

cartographic perspectives

Number 41, Winter 2002

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Letter from the Editor

Dear Members of NACIS,

It is late October it's snowing in Duluth my skis are waxed and sharpened so why am I sitting here at this computer? Oh, that's right, another issue of *Cartographic Perspectives* is "rolling off the presses". Another column from the editor has been requested. With my Titanium PowerBook in hand (on lap?), I type. With nearly six issues of *CP* published since I became editor, I have come to appreciate more than ever the amount of work (and determination) that goes into creating an academic publication. In addition to me, *CP* enjoys the incredible efforts of 6 other editors, 15 editorial board members, and a player to be named later. I want to recognize the efforts of these 22 people, especially the work of Jim Anderson and Lou Cross (i.e., the player named later) who put so much time and energy into the actual production of *Cartographic*

(continued on page 3)

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journal of the
North American Cartographic Information Society

ISSN 1048-9085

Cartographic Perspectives is published triannually
© 2002 North American Cartographic Information Society

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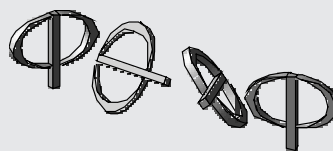
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about the cover



"The cover design was created by Lou Cross. Lou is a cartographer and graphic artist with the Florida Resources and Environmental Analysis Center at The Florida State University.

This issue highlights the use of railway maps as a teaching aid for learning complex railway networks. The cover highlights the region surrounding Columbus, OH, the site of the 2002 annual meeting. The excerpt of the map used in the cover design was taken from Goldthwait's 1861 map of the United States, British Provinces, Mexico, Central America, W. India Is. & c., exhibiting the railroads with their distances, single and double tracks and width of gauge. A complete view of this, and many other railroad maps are found at the Library of Congress site: <http://memory.loc.gov/ammen/gmdhtml/rrhtml/rrhome.html>.

Perspectives. Thank you to each of you for your work and dedication in producing *CP*. It certainly makes my job a whole lot easier.

This issue brings together three diverse papers, representing three different perspectives in cartography. The first paper *Thinking Philosophically in Cartography: Toward a Critical Politics of Mapping*, forces us to ask “what are the conditions of thinking in cartography that we can both see the shape of that thinking, to see it as it is, and therefore to begin to see how it might be otherwise”. Another way to ask this question, I suppose, is to ask how has our thinking in cartography been constrained by historical precedent, by current practices, and how does this limit our collective perspectives for future cartographies? This paper should force us out of our comfort zone, or at least against the boundaries of that zone.

The next paper, *Frank H. Galbraith's Railway Mail Service Maps, 1897* presents what I see as one of the first maps to use icons as part of the “user interface” to geographic information, so to speak. Galbraith used pictures representative of the political and social culture of the late 1800's as visual mnemonics to help railway mail service workers learn the complex mail distribution network. This paper presents a wonderful story of the reasons for the development of various icons used, and how the maps did in fact help the railway service workers learn the environment.

The last paper, *Participatory Mapping of Disabled Access* is a discourse on empowering with maps. It provides a valuable account of the process that was used by disabled residents of Newbridge in Ireland. These residents used maps to document areas in Newbridge where barriers to access to the built environment exist for them. The

results of this participatory mapping project were used to argue for changes in the design of built environments, as well as suggestions for modifications to existing environments, resulting in better access for the disabled.

As I reflect on these three papers, I recall a session at the NACIS meetings in Columbus titled **Future Directions: NACIS and the Cartography and GIS Professions** where the discussion centered on “what vision should NACIS have?” From the panelists' presentations, and from the comments and questions from the audience, suggested that we have some sort of problem. I thought “hmmmm”. Of course, those of you who were at the session and heard my comments know what my “hmmmm” is all about. I won't tell here the entire joke that I told in the session in Columbus, but I will share the punch line that is, “I am already across the lake”. So now, what could I possibly mean by that? Let me explain.

I look at NACIS as being a pretty healthy organization. Membership is up. We have a very diverse membership. Where else can you find a map librarian, a geo-visualizatoinist (hey, a new word), a practical cartographer, an analytical cartographer, a statistician, a GISographer (another new word!), a historical cartographer, a cognitive cartographer, a critical/social cartographer, and a Rabbi at the same banquet table? (There really wasn't a Rabbi, it just seemed to fit). The only place I have encountered this is at the NACIS meetings. We are a more than tolerant group we are an accepting group one that listens to all view points, is supportive of others' views and philosophies, and understands the importance of plurality in the discipline of cartography. Somehow we have made it work. So when I look at future directions for NA-

CIS, I guess I don't see it as a call to solve any perceived problems with cartography, GIS, and NACIS. Instead, I see the future of NACIS as one that builds on our success of being a diverse group that recognizes the importance of each member, regardless of their cartographic bent. So, instead of asking, “how do you get across the lake?” we should see that we are already across the lake we don't need to make that metaphorical swim. This issue of *Cartographic Perspectives* is a good example of our diverse organization.

On another note, this issue marks the beginning of *CP* having an official copyright. Each issue of *CP* will be registered with the Library of Congress, and will benefit from all the rights and protections under copyright law. Both the NACIS and *CP* Boards believe that this is a positive step for *CP* and that it will raise *CP* to a higher level as a publication. This, of course, transfers copyrights from authors to NACIS, and any reprints of published articles are parts of articles will require written permission for duplication. This will ensure that *CP* will become more visible as a publication outlet.

As always, I welcome all comments about *CP*.

Warmest Regards,

Scott Freundschuh

Thinking Philosophically in Cartography: Toward A Critical Politics of Mapping

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The purpose of this paper is to examine some of the context in which mapping is practiced and thought about. I shall make several points. First, our present context is historical and arose from identifiable events that help shape the way mapping takes place today. But every context allows some possibilities and closes off others. Second, our current context is based on a Cartesian–scientific worldview which casts maps as communicators of spatial location. One consequence of this is that we do not take account of maps as helping us find our meaningful place in the world. Third, examining this context as a horizon of possibilities is itself a political project. Finally, some possible components of such a “politics of mapping” are sketched out that might let us understand our horizon of possibilities in order to expand it.

Keywords: Critical politics of cartography, Heidegger, Foucault

Missing from [Kant's critiques is] the mode of understanding itself, a volume devoted to the rhetorics of how we make sense of the world and of how we share that sense with others. Its provisional title: A Critique of Cartographical Reason.

—Gunnar Olsson (1998, 152)

Horizons of Possibility

This paper asks the question: what are the historical conditions of possibility for thinking cartographically? Our present context is historical and arose from identifiable events that help shape the way mapping takes place today. But every context allows some possibilities and closes off others. What is it possible to think and do? By emphasizing that these are *historical* conditions we are not consigning events to the past, but acknowledging that different conditions may exist at different times.

I suggest that the work of Heidegger and Foucault can shed considerable light on this question of our current context for three reasons. First, these questions can be seen as philosophical in the same sense as Heidegger's ontological project about “being.” Heidegger's constant concern with being (often capitalized in English as Being to distinguish it from *a* being) was a question not just of what exists but with being as such.¹ Being is what it means to be (a short glossary of key terms is provided at the end of this paper). Heidegger's work is notoriously difficult and strewn with vocabularies and etymologies of his own devising. Still, his ontological question does point the way towards an important emphasis on understanding being within a particular historical framework.

An historical ontology (Elden, 2001; Hacking, 2002) examines the very conditions of possibility for thinking itself, in order to widen those conditions and increase the possibilities for human freedom. Putting it like this should tip us off to the fact that rather than armchair philosophizing this project is a politics, in this case a politics of mapping. Why? Because politics looks for the capability and grounds for intervening in the produc-

tion of (spatial) knowledge, as well as for resistance to established power relations. Politics and philosophy (in this case ontological thinking) are both involved. Foucault's "problematizations" are another way of doing historical ontology as we shall see.

Second, Heidegger's project is relevant to cartographers because he argued that enquiry in general was dominated by a scientific approach that obscured essential aspects of how things are. Although Heidegger was writing in the 1920s and 30s there is no particular reason to suspect that scientific mentalities have become less dominant, either generally or in cartography. Yet Heidegger was not anti-science. He would grant that there are many wonderful insights and achievements in science. However, these are largely confined to the physical sciences. He was doubtful whether the "human sciences" could be conceived in the same manner. Because cartography, mapping and GIS are at the intersection of science and human science, and are also practices and technologies, it is a particularly fascinating question to see how it has proceeded in this light. Brian Harley asked us much the same question: "are [cartographers] concerned at all with how maps could answer the Socratic question 'How should one live?'" (Harley, 1990, 16). Or does that political question pass us by as we concern ourselves with accuracy and interoperability? Harley's own reply is pessimistic, but perhaps he was too quick to judge. In any event, the success, goals, and problems of cartography's Cartesian tradition can be assessed by Heidegger's critique.

Third, Heidegger and Foucault were acutely aware of the importance and centrality of space in their thinking. Heidegger for example understood our being as one of being-in-the-world and was interested in place, distance, nearness and spatiality (see eg., section 22 in Heidegger, 1962). Foucault's concern with space in terms of its power-knowledge relations has also long attracted interest from geography (eg., Driver, 1985; Philo, 1992) and cartography (Harley, 1989). Both Heidegger and Foucault play key roles in a larger project of "the politics of space" (Elden, 2001; Hannah, 2000; Harvey, 2001).

In Gunnar Olsson's essay quoted above he makes a striking observation: modern thinking (he calls it by the more technical name: reason) is cartographic and we need to examine this thinking, this rationality (see also Olsson, 2002). No doubt Heidegger and Foucault are not the only writers we could turn to if we want to understand mapping. What is important here are not the exact details of their writings but how their writings can cast light on mapping. The three reasons given above; highlighting the political conditions of possibility, a critique of cartography's Cartesian tradition, and a concern with spatiality let us see what Olsson meant by a cartographic reason or rationality—our current context.

"What is our current context in which mapping takes place?"

Theory and Practice in Cartography

What is our current context in which mapping takes place? One aspect can be examined by understanding the relationship between theory and practice. More than a dozen years ago Harley argued that cartography artificially divided theory and practice. At that time his concern was cartography's social relevance and its "theoretical isolationism" as he called it (Harley, 1990, 1). Mapping is often granted conceptual (theoretic-philosophic) and practical status (its practices). We distinguish between *understanding* maps and *using* maps. But there is all too often a failure to grasp how theory and practice affect each other. For example, maps are often used unreflectively for instrumental ends, to make things happen, while on the other hand some social theorists think of maps as repressive,

and dangerously powerful, implying that we should use them only very reflectively.² Elsewhere these positions have been characterized as “theory avoiding” and “theory embracing” (Crampton, 2000). Both have proved useful to their adherents, but both are only part of the story we can tell about mapping. Perhaps the way we use maps affects how we understand them? Perhaps then if we can’t put maps into practice we gain only a limited understanding of them. (This has immediate consequences for the history of cartography because we cannot use historical maps in the context in which they originally existed.) By questioning our boundaries of thinking Harley was initiating what we can call a politics of mapping.

It’s not very usual to think of mapping as a politics. That maps sometimes have a political dimension, such as propaganda maps, advocacy maps or public participation GIS, yes; but that the practice of mapping itself (as the production of geographic knowledges) is a political project? That is not so clear. Perhaps our responsibility should be to make maps as a-political as possible. Certainly it was not too long ago when cartographers could explicitly state that there should be as little “intrusion” of politics (ideology) into mapping as possible.³ And attention to mapping from those interested in the politics of space has also been intermittent. The journal *Political Geography*, for example, editorialized on Harley’s death with the comment that “there has been no sustained effort to understand the meaning of maps for the political processes we research” (Taylor, 1992, 127). The journal understood that maps produce spatial knowledge and that this fed directly into and informed politics, but regretted that this topic had been so overlooked.

“It’s not very usual to think of mapping as a politics.”

The opposition and neglect of this topic arises in part from an attempt to conceptualize cartography as purely technical, but it goes further than that. It also depends on the constitution of cartographic knowledge as an *a priori*, that is, as beyond the reach of human conceptualizing (it existed “prior” to our concepts and politics and is independently true). On this view, maps represent the things in the environment themselves, and cut nature at its joints (see Andrews’ introduction in Harley, 2001 for such a view). A historical ontology on the other hand suggests that the way things are, their being, is in fact a historical product operating within a certain *horizon of possibilities*. We are in a certain contingent way and can be different. If this view is valid then a politics of mapping is not just a question of propaganda maps (maps used politically) or even a political critique of existing maps, but a more sweeping project of examining and breaking through the boundaries on how maps are, and our projects and practices with them. This is politics in a very positive sense. And it would pretty much have to be a project that was always ongoing—we would never reach a conceptualization of maps “out” of history. Heidegger signals this in the title of his best-known work *Being and Time* (Heidegger, 1962).

Harley’s attempt to address these issues (eg., Harley 1988a; 1988b; 1989; 2001) was a necessary step in bridging the intellectual gap between theory and practice, but it was ultimately unsuccessful and sadly incomplete (Harley died in 1991 at the age of 59). The reasons for this failure have been detailed elsewhere but have to do with Harley’s conceptualization of power and politics (Crampton, 2001). Harley was a new kind of cartographer, and I can think of few other cartographers before him who studied the relation between maps and power. Symptomatically he would deny he *was* a cartographer, but in fact his work can be understood as making it possible to be a new kind of cartographer. But even Harley constituted cartographic knowledge as *a priori*. Thus his project became one of uncovering the layers of ideology inscribed in the map to get at the golden

nugget of truth underlying it all. On this view, power is repressive (a view never held by Foucault for all that Harley appealed to him). Since Harley's death, progress toward a critical politics of cartography which bridges the gap between theory and technology has been sporadic or carried out under other names—yet it has never entirely disappeared (see Yapa, 1991; 1992; Edney, 1993; Pickles, 1995; Cosgrove, 1999; Harvey, 2001; Black, 1997; Elden, 2001; Monmonier, 2001). What is at issue, but which has not yet been clearly articulated in this work, is a critical politics of mapping, rather than just a political critique of existing maps (more on this below).

Harley's fruitful contribution was to ask the vital question about what mapping is and could be, and like Heidegger to set us on the path of questioning its possibilities. That's why Matthew Edney called his obituary of Harley "Questioning Maps, Questioning Cartography, Questioning Cartographers" (Edney, 1992). But surely other cartographers and geographers have also thought about what mapping is? Arthur Robinson, for example, even co-authored a book called *The Nature of Maps* (Robinson & Petchenik, 1976). Was this not about the being of mapping? The longer answer to this is suggested in the next section but the short answer is that Robinson and Harley's projects were different because Robinson tried to describe how maps are, whereas Harley asks why maps are as they are, and how else they can be. It is this latter project which is the political one.

It is a key argument of this paper that maps and GIS are important sources for the production of geographic knowledge. What are the power-knowledge relations of mapping as they occur against the historical horizon of possibilities, and how that horizon can be enlarged. This is a question of the historical formation of mapping concepts (eg., about cyberspace) as an epistemology, and the possibilities that are given to us for the being of those concepts, or an ontology. In other words, theory and practice.

"Harley's fruitful contribution was to ask the vital question about what mapping is and could be . . ."

The Fisherman's Problem: ontic and ontological knowledges

What does it mean to open the question of the conditions of possibility for cartography, and how does this constitute a question which is philosophical and political? To provide an initial response to these questions we can go back to a distinction between two types of knowledge that were important to Heidegger's work (see Heidegger, 1962, §4):

1. Ontic knowledge, which concerns the knowledge of things as such; and
2. Ontological knowledge, which concerns the conditions of possibility for ontic knowledge.

For example the question "how old is the Vinland map" is an ontical question, whereas "what is the mode of being of maps" is an ontological question. The first question may be addressed and resolved by science, but not the second (Polk, 1999, 34). Elden adds that "Heidegger's own exercise of fundamental ontology deals with the conditions of possibility not just of the ontic sciences, but also of the ontologies that precede and found them. This is the question of being" (Elden, 2001, 9). Heidegger's distinction suggests that ontical enquiry often characterizes disciplinary work because it can be addressed scientifically. In the discipline of cartography for example, we enquire how to satisfactorily generalize and symbolize landscape features, or which projection best reduces distortion. But this ontic language of science and objectivity itself takes place within a conceptual framework (ontologically). We can call this the fisherman's problem,

using an insightful metaphor from Gunnar Olsson: "The fisherman's catch furnishes more information about the meshes of his net than about the swarming reality that dwells beneath the surface" (Olsson, 2002, 255). The fisherman certainly catches real fish that were in the ocean (that is, ontical enquiry certainly can say truthful things about the real world). But if he tried to say something about the reality of the denizens of the ocean, his explanation would be related to the size of his fishing net. He wouldn't have much to say about whales or sharks, nor about sea anemones. The net therefore plays a double function of both revealing things about the sea and hiding or concealing them. For Heidegger this double function of unconcealing-concealing is an abiding aspect of our understanding of being. If Heidegger is right then studying maps and mapping would seem to include as much about what maps can't or don't do as what they can do. This is why Harley spoke of the silences of the map (Harley, 1988b).

If we now go back to the difference between Robinson and Harley we can see that where the former described the fish in the net, the philosophies of Foucault and Heidegger are concerned with the net itself. Harley also asked about the net. What does the net catch? Do we like what it catches? Have other places or times had other kinds of nets which caught different things? What do we suspect the net to be unable to catch? How can we change the net to catch other things? According to Heidegger our present "ontological net" is critically flawed because it sets up being in a very scientific way. We like to measure things and treat them as objective presences on the landscape that can be re-presented. Again, this critique of science should remind us more of Harley than Robinson.

The ontic-ontological distinction is a familiar one in the history of philosophy, dating back to Descartes and Kant. When Heidegger took it up, he distinguished between living life as such (making choices against a background of possibilities) for which he coins the term "existentiell" understanding, and the questioning of what constitutes existence and the structure of these possibilities, which he calls the "existential" understanding (Heidegger, 1962, §3-4). This *existential* understanding is one directed toward the meaning of being. Heidegger begins his book by stating that we are very far from answering the question of what an existential understanding might be; so far, in fact, that the very question itself is forgotten (Heidegger, 1962, §1).

These bewildering terms might make us wonder why it's worth worrying about the "being of maps." Why not study concrete maps that actually exist? Heidegger's response is essentially to refer us once again to the fisherman's problem. Sure, we could study the contents of the net. This is what we do when we study maps and mapping, especially from a scientific viewpoint. It is ontical enquiry about things. But the only way to know anything meaningful about the nature of the ocean is to understand our conceptual framework from within which we understand that ocean—to look at the net itself. This ontological looking means thinking about being as such, including the being of maps. The fact that it sounds strange to say this ("the being of maps") is just one indication that we hardly ever think this way, that is, philosophically. Perhaps if we do so, we can open up a new and productive dialog about mapping.

How we might do philosophical thinking

What is philosophy today—philosophical activity I mean—if it is not the critical work that thought brings to bear on itself? In what does it consist, if not in the endeavour to know how and to what extent it might be possible to think differently, instead of legitimating what is already known?

Foucault, 1985, 8–9

If we grant that the ontic–ontological distinction is helpful, it is still not immediately apparent how ontology might be carried out in cartography. And what about ontical enquiry? If the whole way maps can be is expanded, it seems as if the ontical questions would have to change too. Since ontological thinking is rare and neglected (according to Heidegger) there won't be many examples to draw from. Luckily there is one well-known example that we can examine that picks up where Heidegger left off. Even better, it is directly relevant to cartography. The following is an extract from a lecture in November 1983:

Most of the time a historian of ideas tries to determine when a specific concept appears, and this moment is often identified by the appearance of a new word. But what I am attempting to do as a historian of thought is something different. I am trying to analyze the way institutions, practices, habits, and behavior become a problem for people who behave in specific sorts of ways, who have certain types of habits, who engage in certain kinds of practices, and who put to work specific kinds of institutions. The history of ideas involves the analysis of a notion from its birth, through its development, and in the setting of other ideas which constitute its context. The history of thought is the analysis of the way an unproblematic field of experience, or a set of practices which were accepted without question, which were familiar and 'silent,' out of discussion, becomes a problem, raises discussion and debate, incites new reactions, and induces a crisis in the previously silent behavior, habits, practices, and institutions. The history of thought, understood in this way, is the history of the way people begin to take care of something, of the way they became anxious about this or that—for example, about madness, about crime, about sex, about themselves, or about truth (Foucault, 2001, 74).

"A Foucauldian history of cartography would be a history of how a particular problem was taken up cartographically."

It is worth trying to understand Foucault's meaning here. He begins by making a claim that the work he is doing is a history, but that it is not like the history we are most typically used to. So Foucault is a historian but not a traditional one. A traditional historian is interested in the "history of ideas" or what is thought at a particular time (the *zeitgeist*, contemporary discourse, what people said at the time as recorded in newspapers, journals, writings, records; i.e., the historical "archive"). Foucault, however, is interested in how things "become a problem" or problematizations. When something which was previously unproblematic does become a problem then people start to pay attention to it, even worry about it and try to deal with it. We can pick up on these periods of problematization as times when the regular ongoing behaviors are no longer possible in the old way. It might cause "cartographic anxiety" (*Angst*) as Gregory called it (Gregory, 1994). In this sense, mapping is a problematization itself. We map because we are concerned with a certain aspect of the environment and wish to try and deal with it. A Foucauldian history of cartography would be a history of how a particular problem was taken up cartographically.

In fact, it's the fisherman's problem again. We reel in the net and find it has big gaping vents and weird bite marks over it that prevents us from fishing as normal. We begin to suspect some large beast down there that is too strong for the net, so we research ways of strengthening the net or making the mesh coarser. Or perhaps we switch from net fishing that scoops up everything, to making a distinction between fish-for-consump-

tion and fish-as-part-of-an-ecological-system. Now fishing is not just a question of extracting resources but concerned participation in an ecological system. Because of a problematization, fishing as a way of being has changed.

A good cartographic example is provided by the controversy over the Peters projection. In the decades following the introduction of his world map, Arno Peters attracted dozens of articles that were highly critical of it (Monmonier, 1995). But Peters persisted, his map was adopted by aid agencies and the World Council of Churches, and was even featured on the US TV show *The West Wing*. It was and still is a big problem for cartographers. While their approach was ontical (they pointed out all the technical reasons he was wrong) it is also possible to read the controversy as saying something defining about cartography itself (Crampton, 1994). Perhaps Peters, explicitly using the map as a politics, has made a new way for mapping to be. On this view, the cartographic opposition is inadequate, not because cartographers missed the point (their technical criticisms of Peters were certainly true) but because Peters created a new point!

Aspects of problematization include the following:

1. It is to deal with something as a problem at a particular time: for example, why did the Peters projection become such a hot-button issue at this time?
2. Second, to problematize something is not to do a history of ideas but: "to define the conditions in which human beings 'problematize' what they are, what they do, and the world in which they live" (Foucault, 1985, 10). Problematizations are an ontology, not ontical enquiries.
3. Finally, to problematize is to examine the larger truth claims of the discourses: "problematization doesn't mean representation of a pre-existing object, nor the creation by discourse of an object that doesn't exist. It is the totality of discursive or non-discursive practices that introduces something into the play of true and false and constitutes it as an object for thought" (Foucault, 1988, 257).

Problematization is an analysis of the conditions of possibility for ontic knowledge. Often these conditions remain unanalyzed and only at certain times do we question our horizons of thought.⁴ This has many fruitful ramifications, not all of which can be examined here. One important aspect however, is that every context establishes normalized ways of being. The hue and cry over the Peters projection for example was over whether it was acceptable ("normal") for a map to be like that. Normalization is a very powerful aspect of ontology because it tends to stabilize established power-knowledge structures. Normalization is often one of those negative effects of power with which Foucault is identified. When people especially are on the wrong end of normalization processes it can ruin their lives, but the response to this is not to escape from power but rather to use it productively (McWhorter, 1999). Power's positivity is an aspect of Foucault's enquiry that is often overlooked.

In the next section I provide a more extended example of how we might proceed with a problematization in cartography. The flip side of this is that when we *fail* to problematize we unreflectively work within normalization.

Problematizing the Essential Lie

In this section I would like to contrast and play off against each other two

"Problematization is an analysis of the conditions of possibility for ontic knowledge."

books by Monmonier (1996, 2001). In the first we can analyze his assertion "[n]ot only is it easy to lie with maps, it's essential" (Monmonier, 1996, 1) to show that this very powerful statement pervades cartography, and that it produces the unproblematized ontology of contemporary mapping. By contrast, in Monmonier's more recent book it is possible to discern some pointers towards a more critical problematization of cartographic knowledge production.

Monmonier (1996, 1) writes "[n]ot only is it easy to lie with maps, it's essential". There are at least three terms of significance: "easy," "lie" and "essential." All three terms surround a fourth, the map, which takes its shape and its being from this tripartite structure in which it finds itself. It is of the essence, it is essential, necessary, that maps lie. In order for a map "to be" a map, it must lie. Lying is in the essence of the map. Furthermore it is easy for maps to lie, it is not something which is difficult or which can only be achieved after a struggle in the sense of going against something's nature. This ease is well-known and assumed in the statement that could thus be rewritten: "Not only (as you know) is it easy to lie . . ." *but also* (and here we introduce the new idea, which we didn't previously know) it is essential and necessary. The natural ease of lying becomes something that is essential and important, that is, we don't have to struggle against this natural tendency of lying, but rather should embrace it as something positive. This is further alluded to in the next few lines where Monmonier writes that "to avoid hiding critical information in a fog of detail," in order that the truth does not get overwhelmed "an accurate map must tell white lies" (Monmonier, 1996, 1). So this positivity, this advantage to lying, is that it will yield truth. In order to tell the truth, we must lie. So any truth-telling, such as the map, comprises as an essential part, lie. A map is both lie, and necessarily and as a result, truthful. And "there is no escape" (Monmonier, 1996, 1) from this.

"It becomes a question of separating the good maps . . . from the bad maps . . ."

This is an old and essential idea in cartography. It can be found, for example, in the famous saying of Korzybski that "a map *is not* the territory it represents, but if correct, it has a similar structure to the territory, which accounts for its usefulness" (Korzybski, 1948, 58). The political consequences of this ontology of mapping are clear.⁵ Our task as mappers becomes one of deciding where to draw the line between the elements of truth and lie in the map. It is a normative ontological statement: maps "ought to be" truth-tellers. We police the boundary, we watch it, in order to make sure that there is not too much lie nor insufficient truth in the map. It becomes a question of separating the good maps, where the lie can be justified (it is just, legal) from the bad maps, where the lie cannot be justified (it is illegal, it has passed over the horizon). In this way we make the difference between USGS topographic quad sheets and propaganda maps. We're immediately made aware of the danger of sliding away from truth-telling by Monmonier: "it's not difficult for maps also to tell more serious lies" (Monmonier, 1996, 1). Thus in order to recognize when a map moves illegally across this border Monmonier has written this book, a text on drawing the line which is therefore an ethical text on the problem of truth in mapping.

These "dividing practices" of normalization were for Foucault a hallmark of modern thought, which for example can be seen in his work on how the mad are separated from the sane, criminals from "good boys," the sick from the healthy. In other words it is how something gets entered into "the play of true and false." Dividing practices are *normalizations* of cartographic thought.⁶

Monmonier's fascinating account of the role of mapping in producing favorable electoral districts (Monmonier, 2001) illustrates the difference

between acknowledging the use of maps for political purposes and a more strongly conceived critical politics of spatial knowledge production by mapping. For most of his book, Monmonier discusses redistricting, gerrymandering, and the legal requirement that political districts achieve "compactness" (as measured through competing indices) and how these distinctions can be used to derive legitimate from illegitimate voting districts (in the legal sense). As such, his discussion is an example of how ideas act as dividing practices, especially between what is acceptable and what is not. However, in the last two chapters Monmonier turns from this historical account to explicitly question the way that modern voting districts are constituted.

Using the nomination (later withdrawn by President Clinton) of Lani Guinier to assistant attorney general for civil rights in 1993, Monmonier points out that alternative methods of electing representatives—multi-member districts and proportional representation—to the American (and UK and France) system of "first past the post" have plenty of historical and international precedence. According to Monmonier "[p]roportional voting is used extensively throughout the world, by developed countries in northern Europe and the western Pacific as well as by less prosperous nations in Latin America and parts of Africa" (2001, 144). Thus, despite the negative press Guinier received (as a "quota queen," and a promoter of racial preferences) Monmonier interprets her as problematizing the political agenda as far as space and representational politics are concerned: "American-style elections are not a prerequisite for democracy" (Monmonier, 1996, 146). This raises the question of what prerequisites are necessary, and what the historical horizon of possibilities might permit or disallow at the moment.

Monmonier successfully "puts into play" questions concerning space and politics in real-life practical situations. As such, his work is potentially useful for a critical politics of representation and mapping, and for critical geography more generally. Monmonier does not necessarily cast his work in this light himself. But thinking critically and philosophically about mapping, space and politics does not necessarily entail taking up a position on the political spectrum. It is rather to question the essence of that spectrum and to help redefine it.

Towards a Critical Politics of Cartography

"Even . . . apparently arcane ontological and epistemological questions must be part of the debate [about cartography]. They too raise issues of practical ethical concern. Our philosophy—our understanding of the nature of maps—is not merely a part of some abstract intellectual analysis but ultimately a major strand in the web of social relations by which cartographers project their values into the world"

Harley, 1991, 13.

Harley's words suggest that it is but a short step from questioning the bounds and limits of our lives (philosophy) to politics and that maps are an important practical component of social relations. It is an important step that connects philosophy and action.

First, maps might be sites of struggle. This struggle is a political one where knowledge and power structures meet. To understand cartography politically opens and allows intervention in the struggle over the deployment of power-knowledge effects. On the basis of these questions it is possible to imagine *new* possibilities, changes, and human being at both the individual and societal levels for cyberspace, as Guinier and Mon-

"Harley's words suggest that it is but a short step from questioning the bounds and limits of our lives (philosophy) to politics . . ."

monier indicated. As such, this is a political project where we see “the development of domains, acts, practices, and thoughts that seem . . . to pose problems for politics” (Foucault, 1997a, 114).

Second, maps may not have to produce space only objectively and scientifically, which according to Heidegger has nothing to do with how we live, our experiences, or pleasures. Maps ought to be able to play a significant role in the political project of finding our place in the world. As Harley put it “when we make a map it is not only a metonymic substitution but also an ethical statement about the world . . . [it] is a political issue” (Harley, 1990, 6). For example, if we are interested in understanding an historical map we may think we need to examine it as an object and to assess what information it may contain (eg., see Woodward, 1974). Yet this will not tell us how the map was used and lived as part of a struggle of making sense of the world. It will omit the experiential side of the map as well as any lived context in which to situate our understanding. Using or experiencing historical maps in their original context is not easy. It’s no wonder that instead we objectify maps. Yet maps are meaningful understandings of the world, not just mechanisms for communication. This point echoes a critique made as long ago as 1976 by Leonard Guelke (Guelke, 1976). Guelke argued that the focus on communication in cartography was seriously inadequate because it doesn’t take into account map meaning.

Insofar as a map is thought of as simply communicating an already known and digested *knowing*, then the questioning (of the horizon) is not permitted and is foreclosed. This very foreclosing gives the map its authority and power. But “it awakens nothing in the way of a questioning attitude or even a questioning disposition. For this consists in a *willing-to-know*. Willing—this is not just wishing and trying. Whosoever wishes to know also seems to question; but he does not get beyond saying the question, he stops short precisely where the question begins. Questioning is willing-to-know” (Heidegger, 2000, 22). If we use a map just because we wish to know something, to be on the receiving end of an information transmission, then we have stopped short of mapping as problematization. We have chosen to limit ourselves to thinking within the bounds of our ontology, rather than willing to know what mapping can be and how it can open up a world.

In the ontic cartographic practice so far established the best maps are those which are the most conclusive, the ones which most authoritatively communicate the truth of the landscape (an authority which is vested in their adherence to the rules, rules which are at this particular historical juncture provided by science). But what we aim for here are maps that willfully challenge normalization. For from this questioning comes the possibility of an unfolding of the being of maps and mapping. In the remainder of this article therefore I wish to suggest or open up some possibilities which might contribute to a critical politics of cartography by posing two major questions: why pursue a critical politics of cartography; and second, of what does it consist?

Why pursue a critical politics of cartography?

We can begin this question by identifying a necessary linkage between the political and the spatial, a linkage that is essential, rather than just an occasional political option. The manifold relationship between space and politics has been examined elsewhere (see eg., Elden, 2000) but we can gain a flavor of it by returning to the origin of the word “political.” What did this word mean for the Greeks? As Sallis puts it, referring to Plato’s

cosmological dialogue the *Timaeus*:

How is it, in particular, that reference to the earth belongs to political discourse? The answer, most succinctly, is: *necessarily*—taking necessity to have the sense it has in the *Timaeus*. Discourse on the city [*polis*] will at some point or other be compelled, of necessity, to make reference to the earth; at some point or other it will have to tell of the place on earth where the city is—or is to be—established and to tell how the constitution (*politeia*) of the city both determines and is determined by this location” Sallis, 1999, 139

The political then originally meant how we should live, and how we should arrange the city (or place or site) in which we need to dwell. To use Heidegger’s phrase, we are concerned with our being-in-the-world. At the beginning of this paper I suggested that Heidegger brought a geographic sensibility to light, and here we can see why. The spatial in the sense of this *polis* constitutes the political. Here we are very close to phenomenological enquiry in geography (eg., Pickles, 1985). Elden elaborates:

In his rethinking of the [*polis*], Heidegger makes a potentially major contribution to political theory, by suggesting the links implicit in the phrase ‘political geography.’ Following Heidegger, we might suggest that ‘there is a politics of space because *politics is spatial*’ (Elden, 2000, 419, original emphasis).

Elden’s work (see also Elden, 2001) is critically important here because he recovers from Heidegger the idea of the *polis* as the site of human existence (an idea which was lost when *polis* was simply translated as “city” or “city-state”). The *polis* rather is the site and abode of human history. As a spatialized entity (site, abode) it is what constitutes the political and allows us to rethink it. Maps, because they “make reference to the earth” are part of this constituting. Maps *produce* knowledge through mapping practices, but as problematizations their knowledge is always in a certain context, is normalized, in a power relation, and therefore for all these reasons, political.

It is precisely not a question therefore of examining “the” political in mapping, which is how the question has been framed until now. It is not a question of “looking for” the political in maps, for this would be to assume an a priori realm of the political which is sometimes injected into maps and which makes their content political. On this view we are mislead into uncovering this political content, which is the project I argue Harley pursued. On the view I am discussing here, the project is rather to

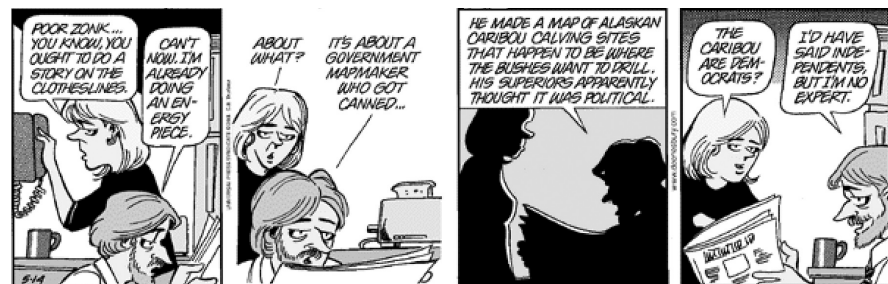


Figure 1. In this Doonesbury cartoon, the joke is dependent on a distinction between the content of the map being political (caribou-as-Democrats) and the position of the map within a political situation and how it helps constitute that political situation. (Used with permission of Universal Press Syndicate.)

investigate and reveal how mapping necessarily produces the political, and how rethinking mapping can lead to a rethinking and questioning of the political. This as such and of itself is both a definition and a call to a critical politics of cartography.

A Doonesbury cartoon can bring to light some of these points (Fig. 1).

In 2001, a USGS cartographer lost his job over a map he made of caribou calving areas in an area wanted for oil exploration. Rick says “it [the map] was political.” The joke is that Joanie deliberately misunderstands and pretends that the *content* of the map (the caribou) is political (obviously caribou can’t be Democrats or even independents). What *is* political is the map’s position in a wider political situation. This example shows that a politics of cartography does not study the political content of the map—as if we could temporarily “adopt” a political mode of enquiry or “look for” political things in the map (as has happened in studies of propaganda maps and in Harley’s work) but how maps as spatial knowledge creatively constitute politics itself. Our target is politics (understood as a horizon of possibilities) and not maps themselves. We are interested in “a politics of mapping” and not a cartography of politics.

In the last section of this paper I will sketch out a few possibilities for what a critical politics of mapping may look like. These are not propositions, axioms or even guidelines, but rather some issues that might bear thinking through. The idea here is not to put boundaries on a subject, but to open up and explore it. Perhaps they are best seen as statements in the process of being superseded, overturned and rejected.

Of what would such a project consist?

1. A critical politics of cartography is a problematization. As we have already noted and lead to, a critical politics of cartography is highly situated spatially. That is, specific understandings of space at particular historical moments are analyzed. A problematization of these moments would enquire what issues were taken up as problems in order to investigate the horizons of possibility of mapping. For example, why did thematic mapping emerge in the late 18th and early 19th centuries in Europe (especially France)? During this period (1780–1830) many of the standard thematic map types we are familiar with today were invented, such as the choropleth and proportional symbol maps. An enquiry about the conditions under which these map types were invented might proceed from the fact that they were not invented by cartographers but were part of a specific discourse about political economy. The choropleth map (invented in 1826 by a Count Charles Dupin) in particular was a very influential method and practice of demonstrating where the state was developed or underdeveloped, and hence where the state’s resources might need to be directed. Thus the map at this time was understood as a key component in governing the state more efficiently. Furthermore, thematic maps were instrumental in forming a statistical framework in which to understand the problem of governance. Statistics were increasingly used to assess “moral” questions, or what we would now call socio-economic issues (crime, birth rates, suicide, early marriages, etc.).

Statistics were able to provide insight into what was “normal” and what was abnormal or deviant, and maps were then able to produce pictures or snapshots of normality over the territory of the state. This led in part to an increasing need to collect more statistics, and the 19th century saw a great boom in these statistical collection procedures, most notably of course the national census (Hannah, 2000; 2001). Atlases of the census,

“Thus the map . . . was understood as a key component in governing the state . . .”

"A critical politics takes up the way that maps have been cast in an effort to imagine other cartographies that are not based on mapping normalized resources."

such as Francis A. Walker's great atlas of 1874 (the first statistical atlas of America) were extensions of this way of producing geographic knowledge (as normalized resources). What was a problem for the 19th century political economists was the issue of how best to govern the territory of the state and it was operationalized in a very particular way which has had long-lasting effects (not the least of which is the predominance of statistical mapping in problem-solving). A critical politics takes up the way that maps have been cast in an effort to imagine other cartographies that are not based on mapping normalized resources. We saw this earlier when we encountered Heidegger's critique of science as an ontic enquiry. Problematizations are concerned with the ontological horizon of possibilities.

2. Critical politics of cartography is a struggle in the sense of a political intervention or participation. A critical politics is not passive, but also very actively directed at intervening in the production of cartographic knowledge. This arises because as a problematization we are interested in how the particular historical horizon came to define our thinking and practices. As we have seen normalization is one powerful procedure in stabilizing this horizon, a stability that can nevertheless be undermined through a critique which sees the horizon as contingent and changeable following intervention. An example of such intervention in mapping is the "Public Participation GIS" (PPGIS) project formed by the National Center for Geographic Information and Analysis (NCGIA) and the Varenus Project (Craig, Harris & Weiner, 1999). PPGIS can trace its roots to the early 1990s, when discussions in various journals and at meetings raised the question of the relationship between GIS and society. Prior to that is a concern with community mapping (eg., Aberley, 1993). The work has developed ways in which "alternative GIS" could be developed which empowers communities, especially those which are marginalized. Terms such as "empowerment" and "marginalization" were themselves critically assessed, and the creative tension of GIS as both enabling and marginalizing is acknowledged.

These efforts can be large and strategic, or small, tactical interventions on a particular issue. An example of the latter was the work of a graduate seminar in cartography in the spring of 2002. The seminar performed community mapping in an Atlanta neighborhood called Cabbagetown (Crampton, et al., 2002). Cabbagetown is one of Atlanta's oldest working class neighborhoods, founded in the 1880s as a factory village to support a cotton mill. Today its very identity is being contested as it undergoes gentrification and the conversion of the mill into gated lofts. The seminar was interested in how the historical "memory" of this unique neighborhood may be expressed through mapping as a process of producing spatial identity, and how in turn those memories may be spread and made accessible to current residents. Techniques involved an online GIS, resident surveys, participant observation and many other ethnographic practices. The goal was to work with community leaders and residents in order to make the online GIS part of the experience of living in Cabbagetown (as opposed to an outsider's representation of it). In this sense, mapping is a struggle over how to remember the past and to write its biography in maps. Often this writing means opposing received wisdom or the "auto-bio-geographies" inscribed by structures of power. Thus in general we can say that a critical politics of cartography involves the positive production of counter-memory (McWhorter, 1999) and counter-mappings (because they are written counter to power).

3. The critical politics of cartography is an ethics, or what Foucault (1985) called an *askêsis*, a Greek word for exercise or practice. That is to say the project is "ethical" if by this word we understand not the "rights and

wrongs" of mapping, but *ethos*, the mores or practices of the time. Ethics means: how shall we live in practice? In turn we ask: What is the origin of these practices? How do they constitute the horizon of possibilities of being? What other mapping practices might emerge under a different horizon and how can we open these other horizons? Mapping practices as an ethics in this sense have yet to be properly considered politically. One suggestion is to take up the challenge of the ethics of mapping as a practice of freedom (Foucault, 1997b) through the "pleasure of mapping." Given how desire has operated to so completely normalize people, for example "gay desire" (McWhorter, 1999), it may be that sheer pleasure offers some positive ways forward. Maps as pleasure is appealing, perhaps evoking the reason people take up mapping as a practice in the first place, before it is laden down with jargon. It is in this sense that I use the phrase "maps as finding our place in the world", maps as pleasurable sense-making of the world. Unfortunately we still know very little about the pleasure of mapping—although Wood has written on it (Wood, 1987) and Harley's beautiful piece on the map as biography may hold some initial clues (Harley, 1987, see also Gould's response, 1999, 74–78).

4. A critical politics of cartography is a technology. By this I mean that we engage with the specific technological question of cartography and its relation to power-knowledge. As was mentioned earlier, cartography raises this issue to the foreground because of its singular place at the intersection of art, science, technology and practice. In today's context by "technology" we mean primarily cartography and mapping as ways of being that depend on instruments and digitality as a means to an end. As such, it may leave behind other aspects of "technology". The original word for technology is the Greek *technê* which meant art, skill, way of making or doing. This sense is however quite lost when mapping technology produces knowledge as a resource or "standing-reserve" (Heidegger, 1977). Two short examples illustrate this point.

First, the question of "interoperability" or how well data and databases integrate with each other. Interoperability has been mentioned as one of the leading technological issues in GIS and digital mapping today (Monmonier, 1999) although the word only came into common usage in the early 1990s (in the sense of integrating software or data; the word was used prior to this in a military context to refer to how well military equipment from different countries worked with each other, as well as how different computers networks can be integrated, but these are not necessarily the same associations we have in GIS/mapping now). What role does interoperability have on the normalization of data? For example, what value will be attached to data that cannot be made interoperable (because they are too local or outside the scientific purview)? How will we judge and value maps or databases when they already have an a priori existence as interoperable? This is technology as an impoverished instrumentality because it is a cause of an end already in sight (that is, interoperability). What we are interested in with technology however is how it can bring about insight into meaningful human life.

Second, the relationship between cartography as a science and an art is still seen as problematic (see eg., Woodward, 2001). No doubt this is part of a larger question of the degree to which cartography sees itself as a technology, science or art. Some cartographers have demonstrated how it is possible to productively reinterpret technology not in order to exploit the environment as a resource but to let the essence of the landscape emerge (eg., Patterson, 2002). Patterson has mastered the art of digital mapping from a manual tradition which pays close attention to the things themselves (see the work of Erwin Raisz and Heinrich Berann). An

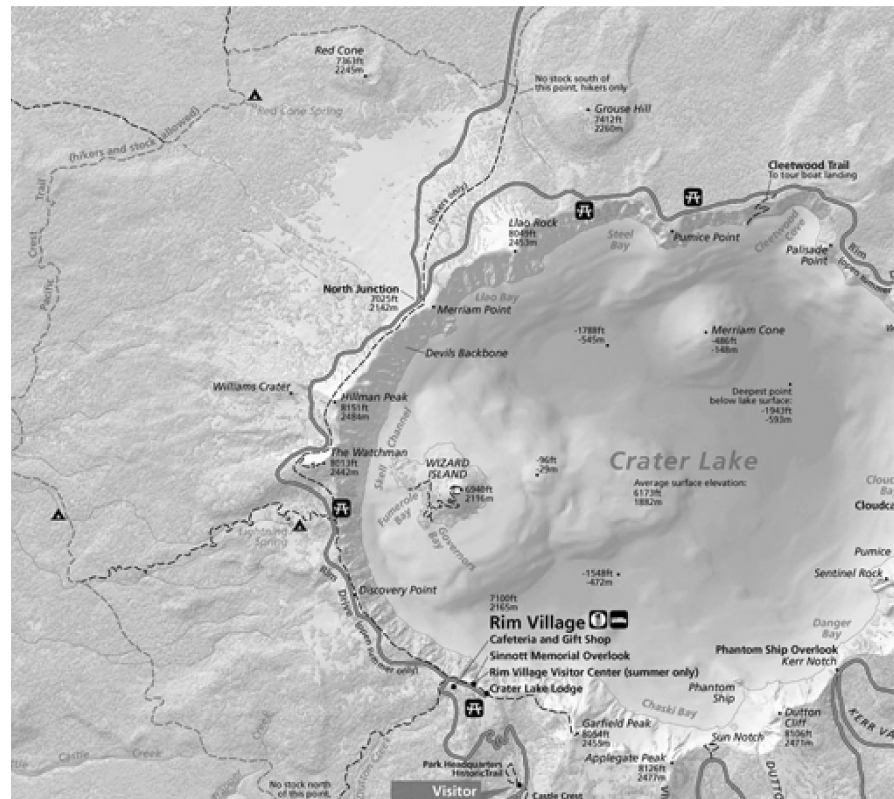


Figure 2. Crater Lake, Oregon on National Park Service (NPS) maps. Produced entirely from digital sources. Source: Patterson, 2002.

example of his work is shown in Figure 2.

Figure 2 shows the detail and realism on NPS maps, the aesthetic quality that can be achieved in the digital realm and not least the superb integration of art and science by bringing out the qualities of the landscape itself. It is critical to note that it is necessary for the cartographer to pay very close attention to the landscape and to understand its processes and ideally to work from personal experience. There is no question here of “automatic” hillshading or whatever. The concepts of “art” and “science” recede in the light of the landscape itself.

Summary

This paper has suggested that in order to pursue a necessary political project with mapping (cartography and GIS) we need to think about the being of maps at this present moment. This “philosophical” enquiry turns out to have numerous critical outcomes of a practical nature. An important distinction was made between knowledge about things in themselves (what we know) and the horizon of possibility for knowing in general (how we know what we know). It is critical to make this distinction because to fail to do so is to fail to think politically. It is by asking what are the conditions of thinking in cartography that we can both see the shape of that thinking,

to see it as it is, and therefore to begin to see how it might be otherwise. It is to think about the being of maps. Seeing this as a critical politics of cartography I suggested a few ways in which this project could be pursued: as a problematization in Foucault's sense (a history and critique of the present), as an ethics, as a struggle, and as a question of technology.

APPENDIX

Short Glossary of Key Terms

H = from Heidegger

F = from Foucault

Being: what it means to be (H)

Existentiell: our everyday understanding about ourselves (H)

Existential: about existence and being as such (H)

Genealogy, history of the present: an account which reveals historical ontology (F)

Ontic: knowledge of specific things (H)

Ontological: the historical conditions of possibility of ontic knowledge (H)

Problematization: historically contingent disturbances of the ontological (F)

ACKNOWLEDGEMENTS

NOTES

This essay benefited from the constructive suggestions of Camille Duchêne, David Weberman, Scott Freundsuh and three anonymous referees. One of these referees provided very thorough comments which were extremely helpful in my thinking.

¹I deviate from common practice in not capitalizing the word being because this has the effect in English of reifying the concept and making it harder to grasp.

²For example, Harvey characterizes mapping as hegemonic: "mapping requires a map and that maps are typically totalizing, usually two-dimensional, Cartesian, and very undialectical devices with which it is possible to propound any mixture of extraordinary insights and monstrous lies" (1996, pp. 4–5). Ó Tuathail points to power relations (re)produced through mapping: "[I]dealized maps from the center clash with the lived geographies of the margin, with the controlling cartographic visions of the former frequently inducing cultural conflict, war, and displacement" (1996), p. 2.

³A well-known example is provided by Harley (1991, p. 16) who quotes one cartographer during the debate about the Peters projection as saying "it escapes me how politics, etc. can enter into it" (the quote is from Duane Marble).

⁴The relation between Foucault's problematizations and Heidegger's ontology and especially his "equipmental breakdown" is discussed in Schwartz, 1998 and Elden, 2001. As Polt points out, Heidegger also anticipates Kuhn's argument on paradigm shifts (Polt, 1999, p. 33, fn. 16).

⁵As one referee correctly pointed out, there is also an internal disciplinary politics to protect the gate keeping of cartographic truth from any attempts (such as Harley's) to undermine or question it.

⁶Heidegger's notion of being as revealing-concealing, that being when it shows itself also conceals, indicates another way of constituting mapping.

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Instead of guarding against the lie, in mapping revealing the truth can be seen as necessarily including concealment. Thus when Monmonier says that it is of the essence of mapping to require the lie, it is inconsistent to reject maps on the grounds that they lie (such as the Peters projection). Cartography (and Monmonier) comes close to developing this line of thought (eg., in generalization) but it has never been fully pursued. Thus cartography remains an instrumental technology of revealing because it wants revealing–unconcealment without concealment.

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Frank H. Galbraith's Railway Mail Service Maps, 1897

Virginia W. Mason

Frank H. Galbraith, a clerk with the Railway Mail Service, developed railway maps in the late 1800s to assist railway mail clerks in learning complex railway mail distribution networks for civil service examinations. Galbraith's maps were based on the premise of associating a picture with words in order to create strong first impressions and retain spatial relationships in memory. These maps are highly pictorial in nature and represent the cultural and regional influences in the choice of pictorial images drawn. This paper discusses the political influences that were the impetus for developing Galbraith's maps, the cultural and regional contexts inherent in the maps, and the effectiveness of the maps as mnemonic devices for their intended use.

INTRODUCTION

"Galbraith's maps were mnemonic devices based on the premise of associating a picture with words and instilling a strong first impression and association of ideas."

Frank H. Galbraith, a clerk with the Railway Mail Service, developed railway maps, informally known as "Gal's Maps," in the late 1800s to assist railway mail clerks in learning the complex railway mail distribution networks. These maps served as memory aids that helped railway mail clerks learn the specific location of counties, routes, and post offices in various states. Galbraith's maps were mnemonic devices based on the premise of associating a picture with words and instilling a strong first impression and association of ideas. While Galbraith's purpose in developing these maps was to create an effective tool for understanding the world in spatial terms, these maps to the historian are symbolic mirrors of political and cultural motivations in the late 1800s. Not only is culture apparent in the choice of pictorial images, but it is also the driving force behind the map's development. The maps' purpose as a memory *tool* reveals to the historian a new value of map production, unlike that of other maps in that era. These maps not only helped railway clerks understand their spatial surroundings but also were representations of a method Galbraith believed was effective for people to conceptualize their surroundings spatially. Galbraith's maps represent more than pictorial place-names. The use of these maps reveals a conceptual process that, although common in the cognitive sciences today, was relatively new in the late 19th century.

"These maps not only helped railway clerks understand their spatial surroundings but also were representations of a method Galbraith believed was effective for people to conceptualize their surroundings spatially."

In order to understand the context in which Galbraith's maps were developed, this paper will discuss the political influences that were the impetus for developing Galbraith's maps, the cultural contexts inherent in the maps, and the effectiveness of the theories for which Galbraith intended for the maps' use. These theories, emphasizing Galbraith's importance of memory retention, will be revealed by parsing out the representative qualities in his maps and incorporating the semiotic ideologies of Charles Sanders Pierce and Ferdinand de Saussure.

Civil Service Examinations

The impetus behind Galbraith's creation of these maps is a result of an extensive examination process required by the Civil Service Commission. In an effort to separate politics from the post office, the United States Congress passed a Civil Service Reform Act in 1889, which required Railway Mail Service employees to be hired based on merit, rather than by Congressional appointment (Columbian, 1903). Mail clerks were on probation

for a 6-month period, during that time they studied the rail schemes and were tested every thirty days on their progress. By the end of the 6-month probation period railway mail clerks were expected to “distribute accurately” to 1,500 post offices and were required to read about 100 envelopes in 7 to 12 minutes with 5 to 10 errors (Cushing, 1893). Thus, the examinations were particularly difficult. The importance of the extensive examinations is evident in this statement by the committee on Post Offices and Post Roads:

The improvement in case examinations has necessitated a great deal of additional study on the part of the Railway Postal Clerks, i.e., the greater portion of the “lay off” or time off duty is now devoted to the hardest kind of hard study and nothing is accepted by the Department as a credible examination unless the clerks make a record of ninety-eight percent, or better, which is a higher standard than is demanded or expected by any other profession or calling.

– *Committee on Post Offices and Post Roads of the 50th Congress as quoted on an advertisement for Galbraith’s Railway Mail Service maps (McEwen, 1897)*

The spatial information that the railway mail clerk had to memorize was extensive. They were required to know how all the mail for any office within the state reached its destination, and they had to pass the exams with 98% accuracy (Cushing, 1893). The subject areas on which the clerks were tested were weighted based on their importance (Table 1). The strongest emphasis was placed on geography, railway systems, and addresses, all of which are spatially based subject matter. The examination included questions concerning the location and proximity of cities to rail lines, water bodies, political boundaries, and the principal rail and road connections and railway centers. Railway mail clerks were also responsible for reading addresses accurately and knowing where the addresses were located.

The time leading up to the development of Galbraith’s maps in 1897 was characterized by a significant increase in the general operations of the Railway Mail Service. The number of pieces to be sorted more than qua-

“By the end of the 6-month probation period railway mail clerks were expected to “distribute accurately” to 1,500 post offices and were required to read about 100 envelopes in 7 to 12 minutes with 5 to 10 errors.”

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Subjects	Relative Weights
Orthography (spelling)	1
Penmanship	1
Copying	2
Letter-writing	1
Arithmetic	2
Geography of the United States	4
Railway Systems	5
Reading Addresses	4
Total of Weights	20

Table 1. Relative weights given to sections on the Railway Mail Service examination (Cushing 1893).

"Galbraith assures the Railway Mail Clerk that by using the maps, one will not only improve oneself, but will also improve and benefit the public service."

drupled between 1896 and 1898 and the complexity of the rail schemes¹ attributed by rail lines and route mileage doubled (White, 1910). The demands placed on the railway mail clerk were critical, making studying route schemes a difficult and tedious process. The schemes were not geographically based and were derived from many sources, mostly local, such as clerks, postmasters, contractors, and stage drivers. Post route maps were seldom used because they were not widely available (White, 1910, 9). Therefore, the distribution scheme was represented in the form of a list completely lacking the visual spatial relationships that are inherent in maps. Although maps may not have been widely used, railway clerks had these distribution networks spatially memorized: "In [the clerks'] minds they had accurate maps that included every post office in a dozen states, and the right railway mail route " (Borchert, 1999, 18).

The standardization of and emphasis on geographical knowledge among Railway Mail Service employees prompted widespread production of schematic maps by centralized administrations. Various correspondence schools, such as the Columbian Correspondence College in Washington D.C. and the International Correspondence School in Scranton Pennsylvania, provided study courses for the civil service examination but did not offer schematic maps for the purposes of study until after 1900 (Columbian, 1903). The Post Office Department began to publish maps specifically for use in the railway system by the 1880's, but these maps may have proven to be ineffective study aids thus providing a need for Frank Galbraith's Railway Mail Service maps.

Galbraith's Railway Mail Service Maps

Frank H. Galbraith was a Railway Mail Service clerk for 15 years before creating his maps. His long history and understanding of the functioning of the Railway Mail Service gives credence to the value of the maps among the Railway Postal Clerks. At a time when employment in the Railway Mail Service was based upon skill rather than patronage and perhaps in response to the fear of waning patriotism in the wake of Civil Service Reforms, Galbraith assures the Railway Mail Clerk that by using the maps, one will not only improve oneself, but will also improve and benefit the public service (McEwen, 1897).

"Galbraith emphasized his own associative ideas with place-names and chose pictures that would most effectively create an impression in the railway clerk's mind regardless of the actual origin of the placename."

He introduced the railway scheme as a visual and spatial entity by associating pictures with words on the maps to heighten the interest in studying. The maps were marketed by the McEwen Map Company in Chicago (Figure 1), were hand drawn and used solely by Railway Mail Service employees and Post Office mailing clerks; they were not intended for the general public. The maps were rented for \$1 a week with a deposit of \$10, which many thought was excessively pricey, evidenced by the McEwen Map Company having to justify the expenses on advertisements. Eight maps are known to exist for the following states: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, and Nebraska.

Galbraith's maps were visual mnemonics that used pictures indicative of the political and social culture at the turn of the last century. His purpose in developing these maps was to use pictures that would associate placename and picture in a familiar context. Although places were often named after postmasters or railway officials, the pictures chosen by Galbraith to represent the placename seldom made such obvious references. Instead, Galbraith emphasized his own associative ideas with placenames and chose pictures that would most effectively create an impression in the railway clerk's mind regardless of the actual origin of the placename.

Galbraith's purpose in the design of his maps was to selectively incor-



Figure 1

porate only those features relevant to the study practices of the railway mail clerk. Many railroad maps published at the turn of the century were crowded with copious amounts of type, lines, and various information, typical of maps made for the railroad industry employing cerographic engraving techniques (Woodward, 1977). These crowded maps were considered inappropriate for the use of studying geographic places. Postal maps were particularly guilty of this practice:

In selecting a physical map, avoid, as a general rule, those that are overlaid with typography. Out of deference to the prejudices, or perhaps to the ignorance, of purchasers, the cartographer often endeavors to make the same map serve for natural, historical, and actual political conditions, and consequently he obscures the sheet by a profusion of names. There are, of course, reasons why certain maps must be covered with words, – that is what a postal map is for. (Gilman, 1891)

Galbraith's maps are selective in the sense that not all offices are illustrated with pictures. Urban areas with densely placed railroad post offices (Figure 2) and sparse rural areas with few or discontinued offices (Figure 3) typically are void of picture placenames. No designs are made where junctions are more easily memorized than other offices, so junction points are not illustrated. No designs are made of offices that are of so little importance that they will be discontinued at any time. No designs are made where text is used instead of a picture. And lastly, no designs are made where there is no room for a design (Galbraith, 1898). Thus, these maps are generally not cluttered:

With an ordinary map there is no proper clue to guide the memory, nothing to create interest. It contains a lot of worse than useless dead offices, figures, rivers, lakes, etc., all crowded into the smallest possible

"These crowded maps were considered inappropriate for the use of studying geographic places."

"With an ordinary map there is no proper clue to guide the memory, nothing to create interest. It contains a lot of worse than useless dead offices, figures, rivers, lakes, etc., all crowded into the smallest possible space, and the result is confusion confounded and confounded confusion."

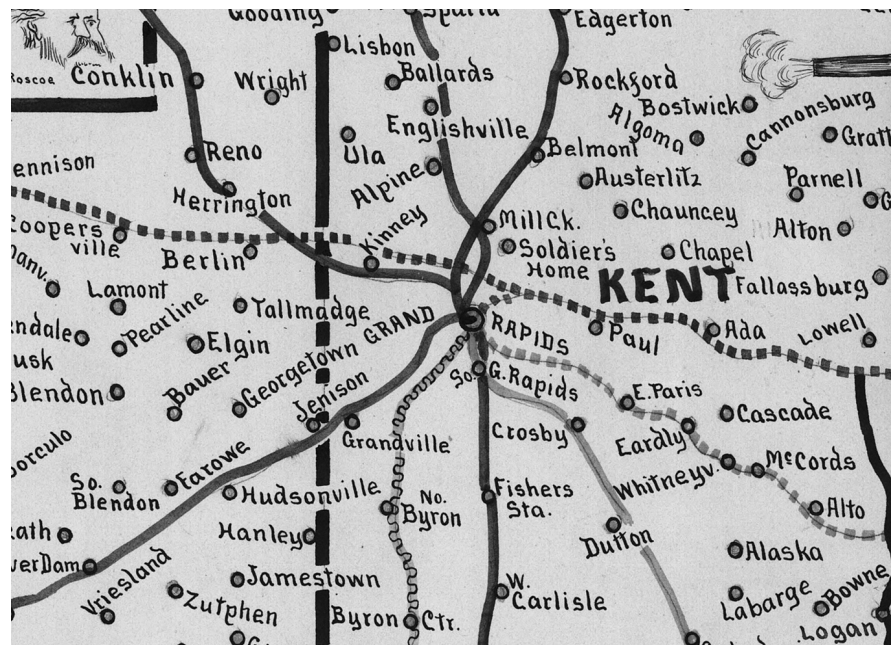


Figure 2



Figure 3

space, and the result is confusion confounded and confounded confusion. (McEwen, 1897)

“On Galbraith’s maps, the rails are easy to find, counties are easily distinguishable, and post offices are locatable.”

This confusion, as stated on the Galbraith map advertisement, is apparent on a Rand McNally Railroad Map published the same year as Galbraith’s maps (Figure 4). The same area of Belvidere, Illinois is represented in Galbraith’s map in figure 5. On Galbraith’s maps, the rails are easy to find, counties are easily distinguishable, and post offices are locatable. Thus, these maps only contain information that is relevant to the operations of the Railway Mail Service. The Civil Service Examination strongly emphasizes spatial proximity to rivers and major bodies of water but Galbraith chooses to omit this information from his maps. We can conclude



Figure 4. Railroad map of Illinois prepared under the direction of, and presented by, Cicero J. Lindly, Chas. S. Rannells, and Jos. E. Bidwell, railroad and warehouse commissioners. 1898.

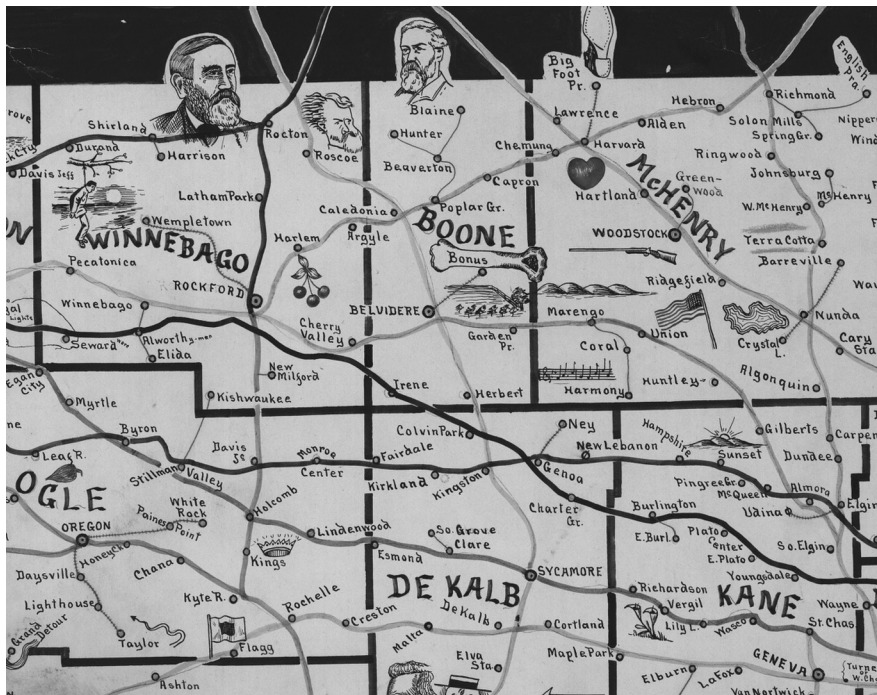


Figure 5

from this and from his narrative on how to use the maps that the purpose of these maps was to focus on the spatial proximity of placename to rail route and not on the proximity to natural features.

"Four Points of Merit" are of value in Galbraith's maps (McEwen, 1897). First, the maps contain no useless rivers, lakes, dead offices, local names, or miles between one town and another, section lines, etc. Sec-

"... the purpose of these maps was to focus on the spatial proximity of placename to rail route and not on the proximity to natural features."

"The McEwen Map Company, which handled the marketing and rental of the maps, claimed the maps were correct to date, meaning that 50 to 250 corrections having to do with offices established or discontinued, name changes, etc. could be made in a year."

"An act or deed in the life of Blaine may occur to you, or it may occur to you the artist made a very poor likeness and that you could do better yourself. No matter what the thought, it has created a slight interest and made an impres-

"The effectiveness of associating an idea and creating a strong impression is based upon a continuum of conventions whereby the more enriching associations are more deeply embedded in cultural contexts."

ond, they are the "largest and plainest maps ever made." Third, each railroad system is shown "in a different color or design," which make the lines easy to distinguish. And fourth, using the maps to study post office locations will help information to be "retained longer than by the use of former methods."

Galbraith's maps were not printed, were hand-made, and hand copied. It appears that the maps were first laid out in pencil and then traced with a wide-nib ink pen. The Library of Congress notes on the Minnesota map bibliography only that the map is a hand-colored gelatin transfer. Although all eight maps were copyrighted in the same year (1898), variation in the typography and pen style among the maps may be evidence that the maps were developed over quite some period of time. The McEwen Map Company, which handled the marketing and rental of the maps, claimed the maps were correct to date, meaning that 50 to 250 corrections having to do with offices established or discontinued, name changes, etc. could be made in a year. The Library of Congress has two copies of a map for each state, and they comprise several sheets varying in size depending on the state (Modelski, 1975).²

The McEwen Map Company's predominant marketing theme was based upon the improvement of memory. They state that to properly use Galbraith's Railway Mail Service maps it is necessary to use "Three Scientific Facts" in memorizing a scheme:

1. A strong impression or interest
2. Association of ideas
3. Repetition

This is how Galbraith suggests one should use the maps (*see Figure 6*).

First, one should mix their office cards thoroughly for a group of counties which lie together. Then, locate the office on the map and carefully study the connection between the design and the office in order to made a forcible impression on your mind. We will suppose the first card is Blaine, Iowa. You look in Buena Vista County and notice the face of Blaine. Now connect the office with the picture, give it some thought before you take up another card. An act or deed in the life of Blaine may occur to you, or it may occur to you the artist made a very poor likeness and that you could do better yourself. No matter what the thought, it has created a slight interest and made an impression. The result is when you come to that office again you will be surprised how well you have remembered it. You will not have to flounder around all over the map, hardly knowing whether you had handled the same card perhaps twenty minutes before (McEwen, 1897).

Semiotic ideology

Research has shown that pictures that depict the text's spatial and relational content can facilitate the retention of information from that text (Dane-man and Ellis, 1995). Galbraith's pictorial representation of placenames and post office names serves to support this hypothesis. Each sign determines a particular level of cognitive interpretation from the map user's perspective; that is, the relationship between the pictorial image and the placename the image stands for varies depending on the degree of cultural convention, or "arbitrariness," inherent in the relationship (Boon, 1979, 87). The effectiveness of associating an idea and creating a strong impression is based upon a continuum of conventions whereby the more enrich-

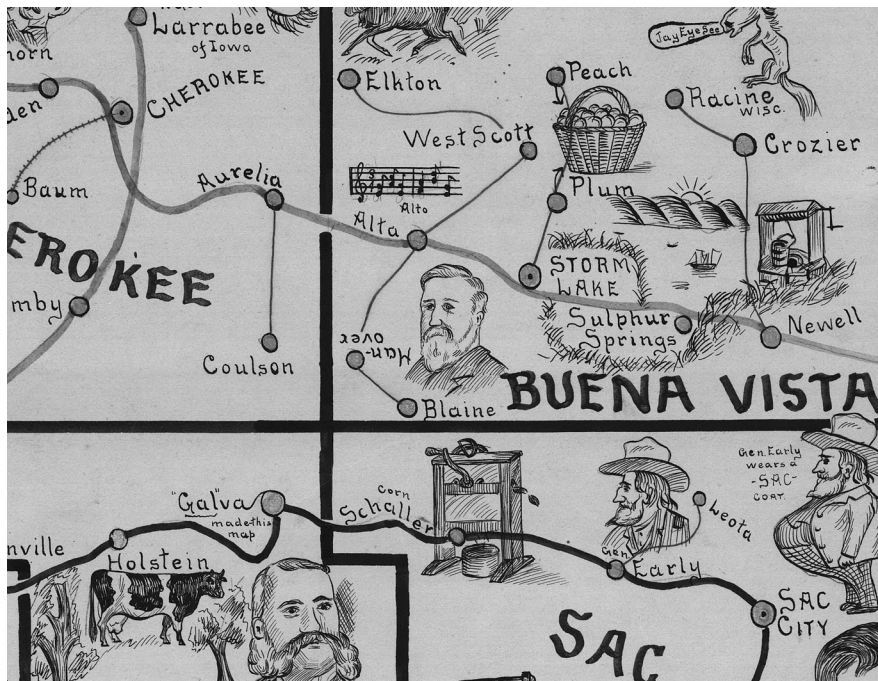


Figure 6

ing associations are more deeply embedded in cultural contexts. Memory retention increases along this same continuum, reflecting Galbraith's idea of "creating a strong impression" and "an association of ideas" (Figure 7).

Peirce's classification of icons, symbols, and indices and Saussure's theory of arbitrariness can be generally applied to Galbraith's representations as follows: Icons are direct representations based on perceived likeness and resemblance (Liszka, 1996, 37). The interpreter, in this case, the railway mail clerk, is the least involved in interpreting a picture-word association. Likewise the degree of contextual convention inherent in the picture-word association is minimal. Indexical signs are signs where the form that the sign takes (in this case the pictorial image) is contiguously or factually connected in some way without perceived resemblance to what the sign stands for (the placename) (Liszka, 1996, 38). Symbols are abstract representations expressed through a word or part of a word and are based solely on context (Liszka, 1996, 39). It is here where the depth of social constructs determines the pictures' effectiveness in retaining the placename in memory. The mind takes a "conceptual leap" and is the most highly involved in interpreting the sign.

"... some of the pictures are 'farfetched,' but this is good because it 'creates interest.'"

Text and Pictures as Mnemonic Elements

Galbraith's advertisement mentions that some of the pictures are "far-

	Icon	Index	Symbol
Interpretation Level:	Lowest	—————→	Highest
Memory Retention:	Lowest	—————→	Highest
Degree of Convention:	Lowest	—————→	Highest

Figure 7

"... the more involved one becomes in interpreting its meaning the higher the likelihood for memory retention."

fetches," but this is good because it "creates interest." According to Galbraith, pictures that are more farfetched and interesting will have the highest propensity to be retained in memory. In figure 8, the placename "Bechyn" is a word that is not intuitively associated with a tangible object. However, Galbraith creates an indexical association to the beach, through the use of homonym, and by using a picture of a person in a bathing suit. The map user makes an external association with a bathing suit and the beach, and thus a person on the beach in a bathing suit must be "Beach-ing." The association in this example is quite "farfetched," but the more involved one becomes in interpreting its meaning the higher the likeli-

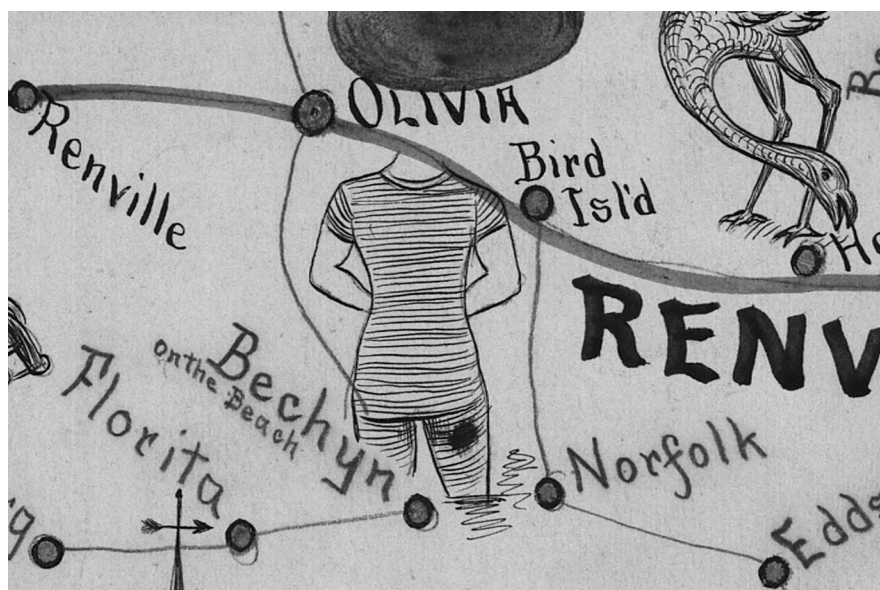


Figure 8

hood for memory retention.

Galbraith manipulates the form and design of text characters by relating a sense or meaning associated with an object. The difference between form and design of text is that form involves the placement of the text and design involves the style of the characters. Figure 9 has examples of text manipulated by form and design. The formation or color of the letters signifies the meaning of the words represented. The letters in "Lehigh" aren't actually high but having them placed in a vertical position gives us the impression that the letters are getting higher. Likewise, with "Hanover" the words are turned over.

"Galbraith manipulates the form and design of text characters by relating a sense or meaning associated with an object."

In the pictures in figure 10, a more sophisticated level of interpretation is required than that of purely textual elements. "Echo" is an icon; it resembles what it is signifying by spelling out onomatopoeia. The dollar sign is a symbol for the meaning of "Rich." The picture of "Summum" is indexical. The numbers shown in three rows with a total line indicates a sum. We are heavily involved in this sign and use the text as a guide to determine the arithmetic function. The picture depicting John Hancock's signature represents various levels of convention for interpreting the sign. In its iconic and indexical form, Hancock's name directly establishes a connection between the signature style and John Hancock the individual, which requires minimal context to make this connection. A high level of cultural context is inherent in its symbolic form because by convention we

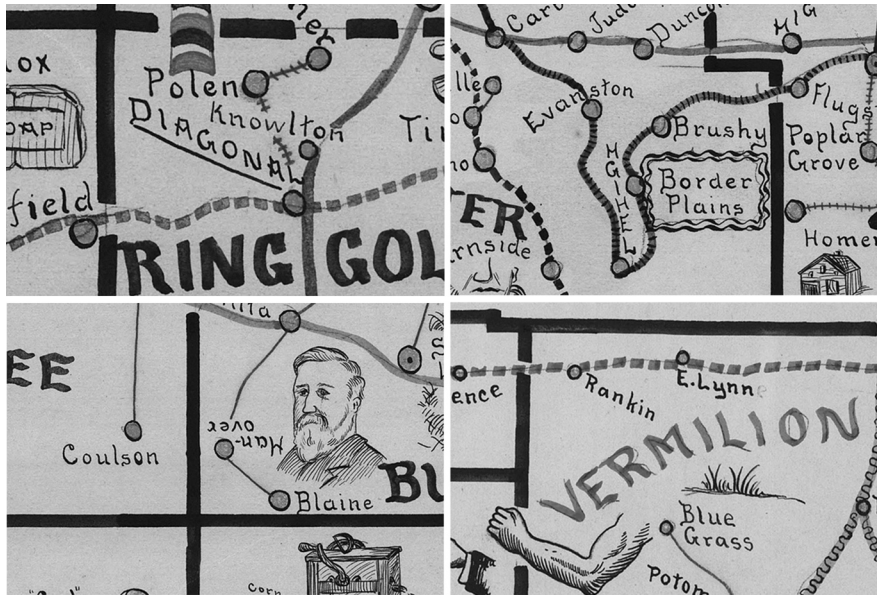


Figure 9

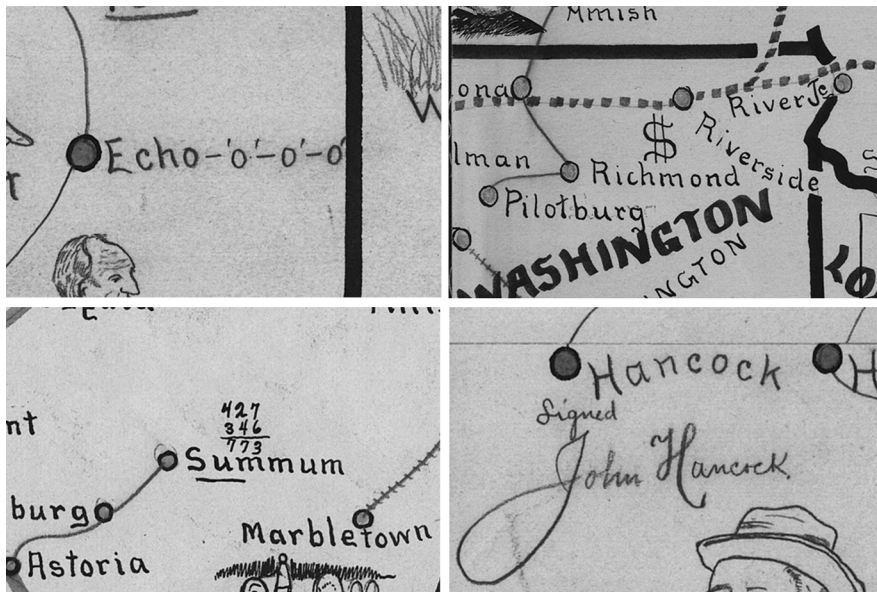


Figure 10

associate John Hancock with his historically significant signature.

By associating a symbol to the placename, rather than an icon or index, a more in-depth interpretation is required. For example, in figure 11, Galbraith uses an identical picture to represent two different place-names. A frog picture is used iconically in "Frogtown" and symbolically in "Hopkinton." A picture of a fork is used iconically in "Fork" and either iconically or symbolically in "Sterling." "Hopkinton" and "Sterling" have a higher level of involvement in the interpretation of the sign. In figure 12, an example of Galbraith representing different objects using a similar picture is shown where a picture of St. Nicholas is an icon and a symbol of Christmas and a "Holliday." "Webster" is represented by different pictures with an iconic portrait and a symbolic dictionary; text is added to help the interpreter with the context.

"By associating a symbol to the placename, rather than an icon or index, a more in-depth interpretation is required."

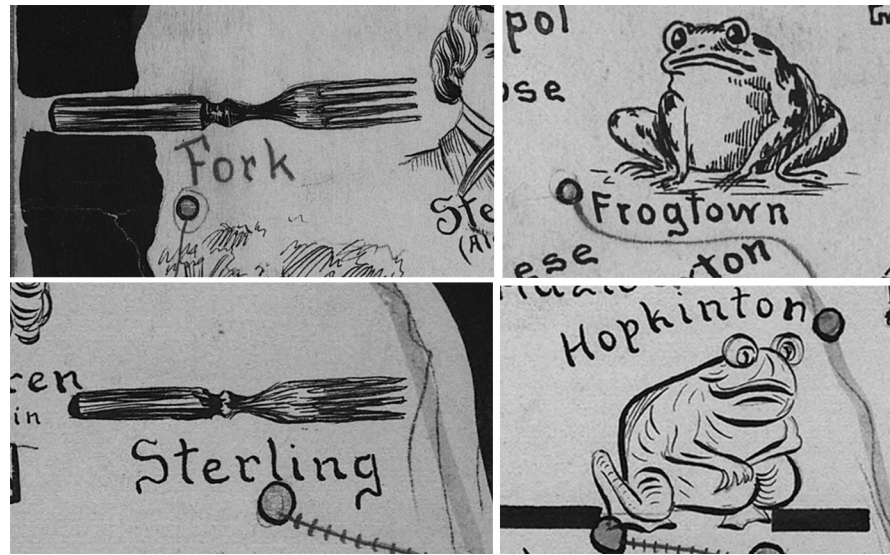


Figure 11

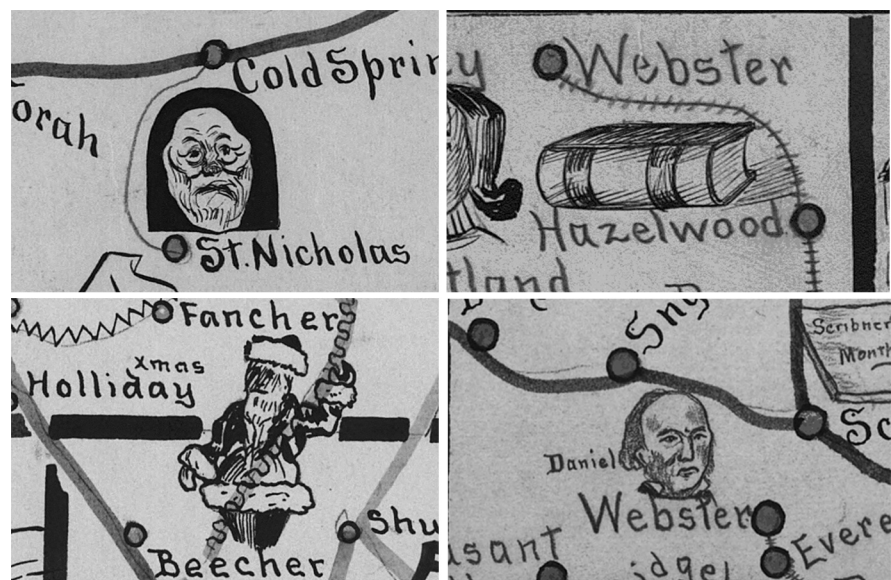


Figure 12

Pictorial Themes in Galbraith's Maps

The temporal, regional, and political culture can be revealed by analyzing different categories of pictorial themes inherent in the maps. The most striking theme Galbraith uses is the skull and cross bones to represent places named after saints (*Figure 13*). Commonly regarded today as a symbol of danger, the skull and cross bones is used conventionally as a warning on poison bottles and mining sites. However Galbraith's use of the skull and cross bones is indicative of a different convention not as widely familiar in modern culture. His use of the skeletal symbols exemplifies the veneration of relics within several religious faiths, notably that of Roman Catholicism.

In the early history of Christianity, the dualism of the body and soul



Figure 13

is the belief in that humans have two forms of life, one being of flesh and one guided by spirit (Obayashi, 1992, 110). People began to venerate their dead bodies, and so churches were built over saints' graves or their bodies (or parts of them) were buried under the altars. These relics serve as a symbolic memorial of the departed saint in mortal form. Galbraith's use of the skull is a representation of the mortality of human life and uses the skull and cross bones not only in symbolic contexts, but also as an icon as representations of Hell and a skeleton (Figure 14).

Galbraith's maps indicate a nationalistic political climate, which is apparent through the common use of the American flag as both symbol and icon. In figures 15, 16, and 17, the level and involvement of interpretation increases as the contextual convention inherent in the picture-word association increases. The symbolic representation of the Union expresses the inherent nationalism and obvious cultural attitudes regarding the Confederacy. The picture of the Confederate soldier "Marching through Georgia" may be considered a symbol of Atlanta but also makes an indexical reference to the South in general by "pointing to" Atlanta as the focal center of the South. Galbraith's use of the American flag signifies nationalism on several levels, and the text accompanying the pictures determines the depth of semiotic interpretation required.

Early caricatures in the United States stem from their use as political weapons and were widely disseminated as lithographic sheets and then in political newspapers and magazines (Bishop, 1892). Galbraith chose pictures of individuals who were highly recognizable either visually or conceptually. Galbraith's caricatures seldom reference local personas;

"Galbraith's maps indicate a nationalistic political climate, which is apparent through the common use of the American flag as both symbol and icon."

"Galbraith's caricatures seldom reference local personas; typically these caricatures are of a nationalistic, or political nature, or are persons that are recognizable with the Railway Mail Service organization."

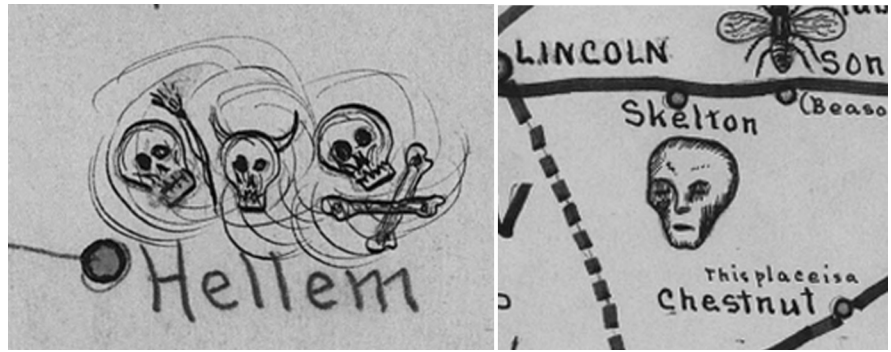


Figure 14

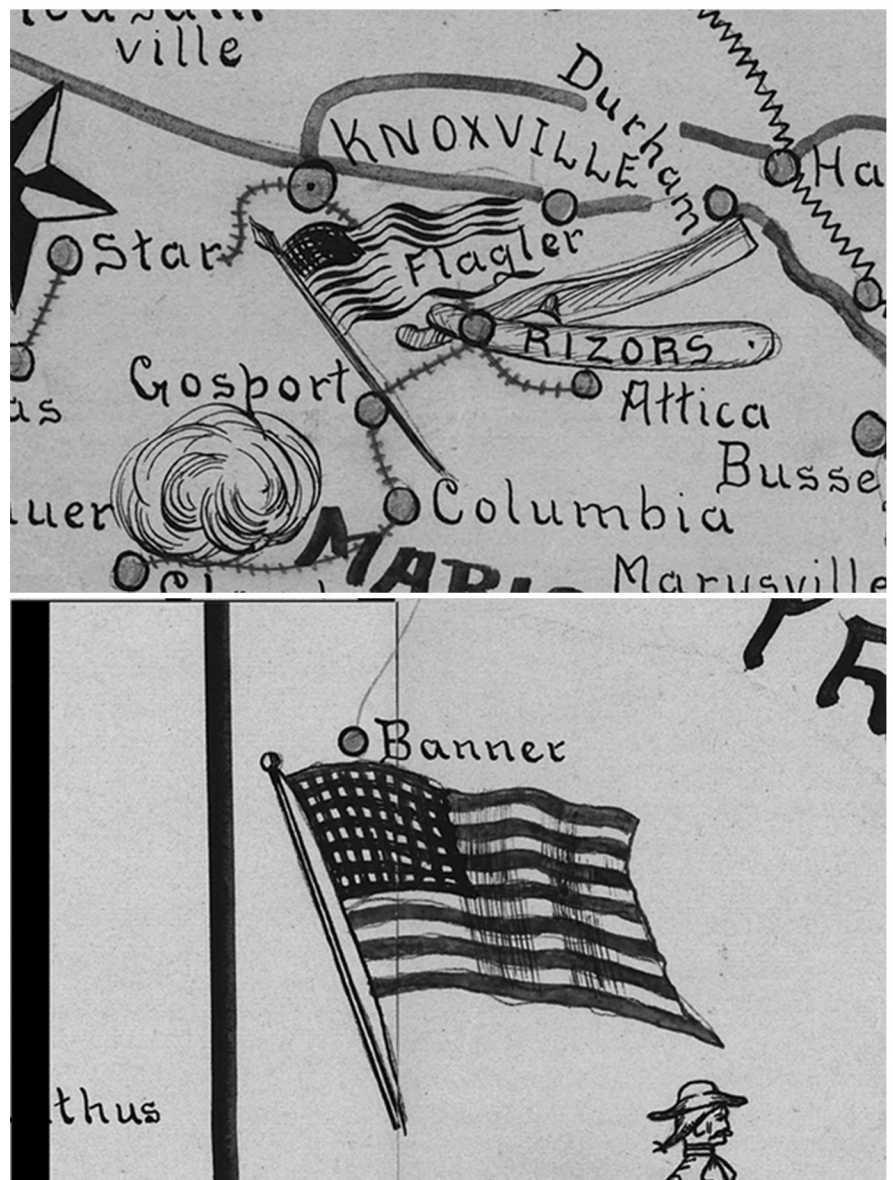


Figure 15

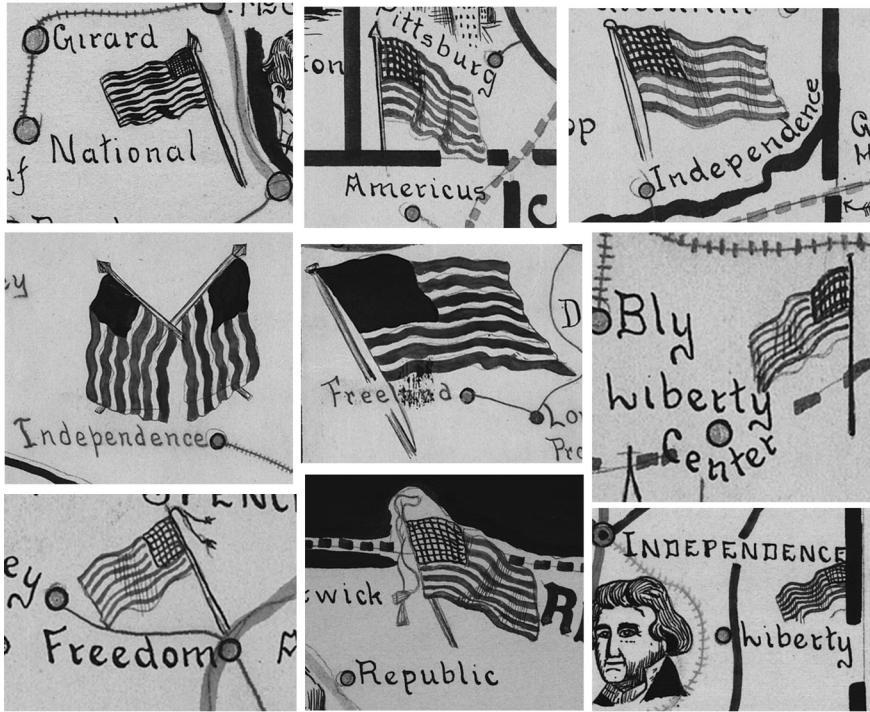


Figure 16

typically these caricatures are of a nationalistic, or political nature, or are persons that are recognizable within the Railway Mail Service organization. The caricature's qualities are based on exaggeration, so it seems quite appropriate that Galbraith would utilize these qualities to make an impression on the mind. For example, for the placename "Burr" Galbraith uses a picture of Aaron Burr and incorporates actual 'burrs' around his face (Figure 18).

Because many placenames originate from the names of national and political figureheads, Galbraith's drawings often represent the individuals in the context of their career, political contribution, or other association. One such example is that of British General Charles George Gordon, nicknamed 'Chinese Gordon,' for his invincible lead in suppressing the Taiping Rebellion in 1864, one of the worst civil wars in history. He was killed in a battle in Khartoum, Sudan in 1884 at which point his name was brought to the forefront of American and British foreign affairs, thus making him a hero, martyr, and global symbol of the Chinese (Figure 19).

That Galbraith uses images that are most familiar heightens the process of retaining the placename in memory and is a reflection of cultural values and racial attitudes in the maps. Racial and ethnic stereotypes, particularly of African-Americans, are disturbingly evident by the exaggeration of facial features, blackface portrayal, an association of African-Americans with 'porter,' 'Dixie,' Deep South, and African contexts (Figure 20). The selection of such images alone, over other possible associations, is an indication of the underlying notions of racial superiority among Whites, as these images were intended to be symbols of the place-names depicted.

Another theme present in the maps is Galbraith's frequent use of a beer stein. The beer stein is not only used as an icon (Figure 21) but it is also stereotypically used as a symbol of German heritage (Figure 22). Drinking beer, in particular, German beer, may have been a common practice indicative of the social culture among the railway mail clerks and is evidence of the presence of the German population so predominant in the Midwest at the end of the 19th century.

"Galbraith's drawings often represent the individuals in the context of their career, political contribution, or other association."

"That Galbraith uses images that are most familiar heightens the process of retaining the placename in memory and is a reflection of cultural values and racial attitudes in the maps."

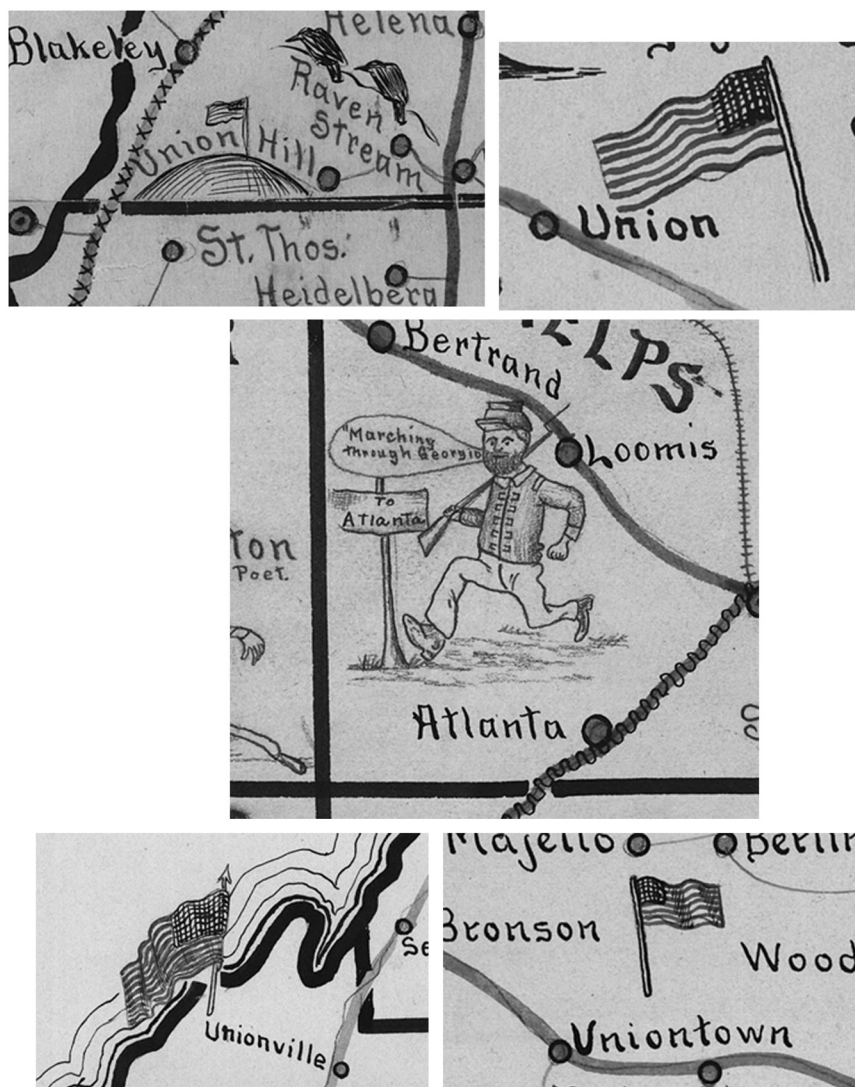


Figure 17



Figure 18

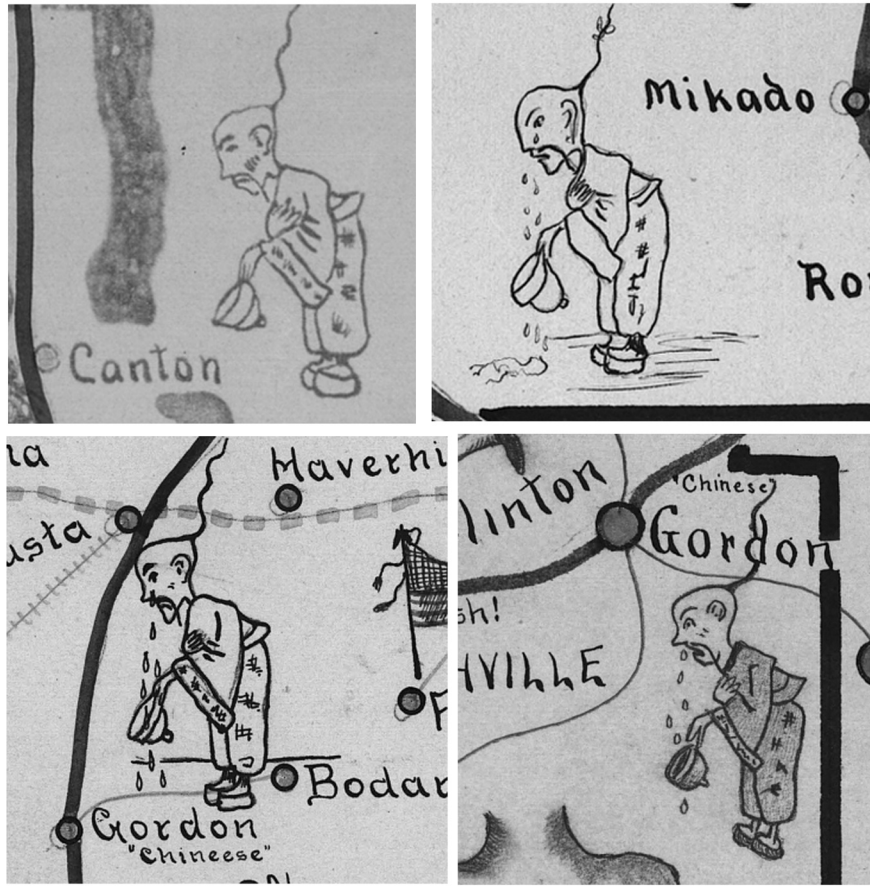


Figure 19

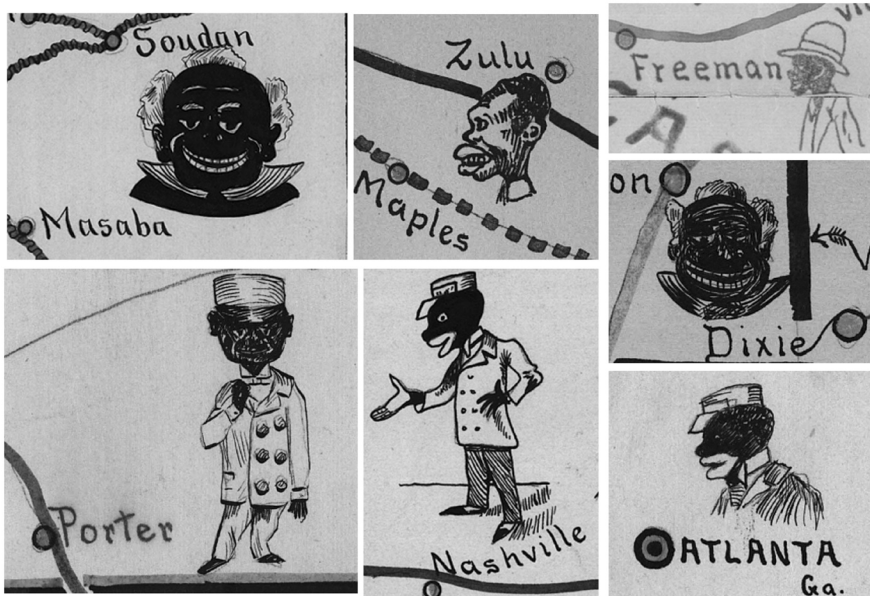


Figure 20



Figure 21

Map as Sign

"Developed locally, the maps are somewhat detached from the federal organizational culture in that their design is not confined to cartographic design standards set forth by the Post Office Department."

The ordinary map confuses and distracts the learner while "Gal's" map interests and guides the memory. It calls into play faculties of the mind which other maps do not. It creates interest in dry names to be memorized. The mind is disciplined and strengthened and the habit of connecting and developing new ideas from stale names is formed.

– McEwen Map Company, Chicago, 1897

In the above statement, the McEwen Map Company says the maps assist in "connecting and developing new ideas." Their main emphasis may have been not on the *new* ideas, but on the relationships of *existing* ideas. This existing knowledge is the main premise of Galbraith's creative maps. He carefully chose pictures that were most common and mainstream within the local culture at that time. Galbraith's maps are a sign because they represent a linking of individual interpretations and understanding and combine them into one contextually derived culture.

This derived culture is defined and mapped, however, at local rather than national scales. Developed locally, the maps are somewhat detached



Figure 22

from the federal organizational culture in that their design is not confined to cartographic design standards set forth by the Post Office Department. The maps were made by a railway mail clerk for a railway mail clerk, which separates the institutional nature of federally standardized maps from the artistic yet creatively functional purposes that make Galbraith's maps so culturally enriching.

Oftentimes maps may be developed to lay claim of authority by mapping the extent of one's power. This is not the motivation behind the development of Galbraith's maps. The motivation behind the maps' development is reactive to political influences but is not an indicator of active political motives. The political influences are revealed within cultural contexts of the pictures, not through the overriding motivations driving the creation of the maps. Had they been developed with such purposes in mind, the pictures represented would be stripped of the regional culture represented in the maps in order to appease a wider audience and their effectiveness would be compromised. While the maps may represent the extent of the area that the Railway Mail Service serves, its main purpose

"The motivation behind the maps' development is reactive to political influences but is not an indicator of active political motives."

"... it is the relationship among the organization, mapmaker and map user that determines the most effective level at which these associations may be

"[The maps] are symbolic in that they reflect and stand for an organizational need and symbolize the creative freedom needed for their creation."

is not to promote the extent as whole, rather, it is to focus on larger scale associations within local contexts. The purpose of the maps as a learning tool is defined more clearly as a representation of culture, rather than through political motivation.

While the depth of the relationship between picture and placename helps us understand how the maps can be made most useful, it is the relationship among the organization, mapmaker and map user that determines the most effective level at which these associations may be made. At the lowest level of involvement, Galbraith's maps represent an iconic view of a map no different than that of a conventional text based map. The maps simply spell out spatial relationships among mapped elements and are merely graphic representations of mapped features. They contain elements that are conventional in most route maps; they contain routes, place-names, legend, and cartouche.

At the next level, the maps are symbolic of the cultural and political actions and events from which, we can begin to tell the story behind the maps' creation. They are symbolic in that they reflect and stand for an organizational need and symbolize the creative freedom needed for their creation. These actions and events lead to a higher level of involvement where a map is transformed from events and actions toward meaning and ideas through cartographic process. They are indirect and direct representations of culture, intellectual process, and bring about new ideas and relationships between existing knowledge and mapped features.

How do Galbraith's maps assist the railway mail clerk in understanding the world spatially? The association of a picture with one's personal ideas appears to be rather one-dimensional. One place equals one picture. Although Galbraith's maps sometimes combine several place-names into one picture through text or exaggeration, his methods do not spell out spatial relationships any more differently than they would on a conventional text-based map. Through selection, simplification, and exaggeration of certain features the railway mail clerk can focus on the spatial relationships. Additionally, the nature of the railway mail clerk's job is spatially based. The two dimensional nature of a map develops when the clerk's concepts are linked with the visual associations laid out on the maps. The clerk sorts mail in-transit between two distribution points, so already he has an inherent propensity for understanding the spatial relationships between places which are external to the map itself.

An element of mapping that is inherent in these maps is the understanding of the physical world as it is mapped onto a more abstract ideology. The pictures are "mapped" or linked with an association or purpose having to do with the context of the picture. It is the linking of the two ideas that creates the map, just like two points on a conventional map create a link. Therefore, we might say that Galbraith's maps not only facilitate the spatial understanding along two dimensions but also combine temporal, cultural, and political linkages across a myriad of spectra.

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Participatory Mapping of Disabled Access

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In this paper, a rationale for a participatory approach to mapping is detailed, and its utility illustrated through the detailed reporting of a project concerned with mapping disabled access to the built environment. In this project, disabled people worked with university researchers at all phases of the research process, from formulation to data collection to end product, to create a detailed access map of their local town. The process of participatory research was found to be a rewarding and empowering experience for the disabled participants. Moreover the resulting map provides a significant resource for local disabled residents and has been important politically, being used to successfully lobby for changes to the local environment.

Introduction

To date, with a few exceptions (e.g., Fry 1988; Vujakovic and Matthews 1994; and some progressive planning and state offices¹), work relating to the production of maps for disabled people and disabled people's use of maps and mapping technology has almost exclusively concentrated on the design and development of tactile maps (Andrews 1988, Dodds 1989, Coulson 1991, Tatham 1991, Hinton 1993, Blades *et al.*, 1999; Ungar 2000) and other navigation and orientation media for people with visual impairments (Golledge *et al.*, 1991, 1989, Blenkham and Evans 1994, Fanstone 1995, Gill 1996, Petrie *et al.*, 1996, Jacobson and Kitchin 1997; Jacobson 1998). As a consequence, while significant advances have been made in the development of the theory and practice (if not widespread application) of creating maps for people with visual impairments, there has been relatively little consideration given to maps that would facilitate and improve the interaction with the built environment for other disabled people, particularly those with mobility impairments. And yet, such access maps have large, potential utility.

Despite some improvements in the design of built environments in most Western countries, many aspects of cityscapes remain inaccessible or difficult to navigate for people with mobility impairments – paths are too rough for wheelchairs, there are steps but no ramps, doorways are too narrow, there are few if any designated parking spaces, public toilets are inaccessible, public phones are too high or in inaccessible booths, street furniture creates obstacle courses (these problems are acute in countries with weak planning legislation e.g., Ireland, but also in historic cities where preservation orders block architectural changes; Imrie 1996, Kitchin 2000a; see Figure 2 for examples). When some of these access factors have been addressed, it has often led to the creation of specific arrangements. For example, poor access to a building might be resolved by the creation of a specific disabled entrance rather than a modification of existing facilities. So as Napolitano (1995) and Imrie (1996) document, disabled entrances are often at the sides or backs of buildings, rather than at the front, along with access for everyone else. In other words, disabled people often still live in what Golledge (1993) calls 'transformed environments'. As a consequence, disabled people often have to take circuitous routes between locations, and have to plan to use alternative facilities if those provided are inacces-

"... access maps have large, potential utility."

"... many aspects of cityscapes remain inaccessible or difficult to navigate for people with mobility impairments ..."

sible. For example, Kitchin and Law (2001) document how some disabled people structure their patterns of spatial behaviour around the location of accessible toilets. Such structuring is dependent on knowing where such toilets are actually located, and without detailed local knowledge this is often impossible, resulting in extremely restricted and routinised trips. An access map would be able to communicate such knowledge and also document the most accessible route between present location and the desired facility.

The project reported here aimed to examine the design and production of access maps for disabled people. However, rather than follow a conventional 'expert model' of cartographic enterprise, wherein the survey and mapping is undertaken by trained professionals, the project also aimed to explore the cartographic and political potential of adopting a participatory mapping approach. In doing so it aimed to explore and build on contemporary debates in disability studies about the nature of research concerning disability issues (see Barnes 1992; Barnes and Mercer 1997; Kitchin 2000b; Oliver 1992, 1999; Rioux and Bach 1994; Stone and Priestley 1996; Zarb 1992). In summary these authors argue, drawing in particular from feminist praxis, that the traditional division within research between expert and subject, researcher and researched, compounds the exclusion and marginalisation of disabled people in society, and assumes an expertise based on a perception of what it is like to be disabled. As a consequence, they argue that much disability research is not representative of disabled peoples' experiences and knowledges. Moreover, they contend that research concerning disability research is invariably researcher-orientated, based around the desires and agendas of (non-disabled) researchers rather than the subjects of the research (disabled people). Indeed, Oliver (1992) has gone so far as to argue that traditional research methodologies represent a 'rape model of research'. He argues that these research methodologies can be alienating, and disempowering to disabled people who take part in research. These participants place their knowledge into the hands of a researcher who then interprets and makes recommendations on the subjects' behalf. Oliver (1992) and others argue that the power-relations within the research process needs to be destabilized and the research agenda wrestled free from academic researchers so that it best serves the wishes of disabled people. As such, they call for the adoption of research strategies that are both emancipatory (seeking 'positive' societal change) and empowering (seeking 'positive' individual change through participation in the research process).

Such arguments about power in the research process and power conveyed in/through research outputs have also been voiced in the cartographic literature. For example, Harley's (1989) oft-cited critique reveals the fallacies of conceptualising and practising cartography as a scientific pursuit that is objective, rational, and value-free. Instead, Harley contends that mapping is a process of creating, rather than revealing, knowledge; creative decisions are made about what to include and what to exclude, how the map will look, and what the map is seeking to communicate (MacEachren 1995). As a consequence, maps are not objective, neutral artefacts but are imbued with the values and judgements of the individuals who construct them and pay for them (Harpold 1999). Maps are rhetorical devices; they are never merely descriptive, they are heuristic devices which seek to communicate particular, power-laden messages. Maps are thus situated, embodied and selective representations and while they might pertain to being objective, mimetic devices, they are ultimately constructed for particular purposes (Monmonier 1989) – they are (largely unacknowledged forms of) situated knowledges. Such a recognition of the

"... the traditional division within research between expert and subject, researcher and researched, compounds the exclusion and marginalisation of disabled people in society ..."

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"... maps are not objective, neutral artefacts but are imbued with the values and judgements of the individuals who construct them and pay for them ..."

"... the disabled people in the present project collectively owned, directed and controlled the study."

subjective and political nature of mapping acknowledges the legitimacy and power of maps not created by cartographic 'experts', and in the case below created by disabled people (see Vujakovic and Matthews 1994 for similar arguments).

As a consequence of these arguments, while an aim of the project reported here was to develop a standardised symbol set for the creation of access maps and to test their utility, it also sought to explore the political potential of the research approach to create empowering and emancipatory geographies. In this latter regard, the study sought to build on other participatory studies undertaken by geographers (e.g. Anderson and Kitchin 2000; Kitchin and Mulcahy 1999; Routledge 1996; also special issue of *Ethics, Place and Environment* 2000) and in particular the work of Vujakovic and Matthews (1994). In their project they sought to incorporate the values of wheelchair users into the production of access maps of Coventry (United Kingdom). Here, there was an attempt to find out from disabled people what access issues exist, how such issues affect cognitive map knowledge, what should be included on an access map, and the form that the access map should take. Wheelchair users, paired with students who had cartographic training, were used as consultants. While the work reported here is similar, there are a number of differences. For example, the disabled people in the present project collectively owned, directed and controlled the study. They were trained and involved as much as possible in the design, creation and dissemination of the work. Several other differences are that the project aimed to produce a much more detailed access map for dissemination, and that the project also included people with a wider range of sensory and physical impairments. In other words, the project extended the emancipatory and empowering qualities of the Vujakovic and Matthews (1994) study by adopting a more inclusive, participatory stance at all stages of the project.

The Project

"... access maps provide valuable resources that can significantly improve daily interactions of disabled people with their local environments."

In the Republic of Ireland the only pieces of legislation related to accessibility are the 1990 *Building Control Act*, and *Parts M of the Building Regulations 1991 and 1997*. This legislation is tokenistic, weak and very poorly enforced. This ineffectiveness has recently been acknowledged by the Irish government which has published a consultation document acknowledging the failure of the legislation and condemning those who have used the 'reasonable provision' clause to make provisions for minimum access (Department of Environment and Local Government, 1999). In short, the legislation has had a minimal effect on access for disabled people to the built environment, invoking slow and ad hoc change in the landscape. As such, the buildings and public spaces are largely inaccessible and difficult to navigate. The result is that the 12-15% of the Irish population that are disabled do not enjoy the same freedom to independently undertake daily activities, such as visiting the shops or going to the pub, that non-disabled people take for granted. In these circumstances, access maps provide valuable resources that can significantly improve daily interactions of disabled people with their local environments.

It is in this context that the participatory mapping project was initiated in collaboration with the Newbridge Access Group (NAG). Formed in 1997, NAG is a pan-disability organisation that has campaigned with some success for better access in Newbridge, County Kildare (population 13,363, OPCS 1996). In essence the aims of the project were (1) to undertake a detailed access audit of the town, (2) to produce an access map that residents and visitors could use to help effectively navigate and enjoy the

town, (3) to lobby local politicians for change, and (4) to create a knowledge and skills base so that the disabled participants could repeat the exercise with other access groups to set up their own mapping projects. The project consisted of eight phases, each aimed to adhere to the principles of inclusive participation: that the planning, execution, and control of the project was agreed collectively.

The *first phase* consisted of planning the remit and scope of the audit. Three meetings were held to identify the nature of the project, the project's aims, and the process that would be employed. Once an initial plan had been formulated, the *second phase* was initiated. Phase two consisted of the formation of a subcommittee of four to consider and plan the specific and structural details of the audit. Here, the initial task was to develop a symbol set that would be sufficient to represent all situations and impediments that a disabled person (with either a physical or sensory impairment) might encounter while moving through the environment (see Figure 1). The symbols chosen had to be easy to apply to base maps while in the field (at 1:1250 scale, the most detailed base maps available), had to be easy to recognize, had to represent all types of impediments, and had to be transferable so that groups in other towns could also use them. As a guide, the sub-committee considered symbols used on other projects (e.g. Fry 1988, Vujakovic and Matthews 1994, Stadt Innsbruck n.d.), subsequently adopted some symbols, modified others, and where necessary, designed

"... the initial task was to develop a symbol set that would be sufficient to represent all situations and impediments that a disabled person might encounter while moving through the environment."

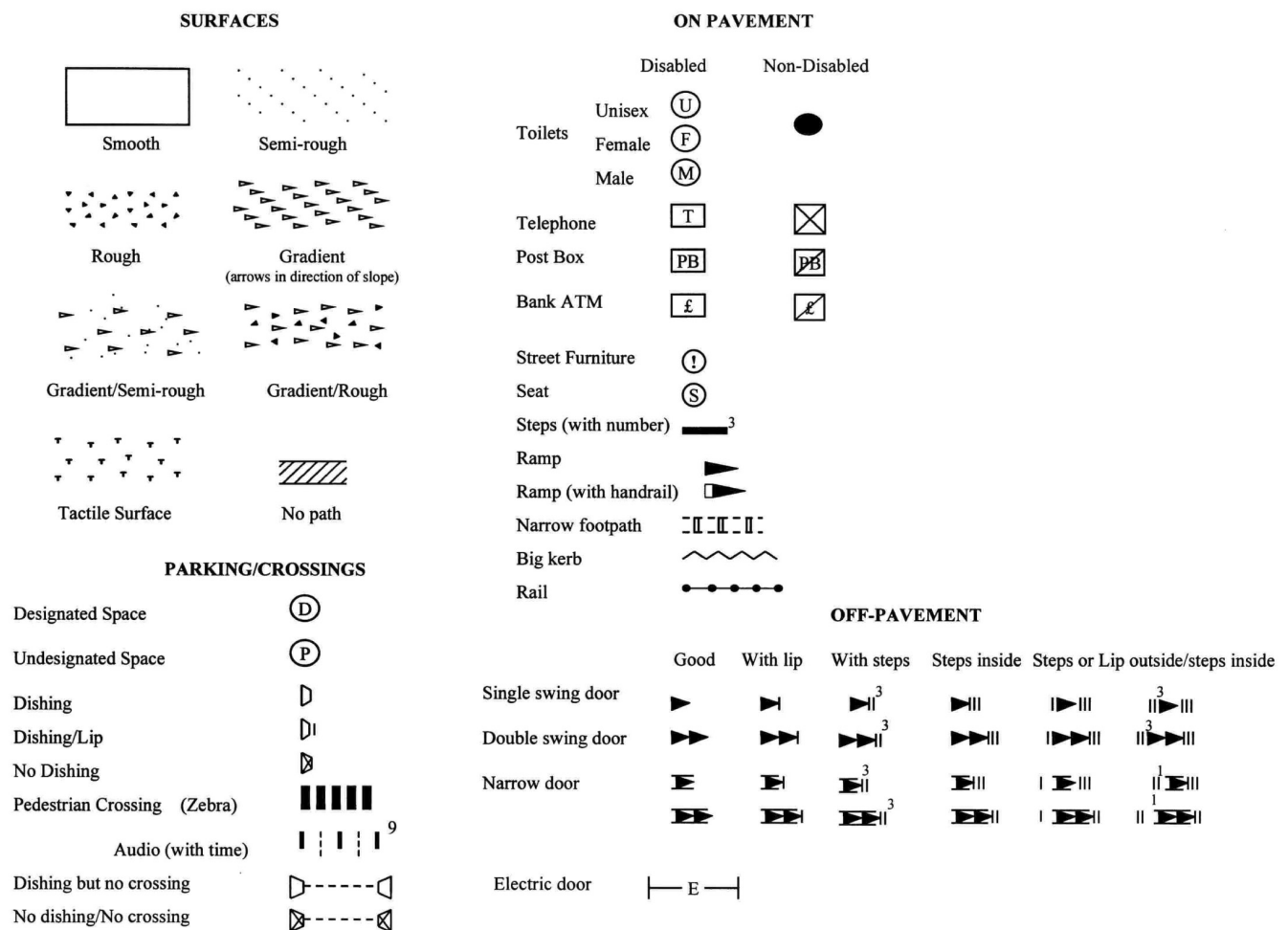


Figure 1. Symbols employed in Newbridge map

new symbols. Although the audit was to consider only the spaces between buildings and entries, a set of symbols for the inside of buildings was also developed. Next, it was decided which areas of the town would be surveyed, and possible strategies for dividing the work between the group's members. The last task in this phase was deciding the areas to be surveyed and mapped. The main shopping and civic areas were selected as study sites, and the region of study was divided into four, roughly equal sized survey areas.

The *third phase* entailed a pilot study to assess, using a small subsection of the town, the effectiveness of the symbol set. From this pilot study, several new symbols were added to the set in response to some unanticipated impediments in the environment, and some of the symbols were revised because they were too difficult to apply to the map in the field.

The *fourth phase* consisted of a training session to teach the members of NAG basic map reading, to illustrate how to recognize all environmental impediments, and how to apply symbols to the field map. This training session took place in the field so that members had guided experience in the environment, and so that they understood how to perform the necessary tasks. Members were instructed to follow the full survey procedure and place all relevant data – every doorway, every piece of street furniture, every public utility – onto the field map regardless of whether there were any access problems. This allowed a subsequent check for problems of cluttering, and to therefore determine how these problems might be addressed. The training session was followed by a de-briefing session during which participants discussed their field mapping experiences, and they provided suggestions for how the survey could be improved.

The actual survey itself was the *fifth phase*. In total, eight disabled people performed the field survey. Group members were divided into four pairs, each pair assigned to one of the study areas. Each pair were supplied with enlarged A3 maps (originally scaled at 1:1250 at A4) of their designated area, along with a tape measure for measuring the width of doors and heights of curbs, and a camera. The camera was used to document particular problems encountered (see Figure 2). Progress was relatively swift, with the designated areas mapped within a couple of hours. Afterwards a de-briefing session occurred to make sure the survey was complete, and to compare notes about how well the survey had gone, and to identify any problems encountered.

Using the data collected, the *sixth phase* of the study consisted of producing high quality access maps suitable for distribution. Because of its labour intensive nature, this was the only phase not undertaken in collaboration with NAG (although NAG was consulted throughout). The maps were produced in the geography department at the National University of Ireland, Maynooth. Rather than use a specialized GIS package to produce the maps, a technique was developed that could be used by someone with access to a basic PC, using widely distributed software. In the end, each survey base map was scanned, and the symbols were then placed on the map using Microsoft's Powerpoint. Due to the thoroughness of the survey, the final access map was highly detailed, with all doorways, utilities, street furniture, path/road surface condition included. A portion of the access map is shown in Figure 3. The full access map and photographs can be viewed at: <http://www.may.ie/staff/rkitchin/newbridge.htm>

The *seventh phase* first entailed group members checking their survey maps against the final access map, and then a field check of the access maps in the environment itself was conducted to eliminate as many mistakes as possible. To perform a consistent field check, one group member that was not involved in the initial data collection process resurveyed the

"From this pilot study, several new symbols were added to the set in response to some unanticipated impediments in the environment, and some of the symbols were revised because they were too difficult to apply to the map in the field."

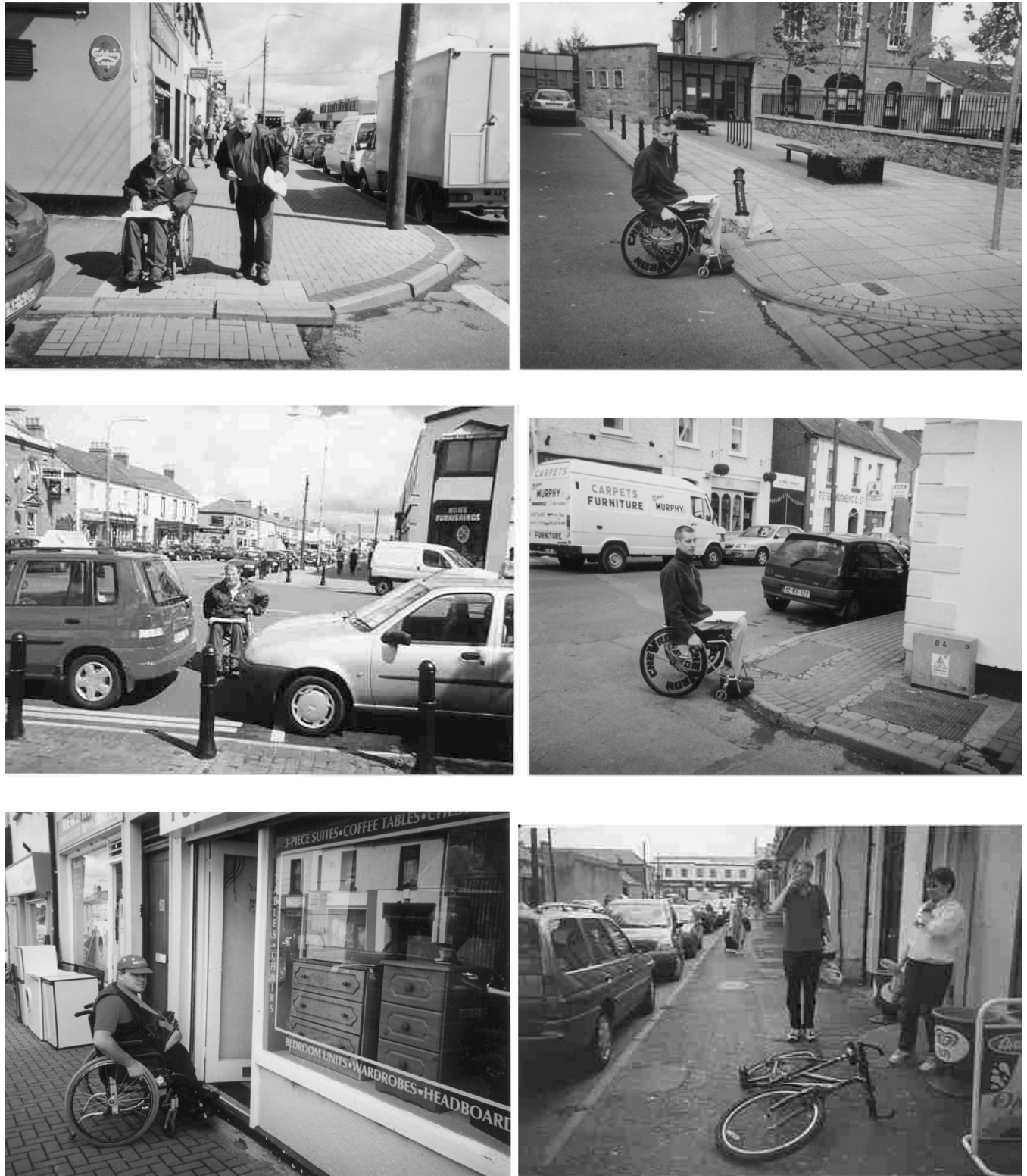


Figure 2. Undertaking the audit and some problems encountered

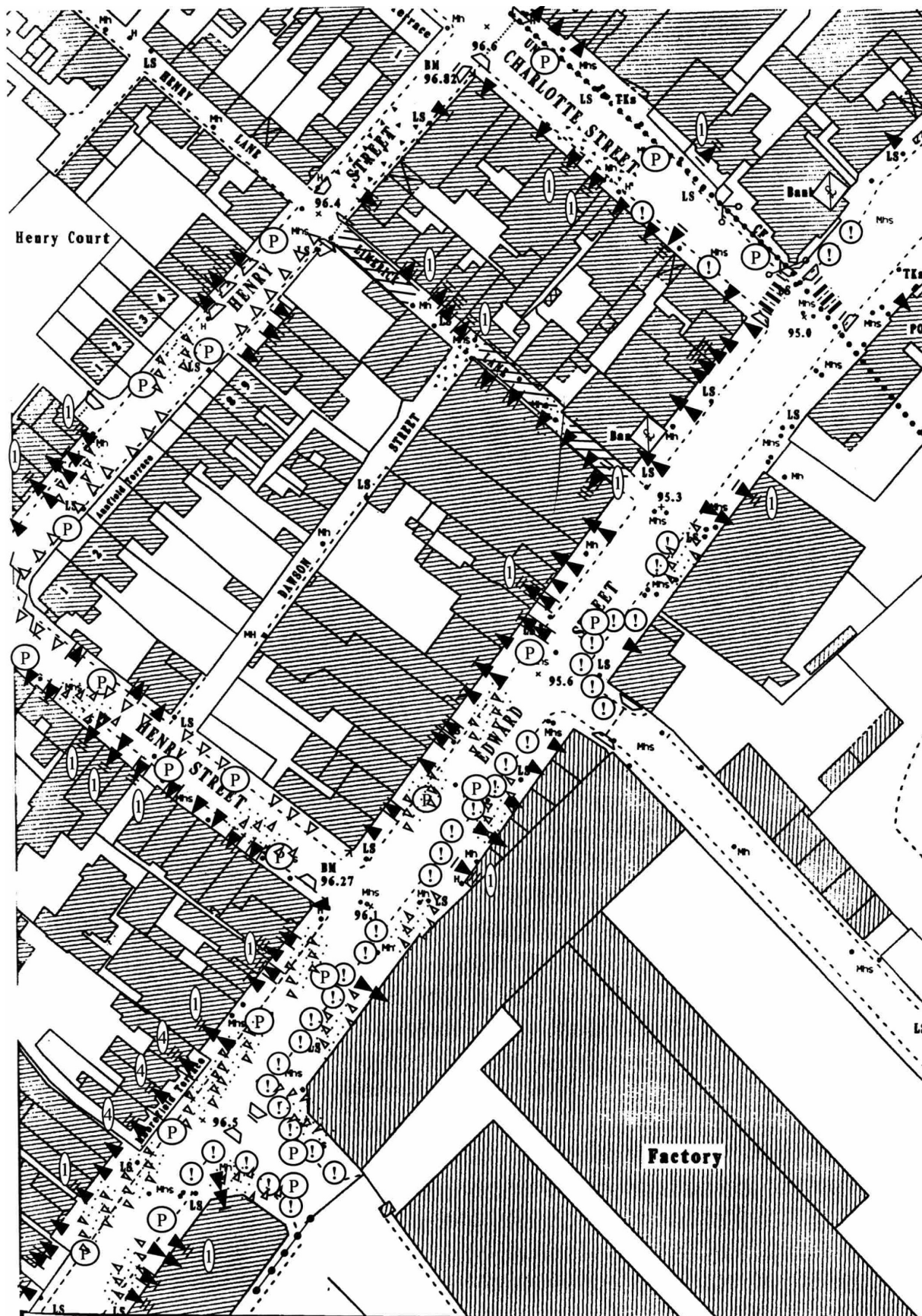


Figure 3. Part of the Newbridge access map

town using the final access map.

The eighth and final phase of the project was the publishing of the access map and its symbol set on the Internet via a series of Web pages. The Web page employs a simple user interface that allows the user to pan the access map. A series of hotspots embedded in the Web map enable the user to click on locations to see photographs illustrating the access problem at that location. In total, 25 photos were included on the web site and a sub-sample are shown in Figure 2. In addition, a large poster showing the entire map and a sample of the photographs was produced, and has been displayed at several locations around the town, and has been displayed at different community events.

In sum, the maps reveal that much of Newbridge is largely inaccessible to disabled people travelling independently. Scores of shops have entrances with steps or lips, and many premises are located upstairs. Disabled toilets are few and far between, facilities such as cash machines, post boxes and telephones are too high, and there are few designated parking places. Where there have been attempts to improve access by dishing the pavement, this has been done inadequately so that a lip remains. Indeed, the latest re-paving and make-over of the town has been very poorly executed, to the extent that features designed to aid access often fail in their aims.

Conclusions

The Newbridge participatory mapping project was considered a success by the participants in three main respects. First, the maps provide a detailed picture of access in the town and constitute a valuable resource for disabled residents and visitors. Second, the maps have been useful as a political device for seeking change. While development has been slow, new public buildings are now generally adhering to ideas of universal access, and the issue of disabled access is now recognised by many local politicians. Third, the project has revealed the potential of a participatory research approach as an empowering and emancipatory strategy. While time consuming (yet relatively in-expensive), it was felt that the additional benefits of collective ownership and training added significant value to the project, without undermining the quality of the finished product. Moreover, because the map is based on firsthand experience of disabled people living in the environment, it is more representative of what access issues actually exist.

Furthermore, the project illustrated the rhetorical nature of mapping and the situated, embodied and selective nature of maps themselves by revealing the role of power in the mapping process and how power is expressed through maps. The collective and participatory approach explicitly challenges accepted conventions about who can legitimately create maps, using what process, and for what audience. Further, it questions what messages are deemed to be important by State cartographers by illustrating the silence concerning disabled access communicated by conventional maps (and the power of that silence in reproducing inaccessible environments). Alternatively, the access maps created by NAG reveal a powerful message of exclusion by demonstrating the widespread inaccessibility of Newbridge's landscape. Such maps can be (and have been in NAG's case) used to lobby local politicians for planning reform because they provide tangible, 'scientific' proof of exclusions. Because of its empowering and emancipatory qualities, and the challenges it poses

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"... the maps have been useful as a political device for seeking change."

"The collective and participatory approach explicitly challenges accepted conventions about who can legitimately create maps, using what process, and for what audience."

NOTES for conventional cartography, participatory mapping is an approach that merits further investigation.

For example:

Stadt Innsbruck, n.d.;

Access Melbourne - <http://www.accessmelbourne.vic.gov.au/>

Geelong CBD mobility map - <http://www.bdrc.org.au/map.htm>

Deakin University Mobility Maps - http://www.deakin.edu.au/maps/disabled_access/

Disabled Access Map – Penrith - <http://www.penrithcity.nsw.gov.au/maps/mobility.htm>

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reviews

The Cambridge Star Atlas, Third Edition.

Wil Tirion. Cambridge University Press, Cambridge, 2001. 90 pages, numerous maps and diagrams. hardcover (ISBN 0-521 80084-6).

*Reviewed by Edith Punt
Cartographer, ESRI Press*

For anyone wishing to learn about the wonders of the night sky, this atlas will be an excellent guide. In a slim, hardbound volume, it covers inhabitants of the night sky from our nearby moon to familiar constellations to far-off galaxies. It makes astronomy accessible to those who are new to the subject, but is packed with an array of detailed star data for the seasoned stargazer.

The book is divided into four sections. The first covers the moon, particularly the part that we can see from the Earth. The craters and "seas" are identified and discussed, as are the mechanics of how the moon travels around the Earth and why we see only one side.

The second section begins with the apparent movement of the sky above our heads and how the path of the stars differs according to where we're standing on the Earth's surface. The bulk of this section is taken up by 24 sequential monthly star maps. The stars on the maps appear much as they do in the sky. Views of the northern and southern sky are shown on facing pages for each month. These maps are meant for the casual stargazer as a guide to the main constellations and a way of better understanding how the star pattern changes throughout the year.

The third section of the atlas

explains the different kinds of stars and the variety of non-stellar objects such as clusters and galaxies. In this section are twenty highly detailed star charts, overlapping maps that cover the entire sky. A variety of star types are classified and shown, along with clusters, nebulae, and galaxies. Accompanying each chart is a table detailing numerous attributes about the features depicted in the charts, such as magnitude, declination, and type. These charts and their accompanying tables have been recreated and updated for this third edition.

The atlas is completed with a set of six all-sky maps that show the general distributions of the objects outlined in detail in the star charts and the tables. These maps allow for easy comparison and an overall understanding of the types of objects that make up the night sky.

Tirion states in the preface that he created this atlas to serve a wide audience of astronomic observers, from those relatively new to stargazing to advanced observers using a telescope. He has also set out to provide maximum versatility such that this atlas can be used as a star and sky guide anywhere on Earth. By creating unique, thorough maps of the sky, Tirion has made stargazing both appealing and accessible to a large audience.

The subject matter is concerned with magnitudes, distances, temperature, and other dimensions far beyond the scope of normal Earthly experience. Understanding the physics involved in the apparent movement of the sky above the Earth can be confusing or even intimidating to a novice observer. One of the strengths of this atlas is that the user is led gradually into understanding the sky by beginning with a comprehensive look of the most familiar object, the moon, then expanding the focus to the stars and eventually to a variety of unfamiliar non-stellar objects, most of which can be seen only by

telescope. The array of information presented, from the diagrammatic explanations in the beginning of the atlas to the very detailed star charts in the third section of the book, ensures that any reader will find information in this atlas to supplement sky observations.

As in any good atlas, the maps take all the limelight, and the *Cambridge Star Atlas* is no exception. The star charts are clear, detailed, and include a wealth of information. The objects have been classified sensibly and effectively. Bright, fully saturated hues and simple shapes are used to distinguish the different types of celestial objects on the maps. The distinction between objects is especially important in maps that have few recognizable patterns, in comparison with standard Earthly maps, to aid the reader in spatial comprehension of a place. Particularly effective is the red ellipse symbol used for galaxies. They are drawn to scale where their size warrants and aligned to match their orientation when viewed from the Earth. The red color and organic shape distinguish them well from the smaller, less complex objects, such as clusters and nebulae.

The all-sky maps are plotted using galactic coordinates on Mollweide's Equal Area Projection. The first of the six maps plots the familiar constellations on this projection. Although they look a little distorted in shape from what we are used to seeing, they provide a helpful backdrop to the following five maps, plotted in faint blue. The equal-area property of this projection means that, although the shapes are somewhat distorted, the patterns of distribution and density of the stellar and non-stellar objects are valid, as each section of the sky is rendered without distortion in size.

The strength of this section of the atlas is that it gives the reader a simple, categorized overview of

what can be observed in the night sky. The symbology is repeated from the star charts, offering continuity and easy interpretation.

These six maps arrange and locate the objects in the context of our own Milky Way galaxy, which is a unique perspective from the celestial sphere basis of the star charts. This allows for a rudimentary understanding of how our galaxy is arranged and, in the case of the final map, how the density of the galaxy along its widest axis affects our view of other galaxies. They allow such an effective overview, in fact, that it might have been more appropriate to place this set of maps before the star charts to continue the sequence of increasing complexity that the sections of the book provide.

While this atlas succeeds in reaching a wide audience with informative maps, charts and tables, it is clear that it could benefit from the addition of a few key elements and some minor adjustments to the design. And although this atlas effectively introduces and encourages observation of the night sky in a way that is neither overwhelming or condescending, certain design flaws make it difficult for the casual stargazer to learn the parts of the night sky not apparent to the naked eye.

The very first page of the atlas, for instance, shows an extremely simplified diagrammatic explanation of the moon's phases and its path around the Earth. Since almost half a page is devoted to this diagram, and it is our first graphic view of the material, it falls a little short of expectation. More realistic symbols for the sun, moon, and Earth, and explanation of the necessary distortion in scale, would make the diagram immediately more inviting and informative. An oblique view of the orbit would give a clearer perspective to the moon phase phenomenon as well.

The diagrams presented as a primer on the apparent move-

ment of the celestial sphere around the Earth are clearly drawn, but lacking somewhat in explanation. Three views of the celestial sphere are drawn, showing the case of an observer located exactly at one of the Earth's poles, at the equator, and at an intermediate latitude. It is difficult to comprehend exactly where the Earth's surface fits in relation to the three celestial spheres, however.

While these diagrams occupy approximately half of a page, they do not take full advantage of the space. Much of the vital information is found in the caption accompanying the diagram, while there is ample space to annotate the diagrams themselves. These three spheres are rendered almost completely in black ink, missing an easy opportunity to simplify and classify the information with color. Although the book is printed throughout in four-color process, many parts of the atlas do not take advantage of the value of color as a design tool.

The monthly star maps use a deep violet-blue backdrop that blends to cyan near the periphery. Key elements on the maps are the stars and the constellation lines linking groups of stars. The stars are suitably rendered in white and the constellation lines in a light orange. A lighter, irregularly shaped cyan band runs through each map, showing the location of the Milky Way.

The complexity of rendering a thin line of a complex color on a background of a single, nearly full-value process color demands perfect color registration, which unfortunately was not achieved here. Furthermore, a slight vibration effect takes place when magenta ink is placed in such a vast field of cyan. While the effect of mimicking the deep violet of the night sky, with the white stars radiating from it, is effective and appealing, simple adjustments in the color choices would avoid many of

the registration problems.

Finally, the format of the book itself does not lend itself to the field reference that it was probably intended to be. It is a medium-format, hardcover, cloth-bound book, measuring approximately 9"x12". While it is fairly light, it is large enough to be cumbersome in the field while working with binoculars or a telescope. The pages do not lay flat at the bind, and the cover warps easily in humidity. The semi-gloss paper stock has the potential to cause a distracting glare if viewed with a headlamp. It would be nice to see this atlas reformatted to a durable soft-cover book, half its size, displaying each of the star charts at the same scale and size, but across a two page spread, followed by a two-page spread of the accompanying star table.

Regardless of these concerns, this atlas is an informative resource for anyone interested in taking a closer look at the objects in the night sky. With its detailed listing of all the primary stars visible from Earth, this volume is a valuable

The Map Library in the New Millennium

Edited by Robert B. Parry and Chris R. Perkins. London: Library Association Publishing, 2001. 267 pages. \$67.50, hardcover. (ISBN: 0-8389-3518-4).

Reviewed by
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The Map Library in the New Millennium is a collection of invited essays on the state of map librarianship during a time of turmoil: the present. The cause of the turmoil is the inclusion of digital spatial data into the midst of the traditional library environment aided and abetted by the availability of geographic data in digital form and the ubiquitous desktop computer with GIS software. This digital data, accompanied by the means to manipulate it, provides a vast array of possibilities and complications for librarians when added to their traditional duties that have revolved around caring for collections of paper maps and aerial photographs.

R.B. Parry, Senior Research Fellow and Map Curator, University of Reading (England) and C.R. Perkins, Senior Lecturer in Geography and Map Curator, University of Manchester (England), are the editors of this seventeen-chapter volume. Over the past decade they have collaborated on three other works of interest to map librarians and those undertaking research in the fields of geography and cartography: *World Mapping Today* (1987 and 2000), *Information Resources in Cartography* (1990), and *Mapping the U.K.* (1996). In this volume they have invited thirteen experienced cartographers, GIS specialists, and map librarians/curators to examine the role of the map library in

an environment that is becoming increasingly digital. The contributors, including Parry and Perkins, are from the United Kingdom (6), the Netherlands (1), New Zealand (1), Canada (1), and the United States (5) with seven of the authors associated with departments of geography or geomatics, six associated with libraries, one map publisher, and one map dealer.

The introductory chapter, by Parry and Perkins, is a review of the evolution of map librarianship and chapter 2, by Carol Marley (McGill University) is an introduction into basic map reference and how it is being changed by the inclusion of digital spatial data. Chapter 3 by Nick Millea (Oxford) discusses how external changes (e.g., legislation, government mapping production, technological advances) have impacted library administrations and their subordinate map libraries. Chapter 4, written by Patrick McGlamery (University of Connecticut) provides an overview of automation of general library functions as well as the impact of GIS on map libraries and in chapter 5, Jennifer Stone Muilenburg (University of Washington), introduces GIS and discusses the results of a survey on the use of advanced technologies in map libraries in the spring of 2000. Parry, in chapter 6, discusses cartographic packages on CD-ROM while Michael Peterson (University of Nebraska), chapter 7, and Menno-Jan Kraak (ITC), chapter 8, discuss the wide variation of maps available on the Internet and the World Wide Web. In chapter 9, Jan Smits (Koninklijke Bibliotheek) explains the importance of metadata and the various standards that are being used and developed around the world. Chris Baruth (University of Wisconsin) in chapter 10 examines how the new technology assists in protecting old maps while increasing their dissemination. In chapter 11, Perkins reviews spatial data, con-

sidering how access has changed over time, while Robert Barr (University of Manchester) considers intellectual property rights and their effects on document delivery in chapter 12. Pip Forer (University of Auckland) in chapter 13 compares the traditional mapping industry to the new digital one while examining the effects on map library practices. In chapter 15, David Fairbairn (University of Newcastle) considers the changes in the expectations of map users due to the availability of digital data and services. Moving out of academic circles, Alan Godfrey (Alan Godfrey Maps), in chapter 14, considers the benefits of traditional paper maps and charts as a publisher-historian and worries that map librarians may be moving toward a future that will change research opportunities, while Russell Guy (OMNI Resources) discusses how map dealers have changed their methods of map acquisition and face new marketing techniques and competition while pondering the possible future of the business of maps in chapter 16. The final chapter is a debate on the future of map libraries and map librarianship in academic institutions between Perkins and Parry. Nearly each chapter concludes with an extensive list of references, electronic as well as printed, and the book includes a three-page listing of acronyms and is indexed.

The goals of the authors of this volume were to provide a means for examining the current state of affairs within academic map libraries and open discussion as to their probable future configurations. While not intending to be the final word on what should be occurring in every instance, the contributors were asked to assess the current trends and their impacts on librarians/curators and users of spatial data. These goals have been met to the extent that the chapters have tried to touch on internal as well as external changes in administration,

acquisitions, cataloging, and reference duties while reviewing the arrival and increasing importance of digital spatial data in geographic research as well as the World Wide Web as a delivery method. It is a wide territory, covering, as it does, historical as well as current events in map librarianship.

The major change in map librarianship over the past twenty years has been the inclusion of GIS into the map library, which is an outgrowth of what might be called the digital revolution. Contributors Marley, McGlamery, and Stone-Muilenburg assume libraries should provide GIS services because of the increasing amounts of digital data being acquired by them. This is an understandable decision because there is little more frustrating to librarians than having physically inaccessible (digitally "locked" or "invisible") materials in a collection when there are patrons who want to make use of them but who lack the ability to do it themselves. While multiple authors supported the idea of GIS and digital spatial data having a natural home in the map library, the discussions varied as to what cartographic services might be provided under the umbrella term of GIS. Are map librarians limiting themselves to producing outline maps and simple distribution maps or are they trying to help users correlate and analyze data in order to produce the more sophisticated statistical maps? No author suggested that perhaps there were boundaries beyond which map librarians might be wise not to venture, although the Association of Research Libraries report (Soete, 1997) quoted by McGlamery (p. 51) noted that GIS technicians could provide cartographic support in map libraries in the future while librarians would fill managerial roles. Interestingly, while Marley (p. 23, 25) and Stone-Muilenburg (p. 67-68) peripherally mentioned the additional educa-

tional needs of map librarians in a GIS environment, and Perkins (p. 249) commented on some of the new skills required, there was no single author who focused on what might actually constitute an adequately trained map librarian in the Twenty-first Century.

Although Millea (p. 36-37) referred to the decision by some North American map libraries to add cartographic laboratory functions to their traditional responsibilities as radical, it does not seem radical enough to deal with the complexities and vast quantities of available spatial data, digital or not. Map libraries, by leaping on the digital bandwagon, are attempting to insure their continued existence by trying to control access to spatial data by providing GIS services. While it is the right of any institution to protect its future existence, it is unlikely that map libraries, or even most libraries, are funded well enough to provide cartographic laboratories sufficient in size to handle all the patrons who could potentially benefit from using digital spatial data in their research. If digital spatial data and GIS are to be provided across the board to all library users then funding those facilities (building space, hardware, software, and staffing costs) must be seen as the responsibility of the highest authority, the university administration. It is not that North American map librarians are so radical; it is that they have not yet noticed that their choices have changed their mindset and mission before a new institutional setting and funding have been established.

However, according to materials found on the World Wide Web, Harvard University has two projects/proposals under consideration that could be the beginnings of that new setting: the Harvard Geospatial Data "Laboratory" and a Virtual Data Center for quantitative social science data. The "Laboratory" suggests providing access to geospatial data

throughout Harvard's libraries and laboratories, not restricting access to it from the map collection alone. While providing GIS access is not specified, one of the tasks is:

"Install and maintain a web-based geo-spatial mapping service that allows visualization, exploratory analysis, subsetting and format conversion of digital geospatial data holdings."

The Virtual Data Center (VDC) for quantitative social science data is an expansion of the role that the Inter-university Consortium for Political and Social Research (ICPSR) has played for American universities for many years. This proposal discusses developing a software layer that would enhance user access and permit the linking of distributed data sets from many sites thus enlarging the database. Because this is virtual, those patrons requiring individual assistance would still need someone and/or someplace to go, but that someplace could be any location that the institution decided to establish, be it a library or a teaching laboratory. If the institutional will existed, a seamless facility, providing the archival and reference functions of a library and the teaching function of a teaching laboratory, could be designed to provide access to geospatial data no matter what the format.

The Map Library in the New Millennium is an excellent work on modern map librarianship that provides seventeen chapters guaranteed to educate and provoke the reader. The editors, R. B. Parry and C. R. Perkins, are to be commended on several accounts. They have chosen contributors who have provided informative and engaging essays on topics of interest to map librarians and have organized and edited the chapters so that the volume does not feel as if it has a multitude of authors. Almost as valuable as the text itself are the

references listed at the end of each chapter; they are a gold mine of international publications and Web resources.

This book is recommended to all map or geospatial librarians, whether or not they are located in academic collections. They have the hardest path in the future and it would serve them well to learn what has been tried and what is left to accomplish. A number of contributors made suggestions for further research, so a careful reading will provide practicing map librarians with suggestions for publications and presentations. While library administrators will find much of interest in these chapters, they may find that the chapters by Millea, Peterson, Kraak, Barr, Fairbairn, and the Perkins and Perry debate will cover topics of immediate interest to them. Geography and GIS faculty, as well as other non-librarians, should gain insight into what is at stake if map libraries should be allowed to decline or disappear instead of evolving into something else.

Only one addition and one correction are suggested. In the Introduction (p. 2), the date of the establishment of the Geography & Map Division, Special Libraries Association, was not stated. The Division was established in 1941. Also in the Introduction (p. 6), the North American Cartographic Information Society is given as the North American Cartographic Association.

Harvard Geospatial Data "Laboratory" http://www.provost.harvard.edu/harvard_mip/libor_sum.html

King, Gary, Principal Investigator (1988) *An operational Social Science Digital Data Library* <http://www.dli2.nsf.gov/projects/harvardproposal.html>

Parry, Robert B. and C.R. Perkins (1987) *World Mapping Today*, Butterworths.

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Perkins, C.R. and R.B. Parry (1990) *Information Resources in Cartography*, Bowker-Saur.

— (1996) *Mapping the U.K.: Maps and Spatial Data for the 21st Century*, Bowker-Saur.

Soete, G. (1997) *Issues and Innovations in Geographic Information Systems: Transformation Libraries*; 2, ARL Office of Leadership and Management Services.

Map Library Bulletin Board

The Ohio State University Libraries Map Room

The Map Room of the William Oxley Thompson Memorial (Main) Library at the Ohio State University houses a unique collection of cartographic materials on campus. There are approximately 80,000 maps in the collection. The Map Room also maintains a reference collection of over 3,000 atlases, gazetteers, journals, bibliographies and books on mapping and cartography. While the Map Room map collection may seem small for a large research library of Ohio State's size, it should be kept in mind that there is a second library collection of maps on campus — in the Geology Library. The Geology Library map collection houses a complete set of current USGS topographic maps at the 1:24,000 scale, as well as tens of thousands of geologic maps from mapping agencies all over the world.

The Map Room staff consists of one full-time librarian and one student assistant. The student works approximately 12 hours per week. The Map Room is open from 8 a.m. – 5 p.m., Monday through Friday.

The Map Room in the Main Library retains a complete set of the USGS 1:24,000-scale topographic sheets for the following states: Ohio, Indiana, Kentucky, Michigan, Pennsylvania, Tennessee, Virginia and West Virginia. The collection also includes a complete run of the 1:250,000- and 1:100,000-scale United States topographic and planimetric sheets.

Until recently the Map Room was a full map depository for the maps of the Canada National Topographic System distributed by the Canada Map Office. This collection includes basic scale maps (1:50,000) and the national series (1:250,000). The 1:50,000-scale series contains over 12,000 sheets, while the 1:250,000-scale series is made up of some 900 sheets. The library also receives the MCR sheets of the National Atlas of Canada Reference Map Series as part of this depository program. However, a few years ago the depository agreement was revised and the Canada Map Office suspended the free distribution of the 1:50,000-scale topographic maps to most American map libraries within the program, while continuing to ship the National Atlas of Canada Reference Map Series sheets. Fortunately, the production rate of the basic scale maps has slowed over the past couple of years. And since fewer sheets have been issued during this period, we have been able to purchase the new 1:50,000-scale maps of Canada as they have been released.

Another large and valuable collection in the Map Room is a series of nautical charts distributed by the Coast Survey of the National Ocean Service, a division of the National Oceanic and Atmospheric Administration (NOAA). These

unique — yet often underutilized — nautical resources contain a wealth of information about this nation's coastal waters and harbors. Issued in a variety of scales, these charts offer a unique portrait of the harbors, waterways and coastlines of the United States. The Map Room also maintains a large collection of unclassified charts of the world's harbors and coastlines, made available to libraries by the National Imagery and Mapping Agency (NIMA) of the Department of Defense. This extensive collection, also produced in a range of scales, is a unique resource providing important navigation data for most shorelines, coastal areas and harbors outside of the United States. On occasion the charts issued by NIMA turn out to be the most detailed cartographic resources available in the Map Room for less-traveled areas of the world. When answering a user's recent request for a map of a portion of the Galapagos Islands, it just so happened that a nautical chart from NIMA had the most detailed geographic coverage of the place in question — the island of Santa Maria.

The Map Room also has an extensive collection of dated but still very useful AMS (U. S. Army Map Service) sheet maps at various scales for cities, countries and regions from around the world, most of which were distributed to depository libraries after World War II and throughout the 1950s and 1960s and 1970s. While admittedly these are dated resources that do not reflect the many changes caused by development over the past 50 years, these maps still provide remarkably thorough and detailed coverage for many countries and areas of the world, and can often provide answers to geographic, historical, and locational questions, despite their obvious date limitations.

One category of materials that can serve to update the older AMS

maps is the Map Room's valuable collection of aeronautical or visual charts, provided by the National Imagery and Mapping Agency. These charts, updated and distributed irregularly by the Department of Defense, cover the globe at a variety of scales. They include Global Navigation and Planning Charts (GNC) 1:5,000,000; Jet Navigation Charts (JNC) 1:2,000,000; Operational Navigation Charts (ONC) 1:1,000,000; Tactical Pilotage Charts (TPC) 1:500,000 and Joint Operations Graphics-Air (JOG-A); 1:250,000. On a number of occasions these indispensable charts have proved to be the only available mapping source for remote areas of the world, and have provided answers to researchers questions that were not found in the Map Room's other cartographic resources.

The Map Room also has a substantial collection of city and regional maps, acquired through both purchases and donations. The majority of the collection is comprised of maps of cities and regions within the United States, but there are many maps of international cities in the collection as well. In addition, the Map Room has a strong collection of historic city plans, acquired from publishers such as Historic Urban Plans in Ithaca, New York.

Unfortunately only a small percentage — perhaps 15% — of the map collection is cataloged and accessible through the library's online catalog. However, until the early 1990s, none of the maps in the collection were cataloged. But for the past decade I have been continually striving to get more of the collection cataloged. Without a doubt, the use of the collection has increased as more maps appear in the library's online catalog.

I have added a few digital maps, atlases and spatial data to the collection, but for the most part at this time I am relying on the web to provide much of this

geospatial data. The Map Room Web site (<http://www.lib.ohio-state.edu/mapweb/>) contains a number of links to map sites and resources for geospatial data. For example, the Web site points users to Ohio data sets at OGRIP, the Ohio Geographically Referenced Information Program. From the OGRIP site the user can download the following spatial data sets for Ohio: Digital Line Graphs (DLGs), Digital Orthophoto Quarterquadangles (DOQQs), Digital Raster Graphics (DRGs), and Digital Elevation Models (DEMs).

The Map Room Web site also contains links to several sources of scanned maps, both historical and contemporary. A marvelous source for historic maps of North and South America is David Rumsey's Historical Map Collection site (<http://www.davidrumsey.com/>). In addition, the Map Room site includes a link to a little known source for the 15-minute quads of Ohio (<http://www.railsandtrails.com/usgs1900/oh/>). And for contemporary digitized maps, nothing beats the incomparable Map Collection site at the University of Texas (<http://www.lib.utexas.edu/maps/index.html>).

Historically the Map Room has not acquired aerial photography or satellite imagery. There is a small collection of satellite imagery (perhaps 80 poster-size images) that serves simply as a sampling of satellite imagery of areas from around the world. Recently, however, the Digital Media Center of OhioLINK (a statewide consortium of academic libraries) has provided Web access to Landsat 7 satellite imagery of Ohio to researchers and students at OhioLINK member libraries — including Ohio State. OhioLINK has purchased all Ohio-based data captured by Landsat 7 since the first data sets were available, and maintains a standing order for new data as it is captured. (OhioLINK only purchases scenes having less than 30%

cloud cover.) A new snapshot of the state is captured every 16 days. Nine Landsat 7 scenes comprise a complete 'snapshot' of Ohio, and each represents ground cover approximately 115 miles wide by 106 miles long.

For reasons unknown to the author, the Map Room was never blessed by owning copies of the Sanborn fire insurance maps for either Columbus or other cities in Ohio. (The Sanborn maps are large-scale maps from the mid-19th century to the 1970s, showing residential, commercial and industrial sections of thousands of cities and towns throughout the country. These detailed maps show the size, shape and construction of buildings, the names and widths of streets, property boundaries, building uses and block and house numbers. Today they are an invaluable historical resource depicting the structure and use of building in American cities over the past 100 years.) Ohio State's library did purchase the Sanborn maps on black & white microfilm several years ago, and these have until recently served as the only format available for our users. Recently, however, OhioLINK's Digital Media Center purchased the digitized version of the Sanborn maps of Ohio cities and made them available on the Web to students and faculty of member institutions. Although the digital versions of these maps were made from the microfilm copies and not from the original color maps, the online format offers our users a powerful, significant and easily accessible historic map resource.

While the Map Room has a relatively small map collection for an academic library the size of Ohio State's, it is rich with cartographic resources. There is a wealth of cartographic and geographic information located in the Map Room, and I am thrilled to be in a position to provide help in uncovering these valuable resources for the students,

faculty and staff of Ohio State.

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Digital Map and Geospatial Information Center Princeton University Library

The Digital Map and Geospatial Information service was formally started at Princeton University in August 1998. It is located in the Geosciences and Map library in Guyot Hall. I was hired to start this new library service. The main goal of launching this new library initiative was to manage, catalog, and make digital geospatial data accessible either online or offline. We also provide a full range of digital mapping and GIS services to our patrons, including reference, research consultation, and instruction to library users about how to search and use digital geospatial data that we have purchased or received free of charge through the Federal Depository Library Program (FDLP).

What digital data do we collect and what is our general policy of collecting digital data?

We are one of the regional Federal Depository Libraries and hence receive all digital data that are distributed to libraries through the FDLP program free of charge. In addition to receiving data through the FDLP, we actively collect local, regional, national and international digital data as

much as possible. The most crucial problem faced by librarians who collect digital geospatial data is how to develop their collection in conjunction with paper maps. At Princeton, I made the decision to collect all the possible "core or base GIS data" that includes government units, transportation networks, hydrography, elevation, and gazetteer data that are available on the market at the regional level, (digital geospatial data that were developed using map scale of 1:1,000,000 or 1:250,000) except satellite images and aerial photos. However, we buy satellite images and aerial photographs if a class is doing a project on a particular area of the world and requests such data. I also made another decision regarding buying digital map products, that is, if a published map is sold as a good scanned map, then I will buy the digital rather than the hard copy map. This is done to solve physical space limitation for storing hard copy maps and the flexibility provided by digital maps. Should a patron need a hard copy of a scanned map, we can print the map using our large format printer. Early on I decided not to buy atlases and digital maps that are bundled with software if that data cannot be viewed or analyzed independently of the bundled software. With the above policy in mind, Princeton University Library's Digital Map and Geospatial Information Center is developing a rich collection of digital map and geospatial data to address the ever-growing demand for geographic data.

At the international level, we have digital data that are digitized from maps with a scale of 1:1,000,000 or 1:250,000 or 1km resolution such as DCW, VMAP0, GTOPO30 and Global GIS Database: Asia, South Pacific, Africa, Central and South America, and Africa Data Sampler, as well as all the VMAP1 data that are available on the market.

At the national level, we have TIGER 2000 boundary layers, Hydrographic Survey Data, all the Q3 FEMA flood data that is available on the market, all the ProQuest Information and Learning Company's Digital Sanborn Map, 1867-1970 databases, and a good collection of DRG and DOQQs. I also downloaded the Environmental Protection Agency's (EPA) GIRAS Landuse/Landcover data for the Conterminous United States at a scale of 1:250,000 and made them accessible online through our server, located in the Digital Map and Geospatial Information Center. I did this because our users were having problems accessing landuse data through the EPA server a few years ago. Since our Center does not have all the states' various geospatial data, I made a web page that has a link to individual states' geospatial data centers (<http://www.princeton.edu/~geolib/gis/uniteds.html>). This provides a virtual access to most of the states' geospatial data. In the future, we plan to scan all USGS 24k topographic maps, if possible, at a better resolution than USGS DRGs to preserve maps and reduce drawer space. We are definitely going to scan all the superseded USGS 24K topographic maps before weeding them out from our paper map collection. This will allow us to keep all the 24K topographic maps that are superseded and weeded out of our paper Map Collection in a digital format. These scanned maps will later be made accessible online to our patrons, if possible, in a georeferenced form.

At our state and local level, we have all digital data created in the 1990s by the New Jersey Department of Environmental Protection's (NJDEP) Geographic Information System (GIS). I have converted New Jersey DEM data from SDTS format into USGS DEM format and made them accessible through our server. I have taken the initiative in archiving old New

Jersey topographic maps and aerial photographs in digital format. Recently Princeton, Rutgers, and the New Jersey Department of Environment Protection started a pilot project to scan and georeference historical New Jersey Geological Survey Atlas Sheets published between 1884 and 1894 and aerial photographs of New Jersey's Mercer County taken in 1951 (Princeton is located in Mercer County). Once this project is done, we plan to ask for funding to do 1930s aerial photographs of all of New Jersey. I am also actively collecting digital map or geospatial data of major cities in the United States and in the world.

GIS and digital mapping facilities at our Center:

Seven workstations with CD rewriter and 21 inch monitors equipped with full range of GIS, remote sensing, and graphic software packages. Large format color printer (HP DesignJet 1055CM printer). Large format color scanner (40" IDEAL/Contex Chroma TX plus). Small color printer (HP DeskJet 990cse) Small color scanner (HP) Digitizing table Light Table Campus-wide license of ESRI software Leica Geosystems's ERDAS IMAGINE MapInfo software in our Center Graphic software packages such as Photoshop, Illustrator, CorelDRAW etc.

Services:

Princeton University Library expects each and every librarian to provide personal service to our patrons. I make sure that each patron who comes to our Center is satisfied with our service. To ensure this, we provide a full range of

digital map and GIS services such as GIS reference, consultation and analysis, workshops, and cartographic design help. I might spend a few minutes or a few hours to help an individual patron. Since we provide a wide range of digital map and GIS services, our Center is widely used. Patrons come to our Center to get help with searching data, understanding data, merging data, analyzing data, converting data, creating maps from analyzed data, etc. In addition, I provide help through emails and phone calls. Our Center is used by various disciplines, because I have made sure from the very beginning that I advertise our services to all departments that deal with location-based information. Besides providing the above services, we also offer regular GIS workshops to educate our patrons about our GIS data collections, services and facilities, and provide specific GIS demonstrations to individual classes. We provide the service of printing academic related material on our large format printer with a nominal fee. We charge a flat rate of \$2.00 for printing a poster or map on plain paper of 11x17 inches to 17x22 inches, and \$5.00 for 22x34 inches to 34x44 inches. If a person prints larger than 34x44 inches, we add \$2.00 provided the paper is not double the size of 22x34 inches. If the paper size is double the 22x34 inches, then we charge \$10.00. The fees are based on research I did to recover paper and ink cost. Data were collected from the HP web page.

How our collection is cataloged:

Our data are cataloged in two ways. Digital data that we received through the FDLIP and purchased by us are cataloged using MARC and made searchable through our library main catalog. However, data that are generated within our Center or came with software or are acquired by me from fed-

eral, state, and local agencies are cataloged according to the FGDC metadata standard and stored in our Center's server. Since we are one of the nodes in the Federal Geographic Data Committee Clearinghouse, a patron can search that part of the data through the FGDC Clearinghouse.

Our Center is open Monday through Friday from 8:45am to 5:00pm. We are closed on Saturday and Sunday. For information visit our web site <http://www.princeton.edu/~geolib/gis/>

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**Map and Geographic Information
Center
Centennial Science and
Engineering Library
University of New Mexico**

The Map and Geographic Information Center, more fondly known as The Map Room, is the largest map repository in the state of New Mexico. It serves the needs of the students, faculty and staff of the University of New Mexico, as well as the citizens of Albuquerque and beyond.

We are part of the regional depository program, receiving maps from the usual cartographic sources: USGS, BLM, CIA, Forest Service, NOAA and NIMA, and the Army Corps of Engineers. We have a small budget to purchase privately published maps and atlases, often supplemented by allocated funds from the general library budget for special projects. Most recently such funding was used to augment our holdings of

topographic maps of various Central and South American countries.

Our collection is worldwide in scope, with an emphasis on New Mexico, the Southwestern United States, Mexico, and the aforementioned Central and South America. We currently have about 200,000 sheet maps, and more than 1,000 atlases and other cartographic related books. We actively collect aerial photography of Albuquerque and have a less extensive collection of air photos for other places in New Mexico. Because of these limitations in aerial photography outside of the city, we work in close collaboration with the Earth Data Analysis Center, a service organization of the University of New Mexico that provides geospatial technologies.

Areas of special interest include: the Sanborn Fire Insurance Maps in three formats (the original maps, microfiche, and online); numerous historical maps of New Mexico, the Southwest and beyond; and a popular collection of NM road maps, ranging from 1908 (still territorial days for us) to the present. Globes attract a lot of attention, especially our moon globe, celestial globes, Braille globe, a 30" high Dymaxion globe, and our most recent addition for kids of all ages, a talking, interactive game globe.

Most of our collection is uncataloged, although we are slowly making headway in getting records for maps into our OPAC. We have for some years now been able to attach item records to GPO Marcive records, and to records cataloged by our sister institution, the New Mexico Institute of Mining and Technology in Socorro, New Mexico. Now, finally, within the last six months, maps are being cataloged here at UNM, some by map room staff (the less labor-intensive DLC items) and the rest by one of the cataloging staff.

Like most map libraries we are trying to juggle the traditional cartographic formats with the

newer electronic formats. Digital topographic maps, both USGS DRGs and commercial products, are in demand as well as climate data and city street level data with route mapping and other custom mapping features.

Most of our electronic data can be used in a GIS. Programs in geography, earth and planetary sciences, and biology, to name a few, rely on a GIS-based approach to correlate data in ways that were difficult until recently. We have a growing collection of city- and state-level data available in-house, as well as access to a veritable explosion of data available on-line.

Many of our paper maps circulate for a one-week period and can be renewed for one additional week. However, copying maps is a more popular option for our customers. We provide a range of options for them to choose from:

8½" x 11" black and white copies
36" wide black and white copies
12" by 17" scanner
up to 13" by 19" color printouts

Costs for these printouts range from \$.75/ft² to \$3.00/copy. Most of our scanner clientele bring in their own zip disks or compact disks and we save scans free of charge.

The Map Room is staffed by one full time librarian, one part-time GIS specialist, and three wonderful, indispensable work study/student assistant staff. We are housed in Centennial Science & Engineering Library, a branch of the UNM General Library system.

Our hours are usually 10a.m.-6p.m. Monday through Thursday, 10a.m.-5p.m. Friday, and 11a.m.-5p.m. Saturday during regular semester sessions. Shorter hours are necessary during intersessions and the summer and occasionally we are closed when illness or other

obligations prevent staff from being present. If any readers of Cartographic Perspectives are ever in the Albuquerque area, please drop by and visit. Our web page can be found at <http://eLibrary.unm.edu/maproom> and a map of the UNM campus at <http://www.unm.edu/campusmap.html>.

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