & J. Hassard (Eds.), *Actor network theory and after* (pp. 15–25). Oxford: Blackwell.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford: Oxford University Press.

Laurier, E., & Brown, B. (2008). Rotating maps and readers: Praxiological aspects of alignment and orientation. *Transactions of the Institute of British Geographers, 33*(2), 201–216.

Law, J. (1992). Notes on the theory of the actor-network: Ordering, strategy, and heterogeneity. *Systems Practice, 5*(4), 379–393.

Law, J. (1999). After ANT: Complexity, naming and topology. In J. Law & J. Hassard (Eds.), *Actor network theory and after* (pp. 1–14). Oxford: Blackwell.

Law, J. (2007). *Actor network theory and material semiotics*. John Law's STS web page. http://www.heterogeneities.net/publications/Law2007ANTandMaterialSemiotics.pdf. Accessed 07 October 2012.

Lee, N., & Brown, S. (1994). Otherness and the actor network: The undiscovered continent. *American Behavioral Scientist, 37*(6), 772–790.

Leszczynski, A. (2012). Situating the geoweb in political economy. *Progress in Human Geography, 36*(1), 72–89.

Mouzelis, N. (1988). Marxism or post-marxism? *New Left Review, 167*(1), 107–123.

Neis, P., & Zipf, A. (2012). Analyzing the contributor activity of a volunteered geographic information project—the case of OpenStreetMap. *ISPRS International Journal of Geo-Information, 1*(2), 146–165.

November, V., Camacho-Hubner, E., & Latour, B. (2010). Entering a risky territory: Space in the age of digital navigation. *Environment and Planning D, 28*(4), 581–599.

Pickles, J. (1992). Texts, hermeneutics and propaganda maps. In T. J. Barnes & J. Duncan (Eds.), *Writing worlds. Discourse, text and metaphor in the representation of landscape* (pp. 193–230). London: Routledge.

Pickles, J. (2004). *A history of spaces: Cartographic reason, mapping and the geo-coded world*. London: Routledge.

Rehrl K (2010) Geoweb verbindet www und physische Welt. In Rehrl K, Reich S (Eds), *Geoweb.* (6–17) Heidelberg: dpunkt-Verl.

Robinson, A. H. (1952). *The look of maps. An examination of cartographic design*. Madison: University of Wisconsin Press.

Star, S. L. (1991). Power, technologies and the phenomenology of conventions: On being allergic to onions. In J. Law (Ed.), *A sociology of monsters—essays on power, technology and domination* (pp. 26–56). London: Routledge.

Stephens, M. (2012): *From geo-social to geo-local: The flows and biases of volunteered geographic information*. Dissertation. The University of Arizona, Arizona. School of Geography and Development.

Tawil-Souri, H. (2012). Digital occupation: Gaza's high-tech enclosure. *Journal of Palestine Studies, 41*(2), 27–43.

Turner, A. (2006). *Introduction to neogeography*. Sebastopol, CA: O'Reilly Media.

Wood, D. (2010). *Rethinking the power of maps*. New York: Guilford.

Wood, D., & Fels, J. (1992). *The power of maps*. New York: Guilford.

Wood, D., & Fels, J. (2008). The natures of maps: Cartographic constructions of the natural world. *Cartographica, 43*(3), 189–202.