Chapter 35

Mappings

Jeremy W. Crampton

Introduction

Just north of the Bayshore Freeway in San Francisco stands an unprepossessing building known simply as "Building 45." From ground level the blue-sided two-story building appears unremarkable, apart from the generous number of disabled parking places. If you view it from above, however, the building yields a secret. The whole of the roof is covered in solar panels. So are other buildings nearby, and across Charleston Road to the north. In fact, what you're looking at (should you be able to peer at these buildings from the air) is the largest commercial array of solar panels in the United States.

Building 45 holds other secrets too. In fact, it is dedicated to enabling people to peer at the earth. On its second floor a team of programmers and engineers led by John Hanke are engaged in what *Wired* magazine calls a "cartographic revolution" (Ratliff 2007). Building 45 is the location of Google's "Geo" products such as Google Maps, Earth, StreetView, and Panoramio. More recently Google added user-generated mapping capabilities called My Places, in which users can create and share maps with each other using a simple file format known as KML or Keyhole Markup Language. Using a KML file you can post your customized map, email it to friends, use it in a Twitter message, or post it on Facebook. If you want to mark the position of Building 45 or any other spot on earth (and Google claims it provides over 60 percent coverage of the world's populated areas), you can create one of those iconic Google pushpin markers. These you can then embed in your website.

This chapter will return to the mystery of "Keyhole" below, but first will address the "cartographic revolution" that comprises much more than *Wired* magazine might expect in its focus on the technical aspects of Google Earth. That cartographic revolution incorporates yet extends beyond the changing technical nature of map production, to take into account

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map consumption, the manner in which we understand maps as imbricated with and implicated in our everyday social, political, and economic lives; as knowledge that is integral to cultural processes; as a critical component of the very systems of meaning that are both mold and mirror of our cultural practices.

Cartographic Revolutions

Until fairly recently it was an unquestioned assumption among scholars that mapping was a human universal – maps were created by almost all societies and could be found deep into human history. Archaeological findings from prehistoric Europe, ancient China, South America, Australasia, and Africa have all been interpreted as maps or at least proto-maps. In the first English-language textbook on cartography by the Austro-Hungarian émigré Erwin Raisz, a stylized "Time Chart" is offered, tracing the spread of cartography from antiquity to modern maps (Raisz 1938). Raisz fought for the Austro-Hungarian Empire in World War I, emigrated to the United States in 1923, and made his career at Columbia (where in 1927 he offered one of the first cartography classes) and then Harvard University (Yacher 1982). The father of American cartography, Arthur Robinson said that Raisz was the "foremost geographical cartographer in America" (Robinson 1970: 189) and his textbook shaped the field for many years until Robinson's own influential postwar textbook (Robinson 1953).

Raisz's Time Chart presented a progressivist and presentist history of mapping achievements. It starts with a significant claim: "the making of maps antedates the art of writing" (Raisz 1938: 7). Over time maps get more accurate, and with few exceptions the West is in the vanguard. Similar narratives of the progression of mapping, usually told as a story adrift from any sociopolitical events such as colonialism or state power, can be found in other classics such as Bagrow (1964), Brown (1949), and to a lesser extent in Robinson himself.

In response, the historical geographer J. Brian Harley and the historian of cartography David Woodward set out to establish a history that would be "cartography without progress," in the words of Edney (1993). Their still-ongoing *History of Cartography*, conceptualized in 1977 during long walks in Devon (Woodward 1992), draws on cultural geography, anthropology, and the power of maps, as well as history, as their agenda-setting essay outlined (Harley and Woodward 1987). However, it shares with those earlier histories the idea of mapping as a universal; something that is common to both prehistoric cultures and late capitalist societies. Harley could not restrain himself from speculating along the very same lines as Raisz: mapping "precedes both written language and systems involving number" (Harley 1987: 1).

In recent years this cultural universality has been challenged by those who understand the history of mapping alongside the history of the state. Thus for Wood, maps are of relatively recent origin (post-1600 CE); although there are scattered precursors, the vast majority of mapping has occurred with the rise of (and in the service of) the modern state (Wood and Fels 2010). (Here Wood has a traditional view of the state as a spatially bounded container, itself an idea that is receiving increased attention from geographers.) Similarly, James C. Scott argued that government needs to make its concerns "legible," for example through cadastral (property) mapping (Scott 1998), and those who have taken up Foucault's outline of "governmentality" have mined a rich seam of mapping as governmental technology. On these views, then, mapping and geographic information systems (GIS) are not universals but have a very clear purpose as a component of state power and sovereignty. It is only with the modern state that mapping realizes its true history.

Sovereignty and Knowledge: The Emergence of Modern Mapping

How, then, did modern mapping emerge? In this section we shall briefly trace some of the key historical moments, not so much as a sequence of dates but under three general ways to approach maps. The first is *mapping as material form*, or what Robinson classically called "the look of maps" (Robinson 1952). The materiality of mapping is a long-standing interest of cartographers, and includes the design or appearance of maps as well as their mode of production, who has access to them, and the diversity of map types ("cartodiversity"). Geographic information systems also need to be designed and there are lots of places where you can get good advice (e.g., Esri's Mapping Center blog [http://www.esri.com/]) on how to best do this. Finally, there has been some effort on how to design maps for the web, although the best practitioners remain the small custom cartography companies rather than academic scholars.[1]

Second, we will consider *mapping as knowledge(s)*. Here we will deploy a key insight of work on theories of cartography over the last twenty years; maps are not just reflective of knowledge but actively create knowledge – what Foucault once said was the question of how they "thought out space" (Foucault 1984: 244). Mapping is an active process of intervention in the world and there is an important historicity or genealogy to the knowledges created in and around mapping. These knowledges do not act in isolation but exist as networks of power relations. Think of them like the news media. News stories report on what has happened but they choose what to report on and how to frame the narrative. In effect, some maps are like CNN, some are like the Fox Network, and some are like the BBC.

Third, we will consider *mapping as practice and performance*. How are maps and mappings used and experienced? What are the effects of mappings, politically, economically, and culturally? Further, how have emerging practices of mapping challenged traditional authoritative mapping institutions, for example through crowdsourcing? How have these changed and reflected back on the materiality of maps and the forms of knowledge creation? This question then asks how maps change the world in practice.

These three topics are fundamentally intertwined and invite us to reflect on maps' historicity or genealogy, not just as a sequence of events but as situated within a larger sociopolitical context. Thus, the study of maps and GIS in this manner has been the subject of *critical cartography and GIS*, which seeks to unpack the assumptions behind mapping. Mapping's "political turn" encompasses questions of map activism, of decision-making, and crucially of maps as "technologies" of the state (Branch 2011). But state concerns are not new and have been a central narrative in the emergence of modern cartography through to the machinations of "Keyhole."

Mapping is a sense-*creating* process as much as a sense-*making* process. Up until about the nineteenth century this was often understood to center on the natural (or God-given) world. But like its cognate disciplines such as geography, geometry, and natural history, this was not just a matter of description but of categorizing and placing objects of inquiry into a structured framework. If this meant mapping as knowledge, it also had a distinct normative and even teleological meaning, with the map performing ways of being.

The Greek writer Herodotus in his *Histories* (written around 430 BCE) attempted a coherent narrative not just of wars but of the world in which he lived. In a pattern that would be repeated, there was a distinct geography to his knowledge, with increasingly weird and monstrous races away from the centers of learning (Athens and Alexandria). At one point he (somewhat skeptically) provides information on the Neuri, a race of werewolves (Hdt.

4.105). Although people were sometimes described as occupying particular locales, these were not political borders in the modern sense.

But it is perhaps the work of Pliny the Elder and his *Natural History* (first century CE) that is the first serious effort to geographically account for human diversity. Pliny's account was written at a time of increasing exploration (particularly after Alexander the Great), just as the blossoming maps of the fifteenth and sixteenth centuries were. But it was also a time when writers grappled with nature's diversity and wondrousness and attempted to account for it. The "Plinian Races" had huge impact in medieval thought and mapping in particular, describing as he did monstrous people such as the "blemmyae" (headless people with eyes in their chests), "sciopods" or shadow-foots whose name derived from the fact that their legs were fused together with one large foot under which they could shelter if they lay on their backs, the "cynocephali" (dog-heads), and Arimaspi or one-eyed people (Friedman 1981). These strange peoples were again often located at a distance both spatially (e.g., in India) and culturally, far from where normal peoples were (Winlow 2009). Taking their cue from ancient writers and biblical stories (e.g., the Nephilim or giants mentioned in Genesis 6:4), medieval maps delighted in placing these human monsters around the margins of the maps.

Monstrousness is a theme also found in both medieval and later (eighteenth-century) writings. However, in the latter case it took place under a different register; if for Pliny the wonders and monsters were against nature, for eighteenth-century writers they were also a transgression against human laws. Thus the abnormal and the delinquent had a little bit of the monster in them that had to be either suppressed or medically treated.[2] As we shall see, maps of abnormality were very popular throughout the nineteenth and early twentieth centuries.

Medieval maps, known as mappae mundi (world maps) or T-in-O maps from their shape, understood the world in proto-race ways. Following another chapter in Genesis (10), which describes how the three sons of Noah (Shem, Japheth, and Ham) peopled the earth, medieval maps showed the world in three divisions, populated by three major groupings of people (Asians, Europeans, and Africans), which could later be interpreted as races. These three peoples were not necessarily meant to be equivalent. Drawing on a theory of multiple origins known as polygenism, they were understood to be hierarchical, with some at the top (Europeans) and others lower down (Asians and Africans). Noah's curse of his son Ham in Genesis (9:25), along with the fact that Ham was allocated to Africa, provided grounds not only for prejudice against Africans but was also often used to justify their slavery.

As Winlow has discussed, the establishment of evolutionary theories in the nineteenth century served to redouble efforts on mapping human racial types as part of a whole concern with human characteristics, population density, migration, and especially language and religion (Winlow 2009). The famous map by Gustaf Kombst (2nd edition, 1856), for example, showed various racial groupings allotted into distinct geographical territories (see Figure 35.1). These maps were made as part of a discourse that was concerned with the distribution of populations (often, as in Kombst, to compare the state of "pure" races with encroachments from other lesser races). This was by no means a nineteenth-century prerogative and many of its geo-race ideas made headway well into the twentieth century – and found friendly reception in geography, anthropology, and biology. The American lawyer Madison Grant, for example, whose racist book *The Passing of the Great Race* (Grant 1932) was indicative of mainstream race science prior to the war, was a longtime councilor on the American Geographical Society (AGS). As an associate of Isaiah Bowman, the AGS Director between 1915 and 1935, Grant had earlier published his work in the flagship journal of the AGS, the

Figure 35.1 Ethnographic map of Europe according to Gustaf Kombst. In *The Physical Atlas of Natural Phenomena* by Alexander Keith Johnston (2nd edition, 1856).
Source: David Rumsey Map Collection. Used by permission of David Rumsey.

Geographical Review (Grant 1916). Grant's was a true biological racism, and his maps in *GR* and his book unhesitatingly drew distinctions between the three European races (Nordic, Mediterranean, and Alpine) and "Negroid" and "Mongoloid" races. He argued some countries were more affected by throwbacks with "Neolithic" traits. Even Britain, with its generally admirable Nordic type (blond, blue-eyed, with flowing hair), sometimes yielded evidence of a less-developed trait. Who can fail to observe, writes Grant, "on the streets of London the contrast between the Piccadilly gentleman of Nordic race and the Cockney costermonger of the old Neolithic type?" (Grant 1932: 27).

Thematic Maps and State-istics

As populations-as-race came to the forefront of governmental concern, new forms of mapping were introduced to deal with the problem. In the late eighteenth century, thematic descriptions of one specific topic rather than the multiple features of a topographic landscape were mapped for the first time. These maps (known as thematic maps) were made not just for the sake of it, but rather to address a burgeoning problem. By the mid-nineteenth century most of the types of thematic maps in use in today's GIS had been invented. The well-known choropleth map, for instance, was first used in 1826. It was used to depict a crisis in education and shows the ratio of (male) children in school compared to population of regions in France. Its author, Baron Charles Dupin, wished to identify what was then called *la France obscure* and *la France éclairée* (uneducated and educated parts of France) (Dupin 1827).

There was tremendous contemporary interest in this map and it was much copied by his contemporaries in what Beirne (1993) calls a "social cartography" that helped invent certain kinds of people, mostly deviants or abnormals (Hacking 2002; Foucault 2003b). These choropleth maps (they were not called that then; the term was invented in 1938 by J.K. Wright: see Crampton 2009) were instrumental in framing a spatial discourse of norms and abnormals. Alongside the maps came a slew of statistical measures, again familiar to us today, such as the "normal distribution" developed by Adolphe Quetelet in his "social physics" (Hacking 1990). Many of today's GIS geostatistical measures came out of work in ecology in the early twentieth century. These statistics were critical as the very etymology of the term indicates: they were "state-istics" (Shaw and Miles 1979), that is, statistics for the state.

The point to consider then is how mapping and the production of certain kinds of knowledge have been imbricated with governmental projects – a question that involves but is not limited to the state. How do maps frame our understanding of spatial distributions such as race, and how as a practice do they create and promote certain forms of knowledge and not others? For instance, J.K. Wright's work in the early twentieth century has left a tremendous but largely unexamined legacy in geography, and specifically mapping and GIScience. Wright brought together a conception of space that could be modeled as points, lines, and areas. This schema today underlies GIS and vector data models of points, lines, and polygons. What is at issue here, then, is how practices of mapping have "thought out space" (Foucault 1984: 244). Instead of points, lines, and polygons, which is not a particularly everyday understanding of the world, perhaps maps should involve a more experiential aspect of our lives (maps as practices)? Or perhaps with its emphasis on hard and fast lines, the map has supported the idea of clear territorial borders, when in fact the real world is more diversified and spatially transitional?

Returning to Keyhole

Now we can return to the question of the "Keyhole" in Google's KML. The Keyhole referred to is the name of a series of secret reconnaissance ("spy") satellites launched by the US government since the 1960s. It is also the name (Keyhole, Inc.) of a company that developed Earth Viewer, a virtual digital earth. Keyhole was acquired by Google in 2004 and renamed Google Earth (Crampton 2008). Prior to the purchase, Keyhole, Inc. was funded in part by the Central Intelligence Agency's venture capital company In-Q-Tel, which was set up in 1999 to fund technology that would advance the agency's intelligence mission. The CEO of Keyhole, Inc. was John Hanke, whom we met in Building 45. (Hanke left Google in 2010.) Prior to its buyout the main client of Keyhole was the National Geospatial-Intelligence Agency (NGA), a geographic intelligence agency about the same size as the CIA.

These interconnections show that government and mapping have had, and continue to have, an intimate relationship. In this it is not unique as there are other disciplines with a government (and military) legacy, such as physics (the Manhattan Project), computer science (DARPA and the invention of the Internet), the health and life sciences, and anthropology (Wakin 1992; Price 2008). These relations may go mostly unexamined, although in the case of the latter they recently prompted the major American anthropological association to issue a statement on research and the military intelligence community (Peacock *et al*. 2007). Similar concerns were raised in geography concerning participatory mapping expeditions to Mexico by academics in North America who had military ties (Bryan 2010). Nevertheless the legacy of involvement in geography is longer than most, given the way that states have mapped terrain for warfare and empire (Driver 2001). In this sense, then, mapping is a technology of government. This is not to reduce mapping to being only an element of government, but rather to identify a project that has not yet been completed: tracing the genealogy of mapping and the state. Nonetheless, there have been some important contributions (Hannah 2000; Edney 1997; Schulten 2001).

The Possibilities of "Counter-Mapping"

We noted above that the term "Keyhole" provides an insight into both where mapping/GIS have come from (technology of government) and where it may be heading. We do this by examining the exciting potential of creating and sharing mappings, personal geographies, creative projects, and explorations with each other. Traditionally the big mapping projects (Ordnance Survey, US Geological Survey, even Lewis and Clark) were in the service of government – Scott's idea of the state making itself visible in order to govern it properly. This meant in turn a "trickledown" model from state and local government to the citizen. If you wanted, say, the plat map of your property, you would go to City Hall and obtain it (sometimes for a price) at the Planner's Office. Similarly, if you wanted an aerial or satellite image, you could go to a federal agency like the National Oceanic and Atmospheric Administration (NOAA) or the USGS. Over the past few years a rather different model of mapping has started to emerge. It is still very nascent (and unfortunately goes by a long list of clunky names like "volunteered geographic information" and the "spatial geoweb"), but the idea is clear: enable open-source data creation and sharing. A rather more evocative way to think about it is "counter-mapping." If the state is mapping and performing surveillance, we citizens are counter-mapping.

Counter-mapping uses tools and data that are *open source*, meaning three things:

1 Anyone is free to obtain them.
2 Anyone is free to change them (i.e., rewrite the code).
3 Anyone is free to distribute them.

"Free" means free to (*libre*) and often (but not necessarily) financially free (*gratis*).

The story of the rise of counter-mapping is a fascinating one. One critical moment occurred in late 2004 when Paul Rademacher was driving around in San Francisco trying to find a new place to live. He was balancing the well-known Craigslist of properties (originally a hard copy but now also online) and a stack of maps. As he drove around with piles of printouts and maps, Rademacher thought, "Wouldn't it be better to have one map with all the listings on it?" (Ratliff 2007: 157). His timing was excellent. On February 8, 2005, Google Maps went online and within only a matter of hours programmers had reverse engineered it so that their own content, rather than Google's, would appear on the maps (Roush 2005). What this meant was that Google Maps had been hacked – not by mischievous troublemakers but by people who wanted to use Google's well-designed maps to display and share their own data. The result was a website called housingmaps.com (still going today), where you can look at a Google map, plug in your price-range rent, and find available properties. Or you can look at a particular area and see what's available.

> One Thursday night, [Rademacher] posted a link to the demo on craigslist, and by the next day thousands of people had already taken it for a spin. "I had no idea how big it would be," he says. (Ratliff 2007: 157)

Google at this point could have closed the door on Rademacher and the other early mappers. It watched – and instead decided to officially open up its maps, releasing the Google Map API in June 2005. Its decision was soon vindicated. In the early fall of 2005, Hurricane Katrina struck the mainland of the United States, and millions of people used Google to visualize and look at the affected areas. While the government agency NOAA posted hundreds of freshly flown aerial imagery, these were on clunky or obscure websites and the public gravitated to Google Earth, where the images were overlaid as updates on the background. Perhaps significantly, the government itself began using Google Earth rather than their own usual channels. Rademacher's own story completes the circle: Google hired him.

While Google has provided some of the tools and resources that are often associated with this movement, and has done much to popularize mapping (Google Earth has supposedly been downloaded over a billion times), we should not forget that it is not open source. Google is a huge company – worth over US$200 billion (i.e., as big as Wal-Mart). And although its API (the application program interface which allows people to combine their data onto Google Maps) has been used in countless ways to make interesting map mashups and web map services, it is at the end of the day a for-profit enterprise (annual revenues of US$30 billion in 2010). The same goes for Esri, the private company that sells the popular ArcGIS software. Although its financials are not publicly available, it is often estimated as having about a third of the multi-billion dollar GIS market.

What this means is that Google and Esri control the data, in terms of what they'll allow you to create and join to their maps, how your maps will look (basically like all other Google maps, for instance), and how you may distribute, reproduce, sell, or not sell them. Essentially, they are in the same position as sovereign states with the added incentive to make a profit (they sometimes get labeled "Big GIS" for this reason). At any time they could alter their business model, close down or charge for their API, or suspend their data exchange services. (Esri has a useful one at arcgis.com.) On January 1, 2012, users got a taste of what this means when Google started charging for use of its Google Maps API over 25,000 hits per day. The new charges meant that some companies found themselves looking at hundreds of thousands of dollars in fees.

What this means, then, is that we need to go beyond Keyhole. Fortunately there are now many open-source alternatives that are robust enough to handle the traffic of even the busiest users, while also being user-friendly enough to let individuals master them. There are tools that provide open-source GIS (PostGIS), data mapping and visualization (GeoCommons), map design (Carto CSS), and tile renderers (Mapnik and TileMill). (If you look closely at Google Maps you'll see that it does not deliver one huge map but rather a series of tiles, and that as you zoom in these are replaced by smaller, more detailed tiles. This tiling helps to deliver rapid-response maps over the Internet. In fact it is a common experience that Google Maps will display more quickly over the Internet than Esri ArcMap installed on your local machine!)[3]

Perhaps the most ambitious project of all, however, is OpenStreetMap (OSM). This was founded in 2004 with the goal of providing a complete map of the world that is open source and copyright free. The challenge here is enormous because to achieve that goal, OSM cannot be based on any other maps (because they are copyrighted). Therefore it is built up mile by mile from the tracks of volunteers using their GPS units to record the route of highways, roads, paths, railroads, and so on. Currently, OSM is a Creative Commons Attribution-ShareAlike 2.0 (CC-BY-SA) license, which means that anybody is free to use it as long as they acknowledge it and provide the same license to end-users.[4] By the end of 2011, OpenStreetMap had acquired and geolocated 2.7 billion coordinates, 121 million routes, and had half a million registered contributors. OSM basemaps now appear in a wide number of places (including Esri products), and are available for the iPhone, iPad, and Android phones and tablets.

To contribute to OSM you need a GPS unit, a web browser, and access to the Internet. Then, by traveling along routes that are not in the database, your GPS can collect information about the location and shape of the route. (You can do as much or as little as you like – you do not have to do the whole M1 or Route 66, for example!) You can travel how you like – by foot, bicycle, train, ferry, or ski lift. You can also map places or locations of interest to you, from the mundane (traffic lights, emergency phone boxes) to the more exotic (air gondolas and cross-country ski routes). Once you have your data, you upload it to OSM using a small text file in the GPS universal format (.gpx) from your web browser. The final step is to symbolize your data using the vast number of feature symbols already existing, or by making up a new one if it is not already present. More recently, OSM has been able to utilize data imported from aerial imagery.

When OSM was first launched many people worried that it would not be accurate. Some of this worry was a genuine concern to build the best map of the world possible. Other criticism of it and the open geodata movement was hard to disambiguate from vested interests. (Jack Dangermond, Esri CEO, once remarked he would not like to rely on open data to find where to dig for a pipe.) To test its accuracy Muki Haklay compared OSM in the UK to the gold standard of mapping, the Ordnance Survey (OS). In general, he found that OSM data are comparably accurate: on average within 6 meters of the position recorded by the OS (Haklay 2010). This does not make OS redundant, but, given its close control over data and licensing, OSM provides quality data where OS is not an option. One example might illustrate its usefulness. Following the 7.0-magnitude Haiti earthquake of January 2010, aid agencies rushed to assist the Haitian people, many of whom lost their homes in the earthquake. International aid was, however, significantly hampered by a lack of good maps of the country (including where the relief camps were). In the hours and days following the disaster, OSM mobilized users and coordinated available data (some providers such as GeoEye also relaxed restrictions on their commercial satellite imagery).[5] As a result a useful and open-source map of the affected areas was produced.

OSM is clearly a major initiative. Its success – like that of Wikipedia but without the same dependency on donations – derives from its thousands of volunteers. Its full usefulness has still to be realized, although as a well-designed copyright-free basemap with lots of detail it is appearing in more and more applications. In fact, technically it has no single design or look: it can be "rendered" with any number of symbolization schemes, or the data can be imported into GIS as shapefiles and designed how you like. If a map has no particular design, is the question of the "look of maps" solved or only deepened? This is a question that has not yet been much studied in cartography, particularly when it comes to optimal design for mobile devices and tablets.

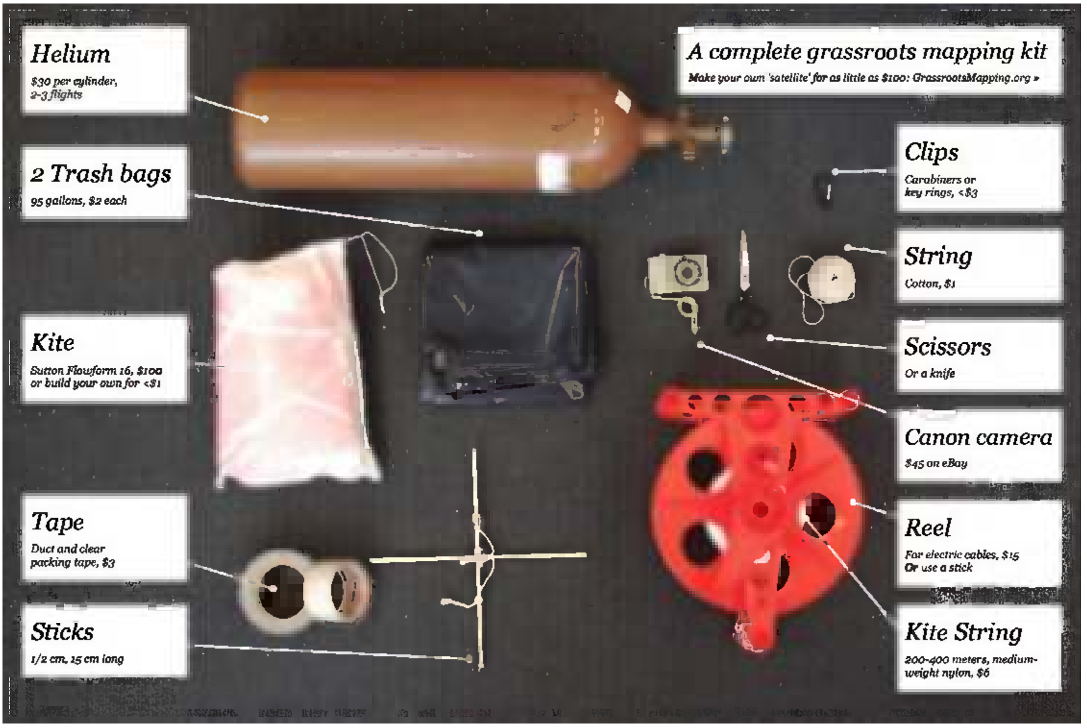
Satellite companies have long played an important role in the production of geographical knowledge. Whether these have been unclassified research satellites (e.g., the Landsat series) or the secret Corona and Keyhole spy satellites of the Cold War (Cloud 2002), they provide data in quantities that no terrestrial sensor could achieve. Until recently these too were the province of wealthy or paranoid governments (US, China) due to their cost. However, today private satellite companies are major players. Their available resolutions are also not too different from the (presumed) resolution of government spy satellites. GeoEye, mentioned above, can provide images from space that can pick out objects as small as .41 meters across or the size of home plate on the baseball field. (The United States does limit commercial providers from releasing imagery beyond .50 meter resolution, and a provision of American law known as the Kyl-Bingaman Amendment prohibits high-resolution imagery of Israel from being released.)

Although this imagery is very useful, it is also costly. The manufacture, launch, and maintenance of a GPS satellite costs hundreds of millions of dollars. Therefore, another aspect of the open geodata movement has focused on developing inexpensive methods to collect "remote sensing" imagery using some rather classic tools: helium balloons and kites. In the United States one notable effort has emerged around the Public Laboratory for Open Technology and Science (PLOTS). Using simple and inexpensive materials (string, weather balloons, a tank of helium from the local hardware/DIY store) anyone can, with a bit of trial and effort, collect higher-resolution imagery than is available from commercial or government sources. Additionally, imagery can be recollected as often as needed. PLOTS is open source and community driven and came to prominence during the BP oil spill in the Gulf of Mexico in the summer of 2010. Local residents, concerned about the effects of the oil on sensitive marine ecosystems (and sources of income), teamed with PLOTS to monitor the spill. Although each image taken covers only a small piece of territory, the PLOTS mapknitter (a free online web-based tool) can "stitch" the images together to make a coherent image. These can be exported as georeferenced TIFF images (for import into GIS) or simple JPEGS. Depending on the sensor installed below the balloon, it is also possible to collect imagery in different parts of the spectrum. PLOTS members have experimented with thermal imagery and multi-spectral imagery, which has a number of applications (for example, assessing the health of vegetation). Others have used these methods to make 3D models of the environment to assess stream erosion or build digital models of buildings in a neighborhood, campus, or city (see Figure 35.2).

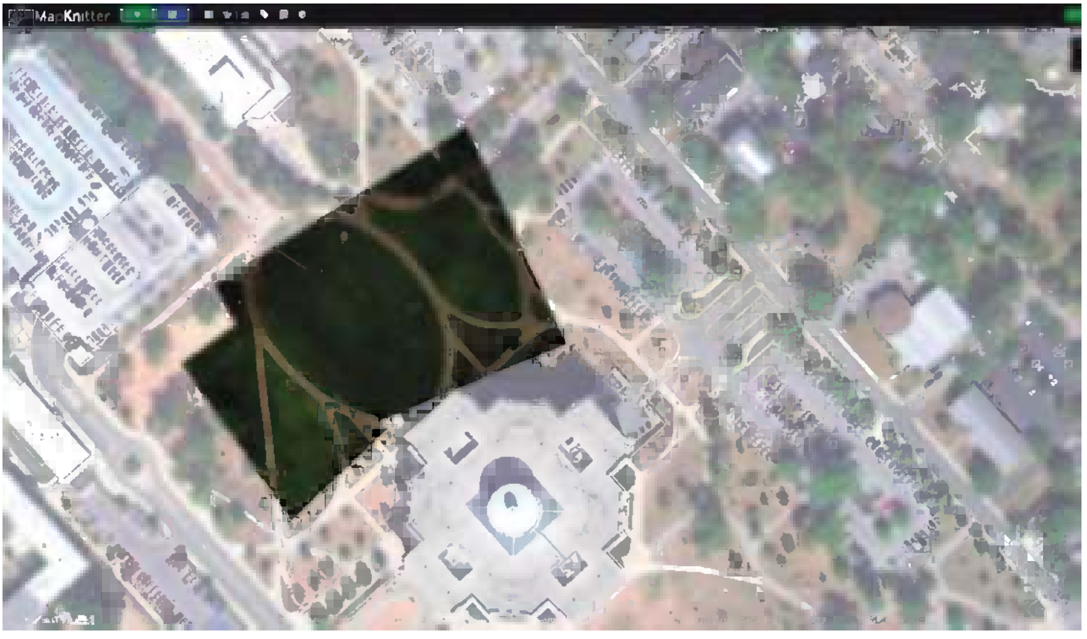
Conclusion

Maps are both opportunity and threat. Today mapping and location technologies are helping to produce all sorts of surveillance possibilities, whether it be your mobile phone, unmanned aerial systems (UAS or drones), or humanitarian relief in Afghanistan using open-source tools. This centrality of mapping to modernity deserves our most sustained investigation as scholars, geographers, and map users. Unfortunately, instead of being grasped in its richness, mapping and cartography are often regarded as a legacy of a more technocratic age. This has sometimes acted to dissuade interest in mapping within academia, at a time when its transformational possibilities are greater than ever. (For example, the number of maps published in geography journals has been on the decline for some time, and cartography and GIS are underrepresented among women and minorities.) Part of the reason for this neglect has surely been the result of the legacy of postwar cartography and its emphasis on smaller, technicist questions divorced from sociopolitical issues. A prime mantra of many cartographers is that maps are – and should be – the View from Nowhere, that is, free of all politics. The primary goal of this chapter has been to sketch out a different view; namely, in what way maps are political.

There is a final consideration, however. If mapping and cartography are to realize their transformational potential, sometimes known as the "democratization" of cartography (Gorman 2011), access to mapping technologies and participation in mapping activities



(a)



(b)

Figure 35.2 Typical DIY equipment needed for balloon-mapping (top). Balloon imagery of the University of Kentucky campus being stitched together (bottom).
Source: Public Laboratory for Technology and Science. (CC-BY-SA) Public Lab contributors.

remain the province of the few. While costs have significantly lowered (a balloon mapping kit costs less than $100), participatory mapping, like much of the content on the Internet, is being produced by relatively small numbers of people. Known as the "long tail" or the 80:20 rule (where 80 percent of the content is created by 20 percent of the users), this phenomenon can be observed at work in projects as diverse as Wikipedia, OpenStreetMap, and locational Tweeting (only some 1–4 percent of Tweets are georeferenced). Despite the mantra about the "democratization of mapping," then, the reality is more complex. In the past this differential access was often known as the digital divide, but, as Haklay argues, it is perhaps better to think of "digital inequalities" in the same sense as we think about social inequalities. Indeed, the likelihood of an area being well mapped correlates with the area being well resourced (not socially deprived).

Haklay has conceptualized a hierarchy of involvement, from data collection to "participatory science" to what he calls "extreme" collaborative science, where those involved are co-creators of the very goals of the project (Haklay 2012). All this assumes, however, that people participate in the first place. This has many implications, including the fact that people studying Twitter or OSM are subject to significant bias. Not only are just 4 percent of Tweets georeferenced, but any fair summary of Twitter would have to conclude it is a collection of teens discussing Justin Bieber and Lady Gaga (they have around 20 million followers each; in fact, about 20 percent of Twitter users account for 98 percent of followers). There is also a geographical inequality of Twitter members (see data at http://twittercounter.com). Given that a range of entities are interested in analyzing Twitter (Hillary Clinton being the latest to express an interest in it to predict social uprisings), this is obviously problematic. Research on social networks and their attendant geographies needs to incorporate the "network bias" at stake here, that is, not everyone is equal. In that sense, there is demonstrably no "democracy" of the geoweb.

In an era when the state shows no signs of slowing its geosurveillant capacities (Crampton 2007), the classic mantra "map or be mapped" still has much power, but it might reasonably be rethought today as "only connect."

Notes

1 Custom cartography companies often draw on strong academic mapping programs. Axis Maps, for instance, was founded by cartographers from Wisconsin–Madison and Middlebury College.
2 For more on this, see Foucault (2003a), especially the lecture of January 22, 1975.
3 PostGIS: http://postgis.refractions.net/; Mapnik: http://mapnik.org/; TileMill: http://mapbox.com/tilemill/; Carto CSS: http://developmentseed.org/blog/2011/feb/09/introducing-carto-css-map-styling-language/. One company's story, that of real estate company StreetEasy, is narrated here with these and many other useful links and details: http://bit.ly/xB7oUY.
4 In 2012 OSM switched to the Open Database License ODbl 1.0, which codifies its open data status (see http://opendatacommons.org/licenses/odbl/).
5 A time-lapse video of the OSM Haiti map from one week prior to the earthquake to twelve days afterward is available here: http://www.youtube.com/watch?v=OF-JuFxhDT8.

References

Bagrow, L. (1964) *History of Cartography: Revised and Enlarged by R.A. Skelton*. London: C.A Watts.