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A NEW MAP SIGN TYPOLOGY FOR THE GEOWEB

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INTRODUCTION: FROM ANALOG TO DIGITAL MAP PINS

In March of 1993, *Sales and Marketing Management* published a short article entitled "Pushpins Out, Computer Maps In", detailing the predicted impact that computers would have on the way business managers utilize geographic data. These were early days for computer mapping, and earlier still for Web mapping, but people were excited about the potential of this new technology and the promise it held for better cartographic representations. There were newer, faster, more efficient ways of creating maps; and many long-standing cartographic methods and techniques for data collection, drafting and annotating were suddenly seen as obsolete. One traditional method that faced new scrutiny was the interactive use of pins on maps. As *Sales and Marketing Management* predicted, "the colored pushpins that have adorned many a wall map in sales managers' offices will soon go the way of the dinosaurs" (1993 p. 20).

This prediction likely sounded reasonable at the time—why would we continue using *pushpins* (more generally, 'map pins') when we now have *computers*? After all, everything else was changing, was it not? But perhaps what *Sales and Marketing Management* did not account for was the possibility of the migration of map pins from the analog format adorning "many a wall map in sales managers' offices" to the digital format, where they could adorn many an interactive and Web-based map.

In the end, this is precisely what happened. Pushpins were not abandoned, they simply transitioned one format to another. The act of iteratively pinning a map for annotation or point-of-interest selection is one of the most deeply ingrained forms of cartographic interaction society has ever known. Analog maps have been pinned, tacked and annotated with specialized devices for centuries. The advent of the computer may have heralded a potential reduction in the widespread use of analog pins, but our interaction with maps through pins was never in danger of extinction.

When MapQuest launched in 1996, the makeup of map pins changed from metal and plastic to pixels. Over the following years, as Yahoo!, Microsoft and other industry leaders created their own Web-mapping platforms, map pins remained in common use as a point symbols. When Google Maps and Google Earth appeared on the digital mapping scene in 2005, their primary point icon set was comprised of digital map pins. In the years since, geospatial applications on the Web have increased. They are both commercial (i.e., Google Maps) and open-source (i.e., OpenStreetMap), and often leverage new techniques, such as mapping mash-ups and crowd-sourcing. The purposes for these types of applications are growing increasingly diverse, and their capabilities more robust. Yet the symbols they employ have remained limited and largely pin-based. This new geospatial landscape on the Web has become known by many as the 'GeoWeb' (Haklay, Singleton & Parker 2008, p. 2011). Thanks to the enormous success of these mapping platforms (Regan 2005) and their retention of the map pin as a point symbol, the image of a digital pin has been indelibly imprinted in the graphic vocabulary of modern day cartography.

This paper aims to provide a short history of map pins in order to illuminate their importance in what—by the time *Sales and Marketing Management* made their prediction—had become deeply ingrained in society as a method of cartographic interaction. It will reveal that the act of pinning a map, for point-of-interest selection or annotation, is something that can be (and has been) incited through the use of a map pin symbol. It will also be revealed that a physical map pin and the digital image of a pin have different semiological implications in cartographic representations. Finally, based on these analog-to-digital differences, goals for further research in GeoWeb map sign typology will be set forth.

ANALOG MAP PINS: BACKGROUND AND HISTORY OF USE

Sales and Marketing Management's assumption that map pins would cease to be employed as mapping devices was also a prediction of the demise of a deeply ingrained method of cartographic interaction. Military maps have been adorned with pins for at least two centuries, perhaps beginning during the Napoleonic Wars. Napoleon himself likely pinned maps for strategic planning or tracking military assets in the field. Louis Wairy (1895), in *Recollections of the Private Life of Napoleon*, noted that "During the three or four hours preceding an engagement, the Emperor spent most of the time with large maps spread out before him, the places on which he marked with pins with heads of different colored wax." A version of map pins was also employed for teaching visually impaired children geography in the 1800s (*An*

Account of the Recent Discoveries for the Blind 1837). Teachers used pincushions to create tactile maps where pins represented places and twine was used for physical and political boundaries.

In the second half of the 19th century, maps sold and distributed explicitly for pinning began to appear. Capitalizing upon the interactive mapping techniques of Napoleon and other military leaders, these maps were primarily meant to be the basis of interactive war games, where the user would change the map iteratively based on the latest news from the battlefield. The earliest known examples of pin maps for war games are those of "Boston Globe's Map of the Atlantic Coast and Scenes of the Naval Maneuvers" (1898) and "War Maps of Cuba, Porto Rico and the Philippines," (1898). These maps were sold with flags that could be cut out and wrapped around pins. Users were encouraged to play out the theatre of war on these maps, pin-by-pin, one battle at a time.

When pin maps were commodified in the early 20th century, their popularity rose to new heights. In response to the increased interest in pin maps, Edwin Moore patented the "push-pin" in 1900 (Moore) and the use of pins and tacks as interactive mapping tools skyrocketed. Pushpins were increasingly employed as educational, advertising, marketing and management tools—to be used with maps. A number of businesses capitalized on their broad appeal, and sold various pin maps, map pins, and pin-augmentation devices. Moore, the inventor of the pushpin, began selling "Push Maptacks" (*The Magazine of Business* 1921). The Educational Exhibition Company of Providence, Rhode Island, sold special map pins as well as custom cork board and cellular board map mounts (*The Industrial Digest* 1922). C.S. Hammond & Co. published wall maps, such as the "Field Marshal's War Map," which transformed war into a geography game of "marking the day's shifting tides of battle" (*Popular Science* 1943). One business apparently existed solely to produce and sell "map rings". Brude Mapring Co., based in the little town of Virginia, Minnesota, sold the tiny color-coded metal discs that were placed between the pin and the map to "display information supplementary to that shown by tacks" (*The Rotarian* 1922).

Arguably the largest producer of map pin products from the early 20th century onward was Rand McNally. Rand McNally did not simply sell map pins or pin maps, it sold an entire *Map-Tack System* (Akerman 2006). The system included: maps of an optimal scale and coverage for any sales region; map tacks of virtually any color or size; and cabinets that ranged from the shape and size of a large desk, to a file cabinet or an end table (Figure 1). The cabinets were designed with drawers deep enough to accommodate any of the Map-Tack System's annotation devices, which included pins, flags, spot signals, cords, beads, rings, and celluloid flat tacks. The System's maps were printed on "supercalendered paper with light inks," which prevented the map from tearing over the course of multiple uses, and gave the map a design that was clearly meant to be only a backdrop for the user's information.

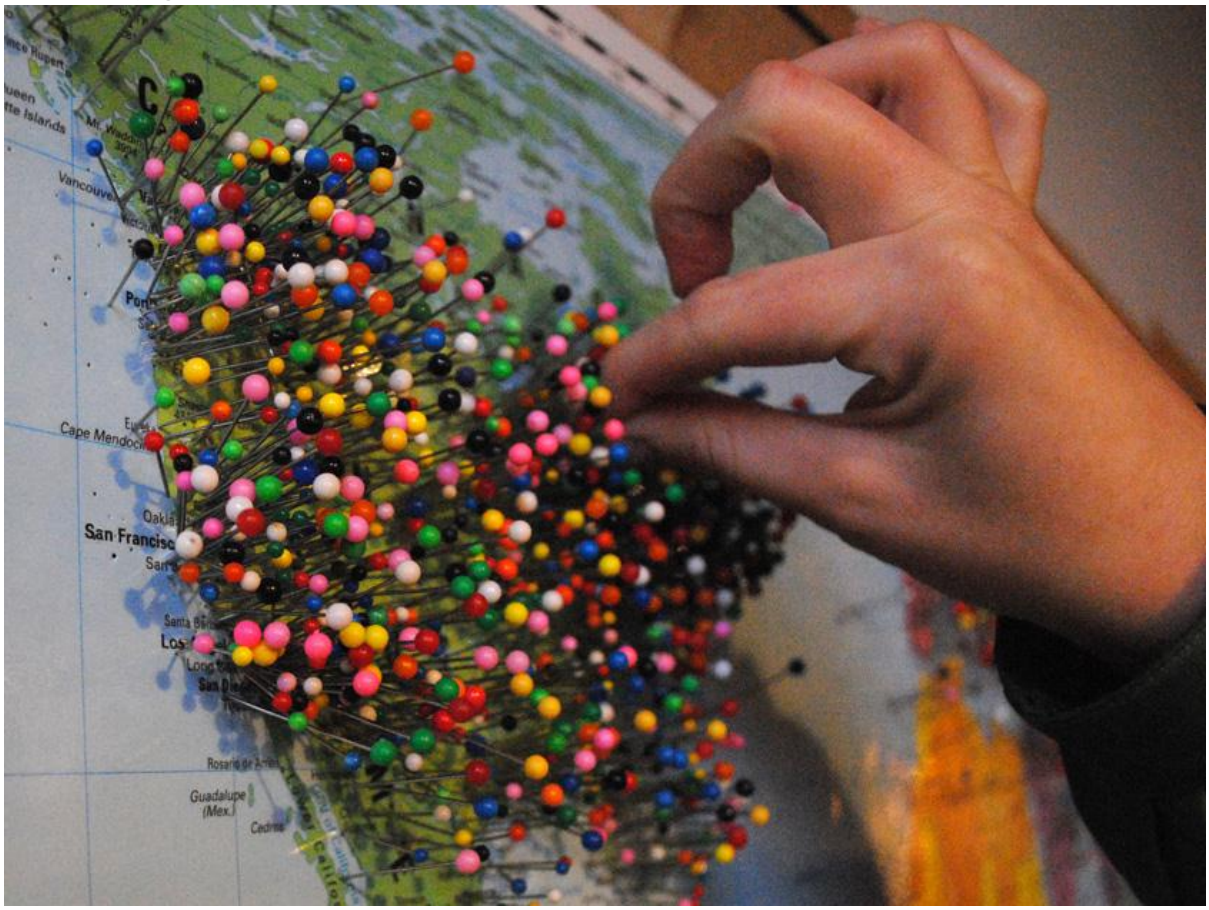
The Rand McNally *Map-Tack System* was advertised as "the most efficient office appliance in the market" for tracking employee and asset locations (Rand McNally 1918). It was likely the most substantial effort to date in formalizing and commercializing the act of pinning a map, and in a larger sense, it was what *Sales and Marketing Management* was referring to when it predicted that computers would send pushpins "the way of the dinosaur" in the 1990s. What the publication couldn't predict, however, was that cloud-based applications, such as "Google My Maps", would end up being veritable "Map-Tack Systems" for the GeoWeb.

DIGITAL MAP PIN: A SEMIOLOGICAL PROBLEM

Decades have passed since the days of the Rand McNally *Map-Tack System*. But map pins can still be found everywhere, in both physical and digital worlds. Pushpin maps remain in restaurants, research institutes, government offices and tourist stops, and they have also migrated to the Web. Online, they are employed prolifically in mash-ups and custom-made geographic visualizations. The use of a map pin as a map symbol is so widespread that it is likely one of the most commonly used point-of-interest indicators on the GeoWeb.

But how can this crossover be explained? Why do we continue to use this sign—and what does it mean? As Blakemore and Harley (1980) put it in the early days of digital mapping, "after all, one of the arguments for computerizing map-making is that by releasing cartographers from repetitive drafting tasks, they can concentrate on aesthetics and communicability." If this is true, why are we still using map pins on digital maps? Is there not a better symbol, or set of symbols?

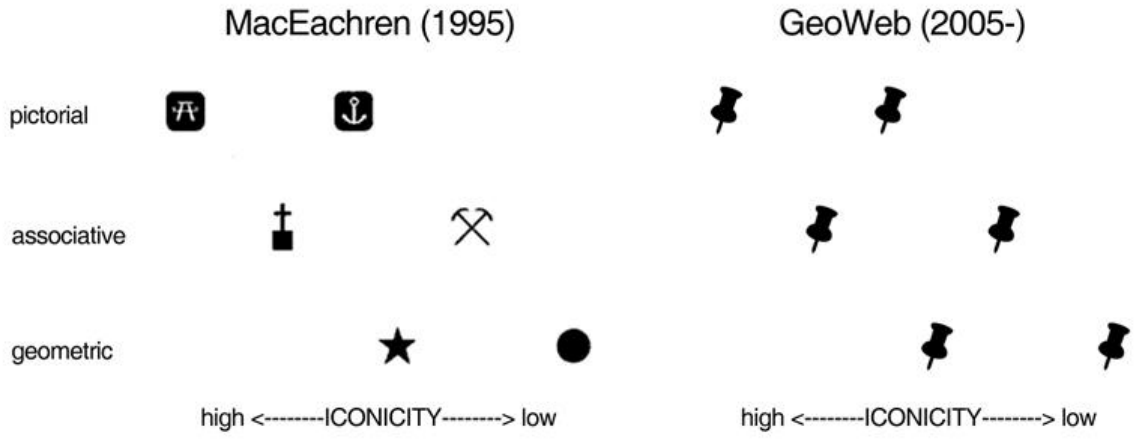
In 1862, L. Prang & Co. published a map for tracking the progress of the United States Civil War. Prang wanted map-users to be able to interact with the map, but map pins were not yet widely available. So they proposed using pencils "with a light hand to enable obliterating marks with the aid of a little soft bread" (*War Telegram Marking Map* 1863). Moore's map pins, Rand McNally's map tacks and similar tools were a collective advance in map interaction design, as they eliminated the need for the proverbial (or not so proverbial, as the case may be) "soft piece of bread" to engage with the map. Once that problem was eliminated, and maps could be interacted with repetitively (via the pin) without causing significant damage (like the digital maps of today), there were very few impediments that would keep people from wanting to engage extensively with a map. Roadside restaurants put pin maps in their entryways for patrons to be impressed by their widespread clientèle and—this is key—to be compelled to mark the location of their own home (Figure 2).



This eagerness to interact with a pin map has a possible semiological explanation. MacEachren (1995) discusses a whole host of different symbol and signs systems used on maps, as well as their intended meanings, under a cognitive-semiotic theoretical framework. Essential to the act of mapping with a physical map pin is the response-sequence that is incited by seeing it (MacEachren & Ganter 1990). MacEachren discusses *incitive* signs (1995, p 227 after Morris 1971) and what they potentially *incite*, such as the act of *participation* (1995, p 227 after Guiraud 1975). When someone sees a wall map with pins in a chocolate shop, for example, they are likely to be *incited* to the response-sequence of *participating* in the *mapping* effort. Map pins work not only because they designate the position of some geographic feature, but also because they also encourage the transformation from a passive map-user to an active mapmaker by designating geographic features of interest to him or her. Thus, map pins work from a semiotic standpoint because they are able to induce appropriate cartographic interactions.

In semiotic terms, map pins are far less successful when used on digital maps. In this case, they are ambiguous sign vehicles that stand for unknown real-world geographic referents. On every map, a pin

imbues a different meaning—a meaning that is often arbitrary and irrelevant to the *look* of the pin. Jacques Bertin (1983) recognized the issue posed by using arbitrary symbols when he stated that accepted sign systems "are merely the result of acquired habits and can never claim to be universal" (Bertin 1983, p 51). MacEachren (1995) explicated this discussion by introducing the concept of iconicity, identifying three categories of point symbol based on their degree of arbitrariness: *pictorial* (most iconic), *associative* (moderately iconic) and *geometric* (least iconic) (1995, p 262). But a plain pin on a map, without any color-coding or supplemental annotation, cannot be *pictorial* unless it is depicting the location of a pushpin on the ground; it cannot be *associative* unless it is depicting the location of a pushpin factory or another pushpin map; and—though this is likely the most common use of the sign—the shape of a pushpin is not nearly abstract enough to be considered *geometric*. MacEachren's sign system highlights the semiotic problem posed by digital pushpins on the GeoWeb: they do not fall into any one of these categories, yet they are being used as if they fit in all of them (Figure 3).



John Keates (1996) discusses and analyzes map sign systems and pays particular attention to two types of point symbols: *iconic* and *conventional*. His *iconic* symbols are akin to MacEachren's *pictorial* symbols and therefore have the same problems associated with them. His *conventional* signs, on the other hand, are something entirely different, referring to the "old cartographic tradition" of accepted signs (Keates 1996, p. 74). In academic cartography, conventional sign systems have been in use as long as textbooks on the subject have been in print, starting with Erwin Raisz's *General Cartography* (1938). On the federal level, conventional sign systems are the backbone of standardized cartographic visualization. The National Oceanographic and Atmospheric Association in the United States, for example, maintains a document entitled *Chart No. 1.*, an exhaustive guide on how and when to implement the thousands of conventional nautical symbols used on their charts. On the GeoWeb, companies like Google and Microsoft have been using digital map pins for years. Considering the massive user-base these companies maintain, it could be argued that map pins have been accepted into the cartographic conventions of the GeoWeb.

While seemingly convenient, conventions have their trade-offs. They may be understood by a broad user-base, but conventions can quickly become antiquated or even deemed politically incorrect. A common example of this is the old cartographic convention of using the image of a Christian cross to represent the location of a place of worship, sometimes regardless of the religion. This particular issue was dealt with directly by designers at Google Maps. Their solution was to create an icon of a building which incorporated architectural elements from common houses of worship across religions. Even this, however, was not well-received because the solution still had the potential to alienate map-users (McEntee 2010).

In the face of such a reaction, it could be hypothesized that in order to be accepted as a convention, a map symbol must be without any potentially inappropriate meaning. This, of course, may well bring to mind the image of a map pin, which is often devoid of any meaning beyond its reference to the act of mapping.

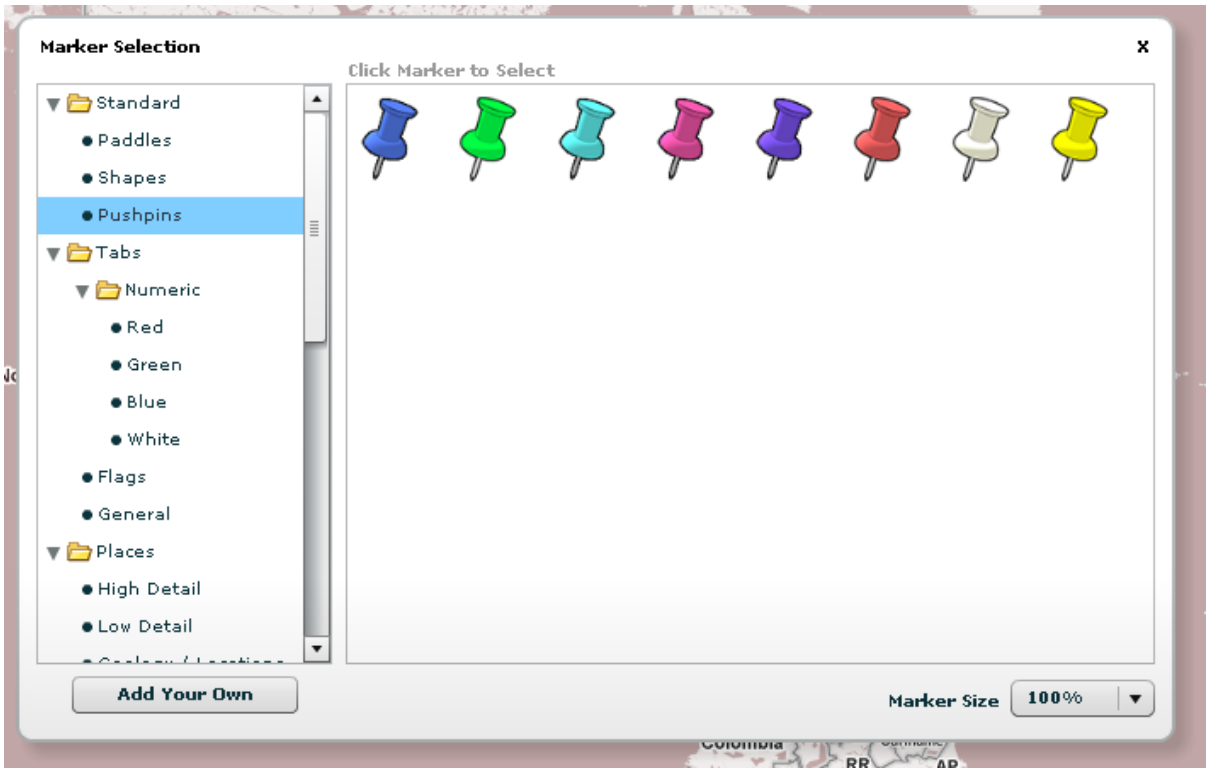
THE NEED FOR A NEW MAP SIGN TYPOLOGY FOR THE GEOWEB

Digital map pins are situated in a new set of point location indicators and annotation devices for the GeoWeb. Just as a sales manager in 1920s had an array of devices at the ready to employ in a *Map-Tack System*, so too does a manager today. Map pins of yesteryear have become digital map pins, which are situated in a new set of point location indicators and annotation devices for the GeoWeb. Data that would have been displayed using map rings and other pin augmentation devices has been wrapped into complex

point symbols and pop-up windows; map cord for creating boundaries with pins has now been replaced with digital lines and polylines.

Yet while all these analog-to-digital transitions have occurred, there is no formalized methodology for decoding them in their new context. There is a need for a new semiology of graphics that classifies their use on the GeoWeb. In order to develop such a semiology, a distinction must be made between pre- and post-production contexts of digital map pins. In the pre-production context, map pins are integrated into the original design of the map. One example of this would be a custom-made cartographic visualization that employs pins as point symbols, such as The Bostonian Society's *Mapping Revolutionary Boston* (Figure 4). In this context, the map-reader is passive and does not have control over the way data is being displayed. It would be the equivalent of a retired restaurant wall map that has been placed behind glass for posterity.

Digital map pins in the post-production context are generally point locators or annotation devices provided by Web programmers, but implemented by map-users or contributors. These are commonly seen on user-generated mash-ups or volunteered geographic information visualizations. One of the most common forms of post-production digital map pinning is implemented through a shared Google My Map or a third-party application, such as Scribble Maps (Figure 5). The bank of point symbols available to users for such mapmaking efforts has increased over the years, but map pins still remain a dominant choice. Post-production pins may or may not be designed to fit the style or subject matter of the map. Instead, they may have been chosen as an *incitive* symbol to encourage map-users to become collaborative mapmakers.



In both pre- and post-production contexts, the digital map pin is generally designed by a Web developer or designer. (In some rare cases this person is also a cartographer). The process of designing point symbols for maps is a complicated one with the potential for innumerous and unexpected missteps. On the GeoWeb, point symbol design has become increasingly difficult as some symbols are designed for interaction, while others are meant to remain passive. When considering point symbols, graphic designer Arthur Lockwood pointed out that "the first problem is that of the design of the symbol so that it is instantly recognizable" (1969 p 70). Map pins certainly have a quality of *instant recognizability*. They are recognizable for what they are: pins for mapping—and that makes them perfect for maps where the sole goal is to indicate the location of something with no further detail. In this case, the map reader will inevitably recognize the pin and understand that "it marks the spot". The map pin's instant recognizability also adds to its potential as an incitive symbol. When a potential mapmaker sees the pin, part of her recognition of the symbol isn't just *what* it is, but *what is to be done with it.* Whether or not the map-user knows what to do with the pin, however, does not help her encode or decode any information within the pin as a sign (unless there is some kind of color-coding or annotation system established to augment the pin).

Lars Brodersen, in tackling some of the issues surrounding Web-based maps, suggests that "we shall strive to use a language (words, symbols and signs) which requires the least possible decoding by the receiver," adding that "the more explanation that is required to achieve understanding, the more difficult the communication becomes" (2005, p 426). If cartographers and programmers creating content on the GeoWeb can accept map pins as *incitive* symbols, they will be able to answer Brodersen's call. If the context in which map pins are being used is one that requires interaction or participation from the map-user (as would be the case with most public participation geographic information projects), a map pin may be an ideal symbol. This is not because of the way the image of a map pin relates to its referent, but instead because of the feeling users get when seeing the symbol—the urge they feel to *participate*.

Some Web programmers and designers have already started to use map pins in more intuitive ways, to both *incite* mapping and act as more highly iconic (and recognizable) sign vehicles. History Pin is one such effort, encouraging users to share historic photos of specific locations (indicated by a pink pin). Users may see the symbol of a pin and feel compelled to digitally "press" it into the map to locate their photos on the landscape. Other programmers and designers have taken the image of a map pin and slightly altered it, to create a sort of hybrid map pin symbol. This type of pre-production symbol cannot *incite* users to map, as it is not user-authored map, but the symbol is maybe be *incitive* nonetheless. In one case, Foursquare created an Election Day mash-up with point symbols that looked like pins, but had a thermometer-style indicator of voter turnout on their heads (Figure 6). By using a pushpin-like symbol, the designer

graphically alluded to the *incitive* nature of a pin on a map to augment the already *incitive* symbol of a fund-raiser-style thermometer. Many other pin-like symbols can be found throughout the GeoWeb, all representing varied efforts to both compel map-users to mentally "note" an item on a pre-production pin map or physically "mark" a location on a post-production pin map.

FUTURE WORK

Very little research as been done to examine the ways in which traditional cartographic symbols have been adopted on the GeoWeb, and one gap in research is the exploration of one of the most ubiquitous point symbols on the Web—the pushpin—and similar digital annotation symbols. Further work needs to be done in the creation and classification of a new map sign typology for the GeoWeb with these symbols—and others—in mind. In a framework that distinguishes between pre- and post-production digital pins and annotation devices, the problem posed by using conventional semiological systems becomes apparent. When a map pin is made digital, it is no longer a separate medium from the map on which it is placed. Cartographers and map-users, therefore, would benefit from a more up-to-date map sign typology, designed specifically for the digital arena and the GeoWeb.

The image of a map pin will not lose its association with marketing manager office maps or restaurant wall maps any time soon. Cartographers working in the digital medium would therefore do well to identify more post-production map annotative elements that have experienced a similar analog-to-digital transition (such as post-its to call-out bubbles). In so doing, we may be able to create a new map sign typology which is appropriate for the most common modern-day maps.

CONCLUSION

Map pins have been employed as interactive tools for at least two centuries. They have been used on maps during war and in games about war, to help the vision-impaired learn geography, to engage and excite clientele at roadside attractions and to track sales managers' assets. The history of pins on maps reveals a societal compulsion to interact with maps—to participate and to make one's mark via the use of a pin. Semiologically, this compulsion can be explained through the designation of the image of a pin as an *incitive* sign. Perhaps after decades of being accepted as a cartographic convention for mapping point locations, seeing a map pin now calls a map-user to action and evokes the response-sequence of mapping.

In an era of high proliferation of geographical information, hacking and mash-ups have made the GeoWeb a canvas on which base maps, data and post-production content can yield the clearest or muddiest of geographical visualizations. Among many modern-day cartographers, the image of a map pin is seen as unsuitable as a point symbol. One of the more disturbing and cartographically inappropriate examples of map pin use on the Web can be found on a simple Google My Maps page entitled *U.S. Drone Attacks in Pakistan*. In January of 2010, this map was one of the most popular in the blogosphere (Google Maps Mania 2010) and has been viewed over 13,000 times since it was made. On the map, a typical point location is labeled with an account of an attack, most of which resulted in several dead. The result is a map of war, violence and death that is emblazoned with comically bright, neon map pins.

This type of insensitive symbology or careless graphical representation has been said to be a symptom of "pushpin cartography" *syndrome* (Stanek & Friedmannova 2010, p 6). But such a phenomenon does not have to continue. If cartographers, programmers and designers strive to use digital map pins in contexts that work and design new icons that fulfill the need for *incitive* symbols, the map pin can remain a useful part of the semiology of graphics on the GeoWeb. If this happens, perhaps a better headline in *Sales and Marketing Management* would have been "Analog Pushpins out, Digital Pushpins Here to Stay".

WORKS CITED

Akerman, J. (2006). *Cartographies of Travel and Navigation.* Chicago: The University of Chicago Press.

An Account of the Recent Discoveries for the Blind. (1837). Edinburgh: Edinburgh School for The Blind, pp 34-35.

Bertin, J. (1983). *Semiology of Graphics*. Madison, WI: University of Wisconsin Press.

Blakemore, M., & Harley, J. (1980, Winter). Concepts in the History of Cartography, A Review and Perspective. *Cartographica*, 17(4).

The Boston Globe's Map of the Atlantic Coast and Scenes of the Naval Maneuvers. (1898). Boston: The Boston Globe.

Brodersen, L. (2005). Modelling the Visualization of Internet Maps (pp. 421-436). In M. Peterson (Ed.), *Maps and the Internet*. Amsterdam: Elsevier.

Department of Commerce & Department of Defense. (1997). *Chart No. 1*. Washington, D.C.: Department of Commerce, National Oceanic and Atmospheric Association.

Edexco Graphic Records Supplies. (1922). *The Industrial Digest, 1*, 1524.

Field Marshal's War Map. (1943, May). *Popular Science*, 36.

Google Maps Mania. (2010). Google Map of US Drone Attacks. Available: http://googlemapsmania.blogspot.com/2010/01/google-map-of-us-drone-attacks.html (Accessed 18 December 2010).

Google My Maps. (2011). Available: http://maps.google.com/ (Accessed 11 January 2011).

Guiraud, P. (1975). *Semiology*. London: Routledge & Kegan Paul.

Haklay, M., Singleton, A., & Parker, C. (2008, 23 October 2008). Web Mapping 2.0: The Neogeography of the GeoWe. *Geography Compass, 2(6)*, 2011-2039.

HistoryPin. (2010). Available: http://www.historypin.com/ (Accessed 11 January 2011).

I Voted. (2010, November). Available: http://elections.foursquare.com/ (Accessed 11 January 2011).

Keates, J. (1996). *Understanding Maps*. Essex: Longman.

MacEachren, A. (1995). *How maps work: Representation, visualization, and design*. New York: The Guilford Press.

MacEachren, A. and Ganter, J. (1990). A pattern identification approach to cartographic visualization. *Cartographica*, 27(2): 64-81.

McEntee, C. (2010, 9 June). Google Map symbols headache for creator. Stuff [Online]. Available: http://www.stuff.co.nz/technology/digital-living/4098069/Google-Map-symbols-headache-for-creator/ (Accessed 11 January 2011).

Moore, E. (1900, 24 July). Push-Pin [654,319]. *U.S. Patent and Trademark Office (Washington, DC)*.

Morris, C. (1971). Esthetics and the theory of signs. In C. Morris (Ed.), *Writings on the General Theory of Signs* (pp. 415-433). The Hague: Mouton. (Original Paper published 1939).

Pushpins Out, Computer Maps In. (1993, March). *Sales and Marketing Management*, 145, 20-21.

Raisz, E. (1938). *General Cartography*. New York, New York: McGraw-Hill.

Rand McNally. (1918). *Handy guide to New York City, Brooklyn, Staten Island and other suburbs included in the greater New York*. New York, NY: Rand McNally & Co., p. 140.

Scribble Maps. (2011). Available: http://www.scribblemaps.com/ (Accessed 11 January 2011).

Shaw, A. (1921, July to December). Moore Push Maptacks. *The Magazine of Business*, 40, 218.
Shaw, A. (1921, January to June). The World at Your Finger Tips. *The Magazine of Business*, 39, 270.
Stanek, K., & Friedmannova, L. (2010, 12 June). *Cartographically Augmented Reality*. Presented at the 3rd ISDE Digital Earth Summit. Nessebar, Bulgaria.
The Rotarian: The Magazine of Service. (1922). New York, NY: International Association of Rotary Clubs, p. 308.
US Drone Attacks in Pakistan. (2010, May 14). Available: http://bit.ly/dExswp (Accessed 18 December 2010)
Wairy, L. (1895). *Recollections of the Private Life of Napoleon*. New York: The Merriam Company.
War Maps of Cuba Porto Rico and the Philippines. (1898). Boston: The Sunday Boston Herald.
War Telegram Marking Map. (1862). Boston: L. Prang & Co.
Regan, J. (2005, 17 February). You can get there from here. *The Christian Science Monitor*.