beginning we have insisted that the interest embodied in maps was neither simple nor singular.

Yet despite this polyphony, the chord that is sounded is that of a . . . *disinterested science.*[64] In its rhetorically orchestrated denial of rhetoric (the austere white margins, the tastefully subdued colors) the map seems to represent only this. Powerful Western interests, capitalism, the troubled sleep of the iron-ore poor . . . *have disappeared.* The rigorous dispassion of the survey sheet is seductive precisely in the degree to which no sign of seduction is apparent: the message of Nature Subdued (howsoever liberally the wealth is distributed)—or . . . *untouched*—is the more powerful because it seems to be spoken not by the *map* (*it* appears to say nothing, appears to *allow* the world to speak), but by Nature itself.

Wood, Denis. The Power of Maps (Guilford 1992)

CHAPTER FIVE

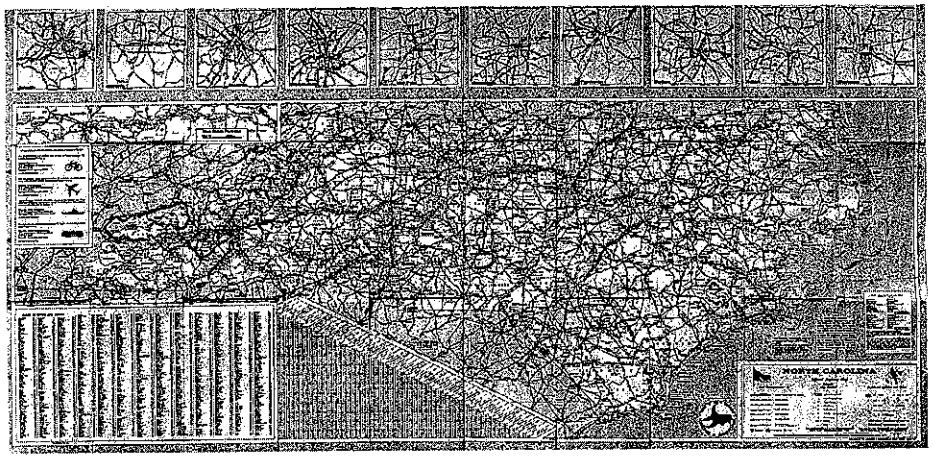
The Interest Is Embodied in the Map in Signs and Myths

We see that this is what maps do: they mask the interests that bring them into being; this to make it the easier to accept what they say as . . . *unsaid* . . . as . . . *in the air.* This is what they do. How is it that they manage to pull this off?

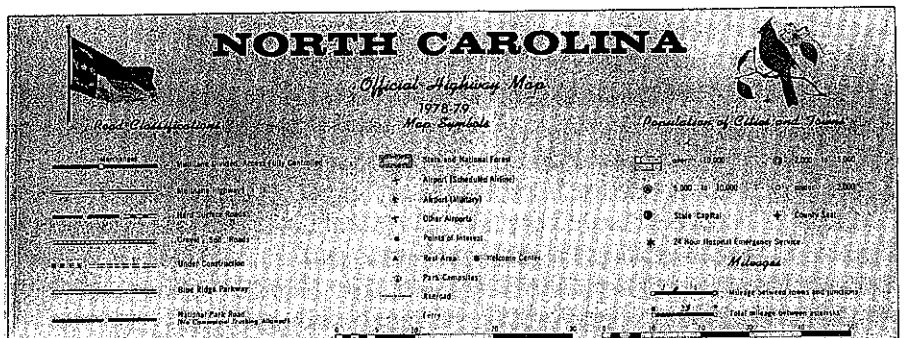
Spread out on the table before us is the *Official State Highway Map of North Carolina.* It happens to be the 1978–1979 edition—not for any special reason: it just came to hand when we were casting about for an example. If you don't know this map, you can well enough imagine it, a sheet of paper—nearly 2 by 4 feet—capable of being folded into a handy pocket or glove compartment sized 4 by 7 inches. One side is taken up by an inventory of North Carolina points of interest—illustrated with photos of, among other things, a scimitar horned oryx (resident in the state zoo), a Cherokee woman making beaded jewelry, a ski lift, a sand dune (but no cities)—a ferry schedule, a message of welcome from the governor, and a motorist's prayer ("Our heavenly Father, we ask this day a particular blessing as we take the wheel of our car. . ."). On the other side, North Carolina—hemmed in by the margins of pale yellow South Carolinas and Virginias, Georgias and Tennessees, and washed by a pale blue Atlantic—is represented as a meshwork of red, black, blue, green and yellow lines on a white background, thickened at the intersections by roundels of black or blotches of pink. There is about it something of veins and arteries seen through translucent skin, and if you stare at it long enough, you can even convince yourself that blood is actually pulsing though them. Constellated about this image are, *inter alia,* larger scale representations of 10 urban places and the Blue Ridge Parkway, an index of cities and towns, a highly selective mileage chart, a few safety tips and . . . yes, a legend.

Legends

It doesn't say so, of course, but it is one all the same. What it says is: "North Carolina Official Highway Map / 1978–1979." To the left of this title is a sketch of the fluttering state flag. To the right is a sketch of a cardinal (state bird) on a branch of flowering dogwood (state flower) surmounting a buzzing honey bee arrested in midflight (state insect).



The "1978–79 North Carolina Transportation Map & Guide To Points of Interest." Unfortunately the distinctions among the pale blue, yellow, pink and white are lost in the reproduction. (North Carolina Department of Transportation)



The legend block from "1978–79 North Carolina Transportation Map & Guide To Points of Interest." Again, it's too bad you can't appreciate the color. (North Carolina Department of Transportation)

Below these, four headings in red—"Road Classifications," "Map Symbols," "Populations of Cities and Towns" and "Mileages"—organize collections of marks and their verbal equivalents (thus, a red dot is followed by the words "Welcome Center"). We will return to these in a moment, but for the sake of completeness, it should be noted that below these one finds graphic and verbal scales (in miles *and* kilometers), as well as the pendent sentence, "North Carolina's highway system is the Nation's largest State-maintained Network. Hard surfaced roads lead to virtually every scenic and vacation spot."[1]

Clearly this legend—to say nothing of the rest of the map—carries a heavy burden, one that reflects aggressively the uses to which this map was put. The plural is stressed because it is a fact not so much *overlooked* (cartographers are not *that* naive), as ignored, denied, suppressed. For certainly in this case, the first and primary "user" was the State of North Carolina, which *used* the map as a promotional device (in *this* context "used" comes naturally), as an advertisement more likely than most to be closely looked at, even carefully preserved (because of its other uses), and so one given away at Welcome Centers just inside the state's borders, at Visitor Centers elsewhere, from booths at the State Fair, and in response to requests from potential tourists, immigrants and industrial location specialists. This is all perfectly obvious in "The Guide to Points of Interest" and the selection of photographs that decorate it (unless that's backwards, and the "Guide" is first of all a way of justifying the photographs, much like text in the *National Geographic Magazine*) . . . but it is no less evident in the legend itself.

Nor is it just a matter of the unavoidable presence of the state flag, flower, bird and insect—though here they are in children's encyclopedia colors—but primarily of what *else* the map's makers have chosen for the legend and the ways they have chosen to organize it (for more than one principle of order operates under even seemingly straight forward subheadings such as "Populations of Cities and Towns"). It is conventional to pretend, as Robinson *et al.* have put it, that "legends or keys are naturally indispensable to most maps, since they provide the explanations of the various symbols used,"[2] but that this is largely untrue hardly needs belaboring. Legends flare into cartographic consciousness not much earlier than thematic maps, are nonetheless still dispensed with more often than not, and never provide explanations of more than a portion of the "symbols" found on the maps to which they refer. The fact that they do not accompany topographic survey sheets (and the fact that the available legend is incomplete), or the plates of a *Rand McNally International Atlas*, makes this perfectly clear. That legends do exist for these maps—*some*place in the book, or by special order—only serves to underscore, through their entirely separate, off-somewhere-else character, exactly how dispensable they really are.

Nor is this dispensability a result of the "self-explanatory" quality of the map symbols, for, though Robinson *et al.* might insist that, "no symbol that is not self-explanatory should be used on a map unless it is explained in a legend,"[3] the fact is that NO symbol *explains* itself, stands up and says, "Hi, I'm a lock," or "We're marsh," anymore than the *words* of an essay bother to explain *themselves* to the reader. Most readers make it through most essays (and maps) because as they grew up through their common culture (and *into* their common culture), they learned the significance of most of the words (and map symbols). Those they don't recognize they puzzle out through context, or simply skip, or ask somebody to explain. A few texts come with glossaries, though like map legends these are rarely consulted and readily dispensed with. But this familiarity with signs *on the part of the reader* never becomes a property of the mark; even the most obvious, transparent sign remains opaque to those unfamiliar with the code.

It is not, then, that maps don't need to be *de*coded; but that they are by and large *en*coded in signs as readily interpreted by most map readers as the simple prose into which the marks are translated on the legends themselves. For at best legends less "explain" the marks than "put them into words," so that, should the *words* mean nothing, the legend is rendered less helpful than the map image itself where the signs at least have a context and the chance to spread themselves a little (as anyone who has "read" a map in a foreign language can attest). One way to appreciate this while approaching an understanding of the role legends actually play is to take a look at those signs on maps that don't make it onto the legend, of, for instance, this *North Carolina Official Highway Map*. Concentrating for the moment on the map image of the state proper, ignoring, that is, the little maps of the state's larger cities, the inset of the Blue Ridge Parkway, the mileage chart (the instructions for which do happen to be pasted over the map image proper, though over South Carolina, just below Kershaw), the guide to other transportation information sources, the borders and rules, and the letters, numbers and other marks that facilitate the operations of the index of cities and towns—though to pretend that any of this is half as self-evident as the signs of the map image is to miss how laboriously we have learned to interpret the architecture of this picture plane, how much we have come to take for granted—still, ignoring all this, and all the words, and somehow managing to overlook that logo of the North Carolina Department of Transportation floating on the Atlantic some twenty miles due east of Cape Fear, it is nevertheless the case that 18 signs deployed on the map image *do not appear on the legend*. That's half as many as do.

Why don't they? It's not, certainly, because they're self-explanatory. No matter how many readers are convinced that blue

naturally and unambiguously asserts the presence of water, or that little pictograms of lighthouses and mountains explain themselves, signs are *not* signs for, dissolve into marks for, those who don't know the code. *Look* at these: where, in the eyes and eyebrows of Mt. Sterling, can anyone see the mountain; or, in the pair of upended nail pullers, the lighthouse at Cape Fear? Nor is there anything more "self-evident" about the use of blue for water. Not only historically has water been rendered in red, black, white, brown, pink and green,[4] but it disports in other colors on the obverse of this very map: in silver and white on the "cover" photo of Atlantic surf; in tawny–pewter in the photograph of fishing boats at anchor; in warm silver–gray in a shot of the moonlit ocean off Wrightsville Beach; and in yellow–green in the photograph of the stream below Looking Glass Falls. Only in the falls, where it indicates shadows, is there blue in any of these waters. This lack of any sort of "necessary" or "natural" coupling between blue and water proves fortuitous, for the color used to represent water on the map *image* does double-duty as background for the sheet as a *whole*, and surely we were never intended to read the circumjacent margin for a circumfluent ocean. There's no way around it: each of these *signs* is a perfectly conventional way of saying what is said ("lighthouse," "mountain," "water") —which is why the map *seems* so transparent, so easy to read. But *were* the function of the legend to explain such conventions (or at least translate them into words), then these too would belong on it, as surely as those that are there.

And if these belong there, so do the yellow tint used for "other states," the white used for "North Carolina," the thick continuous green-with-dashed-red line that asserts "National Park" and the thick continuous yellow-with-long-short-dashed-black line that stutters "county" (so long as the border isn't along or over water). These all may be equally conventional, but they are less vernacular than the blue for water and so are more likely to be misconstrued, especially on a map on which a long-short-short dashed black line mutters "state," a continuous blue line murmurs "coast" or "bank," a fine dashed red line coughs at "military reservation," a slightly thicker dashed red line says "Indian reservation" and a still thicker one proclaims "Appalachian Trail." A fine dashed line in black whispers "national wildlife refuge." A continuous line in red hints, in degrees, at the graticule.

Yet, whereas all these . . . uncommon . . . signs are absent, *on* the legend we find interpretative distinctions made among the shapes and colors of the roadsigns of the Interstate, federal and state highway systems. Does the person really exist for whom the graticule is self-evident and yet the highway signs obscure? There probably is no such human being, though doubtless there are many immured in subtleties of the highway signage system to whom the graticule and its associated cabalism

of degrees and minutes is a deep mystery. What becomes gradually clear is that if the purpose of the legend ever were "explanation," everything is backwards: the things least likely to be most widely known are the very things about which the legend is reticent, whereas with respect to precisely those aspects both natives and travelers are most sure to be familiar, the legend is positively garrulous. Garrulous, but not necessarily . . . informative: the signs under the category "Road Classifications" comprise less a system than a yardsale of marks, many of which remain, despite their inclusion on the legend, "unexplained." What is one to make, for instance, of the three marks given for "Hard Surface Road"? Are we to distinguish among solid red, solid black and enclosed, dashed blue? Or are these just three arbitrary ways of designating the same reality? Suggestions of system inevitably evaporate under the heat of attention: about the time you've concluded that red is the color of federal highways, you run down US 74b in black; and by the time you've decided that unnumbered state roads are in enclosed, dashed blue, you realize you don't have the foggiest idea what that means. There are another three equally vague signs for highways under construction, and another two for multilane highways. There would seem to be an interest in portraying access (controlled or not), jurisdiction (federal or state), condition (constructed, under construction), composition (hard surface, gravel, soil) and carrying capacity (multilane or not) but not *enough* interest to force anybody to confront the graphic complexity implied by a five-dimensional code. Nor is this mess limited to the "Road Classifications" portion of the legend. Of the seven signs under "Populations of Cities and Towns," only four relate to population, and these do so without consistency. The state capital, county seats and "24-Hour Hospital Emergency Service" have individual designations confusingly related to the signs of population. Thus, the sign for "State Capital" is circular, like the signs for towns with less than 10,000 people; but the "County Seat" sign is a kind of lozenge shape. The sign for "Emergency Service" is a bright blue asterisk.

We can see your lips moving as you read this. They're saying, "What a poor excuse for a map! My five year old could do better." But that's not true. Even graduate design students collapse when confronted with a task of this complexity. The design problems alone test them (to say nothing of the . . . *cartographic* problems), but the political realities wipe them out, especially the (by now anticipated) demands of interagency collaboration (for whereas one side of our map was handled by the Department of Transportation, the other was produced by the Department of Commerce), but also the rigors of pleasing state senators *and* representatives, and the imperatives of manifesting those miniscule but vital tokens of partisanship that distinguish the map of a Republican administration from that of the Democrats. Nor is it such a poor excuse for

a map. It's a fair example of the genre. It's indistinguishable, for instance, from the *Illinois Official Highway Map, 1985–1986*; from the *Michigan Great Lake State Official Transportation Map for 1974* (which makes up for the omission of its state insect by illustrating, *inter alia*, the state gem [greenstone], state fish [trout] and state stone [petoskey]); and it's a lot less weird than the *Texas—1976 Official Highway Travel Map*, which in an attempt at shaded relief manages only to look . . . badly singed. *All* the maps of the genre, and most other genres as well, are characterized by legends (like this map's) that in a more or less muddled fashion put into words map signs that are so customary as to be widely understood without the words, while leaving the map images themselves *littered* with conventions it taxes professional cartographers to put into English.

Myths

Invariably the knee-jerk reaction is either to pooh-pooh the examples, no matter how many times multiplied, as bad (as in, "Those are just *bad* maps!") or to call for a revolution in the design of their legends ("Rethinking Legends for the State Highway Map"). Both responses completely miss the point. *There is nothing wrong with the design of these legends: they are supposed to be the way they are.* This will be difficult for many to accept, but once it is understood that the role of the legend is less to elucidate the "meaning" of this or that map element than to function as a sign in its own right, this conclusion is even more difficult to . . . *evade*. Just as the bright blue asterisk signifies "24-Hour Hospital Emergency Service," so the legend as a whole is itself a signifier. As such, the legend refers not to the map (or at least not directly to the map), but back, through a judicious selection of map elements, to that to which the map image itself refers . . . *to the state. It is North Carolina that is signified in the legend, not the elements of the map image*, though it *is* the selection of map elements and their disposition within the legend box that encourages the transformation of the legend into a sign. It is a sign only a cartographer (or graphic designer) could fail to understand. Others receive in a glance, naively or otherwise, this sign of North Carolina's subtly mingled . . . *automotive sophistication*, *urbanity* and *leisure opportunity*. Apprehended this way, the legend makes sense. The headings in red—heretofore so bizarre—appear now as *headlines* to a jingoist text. Under the fluttering flag, appear the words, "Road Classifications." *Plural*. North Carolina's road system is so rich, that one classification can't handle it. And across the legend, under the bucolic branch *cum* bird (read "rural," read "traditional values") and the bee if you can see it (read "hard working" [read "no unions"]), the words, "Populations of Cities and Towns." Cities *and* towns . . . *and* birds and bees.[5] It is almost too

much, though as it says on the 1986–1987 edition of this map, "North Carolina has it all."

It certainly has a lot of whatever it is. Look at those road signs! Their proliferation can no longer be seen as a manifestation of graphic and taxonomic chaos, though, but as a sign insisting that roads really *are* what North Carolina's all about. The sign's abundant density supports the presumption of the headline and justifies the proximity of the flag. That there are more signifiers than signifieds is no longer a mystery to be explained, but part of the answer to the question, "Does North Carolina *really* have a lot of roads?" It's the graphic analogue to the assertion in black at the bottom of the legend box that reads: "North Carolina's highway system is the Nation's largest State-maintained Network."[6] What the roads connect, of course, are all those cities. It's wonderful the way it takes seven signs and four lines to unfold the complexities of what the cartographer can't help observing is but a four-tier urban hierarchy. Again, it's the graphic equivalent of a remark from the governor's letter on the other side of the map about "booming" cities. Hey: this is a *hip* state (though bucolic), urban, urbane, sophisticated (but built on traditional values). The whiff of sophistication is heightened by the kilometer scale, so *European*, almost risqué (though it's carefully isolated in the lower right hand corner of the legend under the heading, "Mileages"). Roads and cities: roads *to* and *from* cities, that is, exactly the desideratum for someone looking to locate, say, a plant somewhere in the South. Modern, in other words, up-to-date. But as the bird and branch and honey bee remind us . . . *not off the wall.*

And yet it's not all work either. In between, in between moments, in between the roads and the cities and towns, in between the *signs* for the roads and the cities and towns, under the innocuous heading "Map Symbols" (which from its central position also casts its net over all the map signs on the legend), may be found the signs for fun, *clean* fun, *good* clean fun, but still fun: "Park Campsites," "State and National Forest," "Welcome Center," "Rest Area" and "Points of Interest," to say nothing of the signs for still other ways of getting around, ferries, railroads and *three* kinds of airports. Led by that bright green forest sign that visually lies at the center of the legend (read "parks"), this heterogeneity speaks of caring for people ("*Welcome* Center," "*Rest* Area") and is the graphic version of the remainder of that black sentence that sums up the legend (and is counterpoised at the bottom against "North Carolina" at the top): "Hard surfaced roads [for which there are three signs] lead to virtually every scenic and vacation spot."

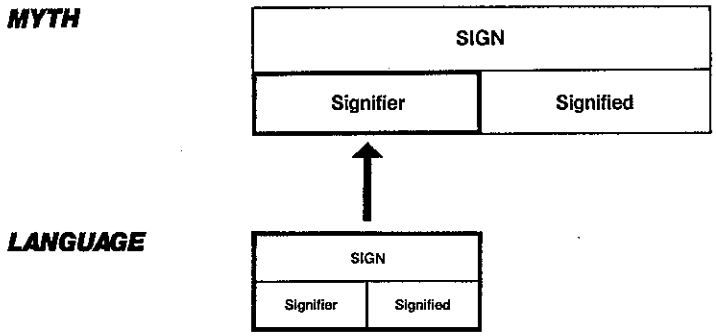
Wow! It's almost overdone. Had it been done up slick by some heavy duty design firm, it would have been overdone. But here, it's just hokey enough to seem sincere. *It is sincere.* We don't believe for a minute anyone sat down and cynically worked this out, carefully offsetting the

presumptuousness of the overheated highway symbolism with the self-effacing quality of the children's encyclopedia colors. But this is not to say that with this legend we are not in the presence of what Barthes has called "myth"—a kind of "speech" better defined by its intention than its literal sense.[7] Barthean myth is invariably constructed from signs that have been already constructed out of a previous alliance of a signifier and a signified. An example, an especially innocuous one, is given by the reading of a Latin sentence, *"quia ego nominor leo,"* in a Latin grammar:

> There is something ambiguous about this statement: On the one hand, the words in it do have a simple meaning: *because my name is lion.* And on the other, the sentence is evidently there in order to signify something else to me. Inasmuch as it is addressed to me, a pupil in the second form, it tells me clearly: I am a grammatical example meant to illustrate the rule about the agreement of the predicate. I am even forced to realize that the sentence in no way *signifies* its meaning to me, that it tries very little to tell me something about the lion and what sort of name he has; its true and fundamental signification is to impose itself on me as the presence of a certain agreement of the predicate. I conclude that I am faced with a particular, greater, semiological system, since it is co-extensive with the language; there is, indeed, a signifier, but this signifier is itself formed by a sum of signs, it is in itself a first semiological system (*my name is lion*). Thereafter, the formal pattern is correctly unfolded: there is a signified (*I am a grammatical example*) and there is a global signification, which is none other than the correlation of the signifier and the signified; for neither the naming of the lion nor the grammatical example is given separately.[8]

The parallels with our legend are pronounced. On the one hand, it too is loaded with simple meanings: *where on the map you find a red square, on the ground you will find a point of interest.* But as we have seen, the legend little commits itself to the unfurling of these meanings, even compared to the map image on which each is actually named—"Singletary Lake Group Camp" or "World Golf Hall of Fame." The appearance of the red square on the legend thus adds nothing to our ability to understand the map. Instead it imposes itself on us as an assertion that *North Carolina has points of interest;* in fact, it speaks *through* the map *about* the state. Yet, as in Barthes' example, this assertion about North Carolina is constructed out of, stacked on top of, the simpler significance of the red square on the legend, namely, to be identified with the words, "Points of Interest."

We thus have a two-tiered semiological system in which the simpler is appropriated by the more complex. Barthes has represented this relationship this way.[9] In our case, at the level of language we have as signifier the various marks that appear on the legend: the red square, the black dashed line, the bright blue asterisk. As signified we have the



Signified and signifier are conjoined in the sign, the whole of which is seized by myth to be the signifier in its second-order seismological system. Barthes cautions that the spatialization here of the pattern of myth is only a metaphor. (Redrawn from the diagram, p. 115, of Roland Barthes, *Mythologies*, Hill and Wang, New York, 1972.)

respective phrases: "Points of Interest," "Ferry" and "24-Hour Hospital Emergency Service." Taken together, the marks and phrases are *signs*, things which *in their sign function* are no longer usefully taken for themselves (there is no red square 350 yards on a side at Singletary Lake) but as indicative of or as pointing toward something else (a point of interest called Singletary Lake Group Camp). Collectively, these signs comprise the legend, *but this in turn is a signifier in another semiological system cantilevered out from the first*. At this level of myth we have as signified some version of what it might mean to be in North Carolina, some idea of its attractiveness (at least to a specifiable consumer), a concept signed also in the photos decorating the other side of the map, in the governor's message, in the "Motorist's Prayer," a concept we could call . . . *North Carolinaness*. The signifier is of course the legend appropriated from the level of language by this myth to be its sign. Insidiously, this myth is not required to declare itself in language. This is its power. At the moment of reception, it evaporates. The legend is only a legend after all. One sees only its neutrality, its innocence. *What else could it be? It is after all a highway map!*

Indeed. *And so it is*. It is precisely this ambiguity that enables myth to work without being seen (that enables the Van Sant map, the *Wanaque Quadrangle*, and this highway map to mask the interests that brought them into being). Perched on top of a primary semiological system, myth resists transformation into symbols (which makes it hard to put into words, hence . . . *hard to talk about*). As a legend or a map or a photograph, it retains always the fullness, the presence, of the primary semiological system to which it is endlessly capable of retreating. What viewed obliquely appears as an advertising slogan, confronted directly is

the blandest of legends, so that the slogan, still ringing in one's ears, is apprehended as no more than the *natural* echo of the facts of the map. It is in this way that *North Carolinaness* comes to be accepted as *an attribute of the terrain* instead of being seen as the promotional posture of state government it actually is. This constitutes, in Barthes' phrase, "the naturalization of the cultural":

> This is why myth is experienced as innocent speech: not because its intentions are hidden—if they were hidden they could not be efficacious—but because they are naturalized. In fact, what allows the reader to consume myth innocently is that he does not see it as a semiological system but as an inductive one. Where there is only an equivalence, he sees a kind of causal process: the signifier and the signified have, in his eyes, a natural relationship. This confusion can be expressed otherwise: any semiological system is a system of values; now the myth consumer takes the signification for a system of facts: myth is read as a factual system, whereas it is but a semiological system.[10]

Not seen as a semiological system: this is the heart of the matter. Of all the systems so not seen, is there one more invisible than the cartographic? The most fundamental cartographic claim . . . *is to be a system of facts*, and its history has most often been written as the story of its ability to present those facts with ever increasing accuracy. That, as we have seen, this system can be corrupted everyone acknowledges: none are more vehement in their exposure of the "propaganda map" than cartographers. But as we have also seen, having denounced this usage they feel but the freer in passing off their own products as anything other than the semiological systems they have no choice but to be. It may no longer appear that an official state highway map is quite such a system of facts as it might have seemed; but this is essentially a consequence of our presentation. Outside of this context, a highway map is accepted as inevitable, as about as natural a thing as can be imagined. Its presence in glove compartments, gas station racks (even if today they must be paid for) and the backs of kitchen drawers is . . . *taken for granted*. Yet as we have shown, even so innocent a part of the map . . . *as the legend* . . . carries an exhausting burden of myth, to say nothing of the *prayer*, *governor's message*, *photographs* and *other paraphernalia* cosseting the map image proper.

Nor does the map proper—if we can refer to such a thing—escape the grasp of myth. On the contrary, it is more mythic precisely to the degree that it succeeds in persuading us that it is a natural consequence of perceiving the world. A state highway map, for instance, is unavoidably . . . *a map of the state:* that is, an instrument of state polity, an assertion of sovereignty. There was, for example, no need from the

perspective of the driver to have colored yellow the states contiguous to North Carolina on its highway map. There was no *real* need to have shown the border. It is not, after all, as though the laws regulating traffic changed much at its borders, though to the extent they do, the map is silent.[11] At this level of language, the map, like the legend, *seems* to proffer vital information; but it's an impression hard to sustain—*there is too little information to make what's provided useful.* Like the legend, the map in this regard makes no sense. From the perspective of myth, however, this delineation of the state's borders is of the essence. Though many will see in this only the most dispassionate neutrality (what could be more natural than the inclusion of the state's borders on its highway map?), there is nothing innocent about the map's affirmation of North Carolina's dominion over the land in white. Not only has effective territorial control long been dependent on effective mapping, but it is among other things the repetitive impact of the image of the territory mapped that lends credence to the claims of control (and hence the extensive logogrammatic application of the state's outline to seals, badges and emblems). Who would question the pretensions, the right to existence, the *reality* of North Carolina? Look! There it is on the map! The 1.6 *million* copies of the 1986–1987 edition of this map constitute 1.6 million assertions of the state's sovereignty, assertions which, however, at the moment of being noticed have the ability to fade back into the map where their appearance is taken entirely for granted, overlooked because expected . . . *naturally* . . . part of the surface.

Which is myth's way: the map is always there to deny that the significations piled on top of it are there at all. It is only a map after all, and the pretense is that it is innocent, a servant of that eye that sees things as they really are. But outside the world of speech, outside the world of maps, states carry on a precarious existence: little of nature, they are much of maps, for to map a state is to assert its territorial expression, to leave it off is to deny its existence. Only when it is admitted that a state unrecognized (unmapped) is scarcely a state, that it is the determination (choice) of people to acknowledge (map) it that endows with substance an assertion of statehood, or not to acknowledge (map) it that relieves it of significance, is it possible to comprehend the anger directed at maps that acknowledge the independent existence of Bophuthatswana, Transkei, Ciskei and Venda; that deny the independent existence of Taiwan; or that, for that matter, run county borders through Indian reservations, such as those of Swain and Jackson counties through the Cherokee Indian Qualla Boundary on the North Carolina highway map.[12] It is not that the map is right or wrong (it is not a question of accuracy), *but that it takes a stand while pretending to be neutral on an issue over which people are divided.*[13] Nor is it that those angered have confused the map with the terrain, but that they recognize what cartographers are

at such pains to deny, that, like it or not, willingly or unwillingly, because *au fond* maps constitute a semiological system (that is, a system of values), they are ever vulnerable to seizure or invasion by myth. They are consequently, in all ways *less like the windows through which we view the world and more like those windows of appearance from which pontiffs and potentates demonstrate their suzerainty,*—not because cartographers necessarily want it this way, but because, given the manner in which systems of signs operate, they have no choice.

Paradoxically, it is an absence of choice founded on choice alone, for to choose is to reveal a value, and a map is a consequence of choices among choices. That the choice of mapping Bophuthatswana as an independent nation reveals a political attitude is something many will readily concede. But *all* choices are to a degree political, and it is no less revealing to choose to map *highways*, for this also is a value. That it would be difficult to produce a state highway map without highways is admitted, but there is no injunction on the state to map its roads anymore than there is for it to map the locations of deaths attributable to motor vehicles, or the density of cancer-linked emissions from internal combustion engines, or the extent of noise pollution associated with automotive traffic.[14] It would be satisfying to live in a state that produced 1.6 million copies of such maps and distributed them free of cost to travelers, tourists, immigrants and industrial location specialists, but states find it more expedient to publish maps of highways. North Carolina *does* publish the *North Carolina Public Transportation Guide*—a highway map-like document displaying intercity bus, train and ferry routes—but it printed 15,000 copies of the most recent edition, less than a hundredth as many maps as it printed of its highways.[15] Not an advertisement, the public transportation map was produced without the assistance of the Department of Commerce. Could this be why, unlike the highway map among whose blond hikers, swimmers, golfers and white-water enthusiasts no blacks appear, blacks figure so prominently on the public transportation map? Here blacks buy intercity bus tickets, get on city buses, and in wheel chairs get assisted into specially equipped vans. The reek of special assistance is like sweat: "Many of you have requested information on how to make your trip without using a private automobile. Because of these requests. . . ." But there is nothing of this tone on the highway map. There was never any *need* to have requested a highway map: it, after all, is . . . *a natural function of the state.* Everything conspires to this end of naturalizing the highway map (even the map of public transportation), of making the decision to produce such a map seem less a decision and more a gesture of instinct, of making its cultural, its historical, its political imperatives transparent: you see through them, and there is only the map, innocent, of nature, of the world as she really is.

Codes

It is, of course, an illusion: *there is nothing natural about a map*. It is a cultural artifact, a cumulation of choices made among choices every one of which reveals a value: not the world, but a slice of a piece of the world; not nature but a slant on it; not innocent, but loaded with intentions and purposes; not directly, but through a glass; not straight, but mediated by words and other signs; not, in a word, as it is, but in . . . *code*. And of course it's in code: *all* meaning, *all* significance derives from codes, *all* intelligibility depends on them. For those who first encountered their codes in the breakfast cereal box—little cardboard wheels arbitrarily linking letters and numbers—this generalization of the idea may occasion some disquiet. It shouldn't. When you wear a tie to work, you're dressing in code. When you frown, you're expressing in code. When you open a door for a lady—or wait for a man to open a door for you—you're gallanting in code. When you type or scribble, you're writing in code. Human languages are probably the most elaborate and complex codes we're familiar with—and the dictionary just a big clumsy breakfast cereal toy—but there are sublinguistic codes of incredible sophistication (those danced by Ginger Rogers and Fred Astaire) and supralinguistic codes of deep subtlety (such as the conventions underwriting the structure of James Joyce's *Ulysses*). Usually a number of different codes are used simultaneously (this is a text). Fred and Ginger were placed in settings, dressed, wore their hair a certain way, gestured, spoke and sang as well as danced and all this was coded.[16] The code of conventions structuring *Ulysses* cannot be encountered outside the code of English in which it is embedded. There is even a code of codes: mime, for example, is forbidden the code of words, and in general the arts are distinguished by a code whose elements are other codes. It has long been a hallmark of cartography that it speaks in art as well as science.

More technically a code can be said to be an assignment scheme (or rule) coupling or apportioning items or elements from a conveyed system (the signified) to a conveying system (the signifier). The highway code is paradigmatic of the way this works. On the one side are intentions (she intends to turn), promises (Holly Springs will be encountered 3 miles down this road) and commands (not to pass, to stop, to go). On the other side are gestures (a hand stuck straight out the driver's window), words and numbers ("Holly Springs/3 miles"), and lights and lines (a red traffic light, a solid yellow line down the middle of the road). The intentions, promises and commands are elements of the system conveyed: *signifieds* (content). The gestures, words, numbers, lines and lights are elements of the system conveying: *signifiers* (expression). The code (the rule—in this case, the Law) *assigns* the latter to the former, couples them. In so doing, it creates a *sign*.

An important distinction is being made here. The sign is *not* in the gestures or the lights, the words or the numbers: it is *not* the signifier. Nor is the sign in the intentions, promises or commands: it is *not* the signified. The sign exists solely, utterly and exclusively in its correlation (established by the code, the rule, by custom, by the law). There is nothing, for instance, inevitable (necessary) in the relationship between a driver sticking his arm straight out the left window and his intention to turn left (and in fact it has been largely supplanted by the flashing of lights on the left side of the car), any more than there is between a driver pointing to heaven and his intention to turn right (though doubtless there was some historical contingency that made it customary). These might, however, quite readily change places (may have already in some parts of the world), so that a left arm stuck straight out a left window signalled an intention to turn right and one stuck straight up signalled an intention to turn left: it would make no difference from the perspective of communication, for the meaning is in the code, and the new code could be as readily mastered as the old. Signs, in other words, are the creatures of codes with the loss of which they are rendered—like fat—into their constituent components, disembodied signifieds separated from insignificant signifiers. It is the codification in which the sign adheres, nothing else. Or, as Umberto Eco puts it:

> A sign is always an element of an *expression plane* conventionally correlated to one (or several) elements of a *content plane*. Every time there is a correlation of this kind, recognized by a human society, there is a sign. Only in this sense is it possible to accept Saussure's definition according to which a sign is the correspondence between a signifier and a signified. This assumption entails some consequences: a *a sign is not a physical entity*, the physical entity being at most the concrete occurrence of the expressive pertinent element; b *a sign is not a fixed semiotic entity* but rather the meeting ground for independent elements (coming from two different systems of two different planes and meeting on the basis of a coding correlation).[17]

Because signs neither have physical existence (unlike the signifier) nor permanence, they are frequently referred to as *sign-functions*, or in Eco's words:

> Properly speaking there are not signs, but only *sign-functions* . . . A sign function is realized when two *functives* (expression and content) enter into a mutual correlation; the same functive can also enter into another correlation, thus becoming a different functive and therefore giving rise to a new sign-function. Thus signs are the provisional result of coding rules which establish *transitory* correlations of elements, each of these elements being entitled to enter—under given coded circumstances—into another correlation and thus form a new sign.[18]

This is not a game of words. Nor is the vocabulary important. What *is* important is the notion that signs, or sign-functions, or symbols—what they are called *does not matter*—are realized *only* when coding rules bring into correlation two elements or items (or functives) from two domains or systems (the one signifying, of expression; the other signified, of content) and that *whenever* there is such a correlation, there is a sign. You may call this resulting sign an icon. You may call it a pictogram. You may call it a word. You may call it an index. You may call it a symbol. You may call it a piece of sculpture. You may call it a sentence. You may call it a map. You may call it New York City. In every case, whatever else it is, it is, *in its sign function*, also a sign, that is, a creature of a code.

No signs without codes. This must be insisted upon: that is, there are no self-explanatory signs; no signs that so resemble their referents as to self-evidently refer to them. They are inevitably arbitrary, inevitably reveal . . . *a value*. Jonathan Culler says:

> Saussure, taking the linguistic sign as the norm, argues that all signs are arbitrary, involving a purely conventional association of conventionally delimited signifiers and signifieds; and he extends this principle to domains such as etiquette, arguing that however natural or motivated signs may seem to those who use them, they are always determined by social rule, semiotic convention. Peirce, on the contrary, begins with a distinction between arbitrary signs, which he calls "symbols," and two sorts of motivated signs, "indices" and "icons," but in his work on the latter he reaches a conclusion similar to Saussure's. Whether we are dealing with maps, paintings, or diagrams, "every material image is largely conventional in its mode of representation." We can only claim that a map actually resembles what it represents if we take for granted and pass over in silence numerous complicated conventions. Icons seem to be based on natural resemblance, but in fact they are determined by semiotic convention.[19]

Once the superordinate role of the convention (the rule, the code) is accepted, it becomes easy to explain how what "self-evidently" resembles a river on a map equally "self-evidently" resembles veins on a diagram of the circulatory system, without invoking complicated principles of metaphor (not that these might not have been operant in the genesis of the sign). It is not that the reader thinks, "Oh, yes, the deoxygenated blood is relatively bluer than that in the arteries, *and* under a clear blue sky the surface of rivers often seems blue; *and* both veins and arteries carry (whatever "carry" means) liquids in a branching (see "tree") network (see "net," see "weaving"), sooo, let's see, that means. . ." This is not how it happens at all. What happens is that the reader finds himself or herself in an entirely distinct coded circumstance *all at once*. At the level of language, the diagram of the circulatory system is decoded without

reference to the codes of the map, and *vice versa*. There is certainly no question of *resemblance* with respect to which Barthes notes, that it would be in any case a resemblance *to an identity* (the *identity* of the river, the *identity* of the vein), an identity "imprecise, even imaginary, to the point where I can continue to speak of 'likeness' without ever having seen the model,"[20] as those do who justify this sign for veins because "they look like veins" without ever having seen a vein (without having seen a hepatic vein, without having seen an inferior vena cava), or the sign for a river (the Colorado) because "it looks like a river" (the Thames? the Cuyahoga?) without having seen it (without having seen where the Colorado trickles all but dry into the Gulf of California). It is not a matter of resemblance: the blue line is a blue line. It is the code that does the work, not the signifier. If there is involved an iconicism, it is always at the level of the structure of the system (it is analogic not metaphoric). It is less the *blueness* of deoxygenation that says "veins" than the *simultaneous* redness of the arteries, their *characteristic* jointure at the extremities, and their *perfect parallelism*; it is less the blue-between-black lines that says "river" than its *characteristic* form, its *characteristic relationship* to other forms (other rivers, mountains, roads, towns and oceans); so that "veins" can as easily be read in black or gray, and "rivers" in diagrams of drainage basins and maps of flood insurance purchase. To say that it is the code that does the work, not the signifier, is just another way of saying that it is the code that makes the sign, not the mark.

Ten Cartographic Codes

So it is the *codes* upon which one must fasten if the map is to be *de*coded (or if a map is to be *en*coded). It is possible to distinguish at least 10 of these (doubtless there are others), which the map either exploits, or by virtue of which the map is exploited. Neither class is independent of the other, and no map fails to be inscribed in (at least) these 10 codes. Those that the map exploits are termed *codes of intrasignification*. They operate, so to speak, within the map: at the level of language. Those by virtue of which the map is exploited we term *codes of extrasignification*. These operate, so to speak, outside the map . . . *at the level of myth*.

Among the codes of intrasignification, five at least are inescapable, the *iconic*, the *linguistic*, the *tectonic*, the *temporal* and the *presentational*. Under the heading *iconic* we subsume the code of "things" ("events"), with whose relative location the map is enrapt: the streets of Genoa, rates of death by cancer, exports of French wine, the losses suffered in Napoleon's Russian campaign, airways, subways, the buildings of Manhattan, levels of air pollutants over six counties in Southern California, the rivers, roads, counties, airports, cities and towns of North

Carolina. The iconic is the code of the inventory, of the world's fragmentation: into urban hierarchies, into hypsometric layers, into wet and dry. The *linguistic* is the code of the names: the *Via Corsica*, the *Corso Aurelio Saffi*; trachea, bronchus and lung cancer, white males, age-adjusted rate by county, 1950–1969; *France, Amérique du Nord; Moscou, Polotzk;* DME chan 82 St John VSJ 113-5; Cortland St World Tr Ctr N RR Path; the Graybar Building, the Seagram; Orange County, Reactive Hydrocarbons; Cape Fear River, US 421; Pasquotank, Cherry Pt., Winston-Salem, Hickory. The linguistic is the code of classification, or ownership: identifying, naming, assigning. The relationship of these things in space is given in the *tectonic* codes: in the *scalar*—in the number of miles (or feet) encoded in every inch—and in the *topological*—in the planimetry of cities, the stereometry of mountain ranges, the projective geometry of continents, the topographometry of the field traverse, the simple topology of the sketch map giving directions to the cocktail party. The tectonic is the code of finding, it is the code of getting there: it is the code of getting. Because there is no connection, no communication, except in time, the codes of filiation are *temporal*, codes of duration, codes of tense. The *durative* establishes the scale, the map's *durée* its "thickness": as the map of rates of death from cancer, *1950–1969*, is "thicker" than the *1978–1979* North Carolina highway map, which is "thicker" than the map of reactive hydrocarbons, *6 a.m. to 9 a.m., July 22, 1979*. The durative reveals (or hides or is mute about) lapses in cosynchronicity. The *tense* says . . . *when:* some maps are in the past tense ("The World of Alexander the Great"), others in the future tense ("Tomorrow's Highways"), but most maps exist in the present ("State of the World Today"), or, if they can possibly get away with it, the aorist: no duration at all (no thickness), out of chronology (not lost—just out of it), free of time (such maps attain to myth at the very level of language).

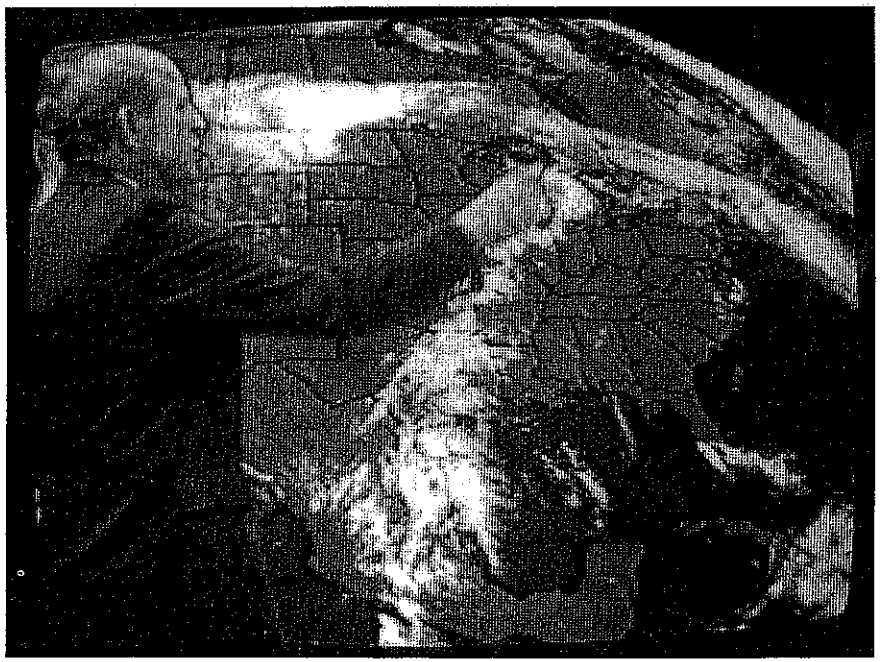
Each of these codes—iconic, linguistic, tectonic and temporal—is embodied in signs with all the physicality of the concrete instantiation of the expressive pertinent element. On the page, on the sheet of paper, on the illuminated display with its flashing lights, these concrete instantiations are ordered, arranged, organized by the *presentational* code: they are . . . *presented*. Title, legend box, map image, text, illustrations, inset map images, scale, instructions, charts, apologies, diagrams, photos, explanations, arrows, decorations, color scheme, type faces are all chosen, layered, structured to achieve speech: coherent, articulate discourse. It is a question of the architecture of the picture plane, what's in the center and what's at the edge, what's in fluorescent pink and what's in the blue of Williamsburg, whether the paper crackles with (apparent) age or sluffs off repeated foldings like a rubber sheet, whether the map image predominates or the text takes over. It is never, even at the lowest level, a question merely of escaping the stigmas of paranomia and aphrasia,

dysphemia and idiolalia, dyslogia and cacology. At the very bottom it is a question of fluency and eloquence, and soon enough of vigor and force of expression, of rhetoric, of polemic, for wherever it may begin the code of presentation soon enough carries the map *out* of the domain of intrasignification into that of extrasignification, into that of the society that nurtures it, that consumes it . . . *that brings it into being*.

Among the codes of extrasignification five again are inescapable, the *thematic*, the *topic*, the *historical*, the *rhetorical*, and the *utilitarian*. All operate at the level of myth, all make off with the map for their own purposes (as they made the map), all distort its meaning (its meaning at the level of language) and subvert it to their own. If the presentational code permits the map to achieve a level of discourse, the *thematic* code establishes its domain. *On what shall the map discourse? What shall it argue?* Though it is precisely the thematic code that has dictated their appearance on the map, from the perspective of the reader, the theme is experienced as a latency inherent in the "things" *iconically* encoded *in* the map: roads, for instance, it is a map of roads and highways; it asserts the significance of roads and highways (if only by picturing them, if only by foregrounding them); its theme is Automobility (the legitimacy of Automobility). Or it is a general reference map, a map of hydrography and relief carved into political units and plastered with railroads and towns, that is, a map, of a landscape smothered by humanity, tamed subdued (the red railroads—sometimes black—inevitably reminiscent of the bonds by means of which the Lilliputians restrained Gulliver), its theme is Nature Subdued. And precisely as the thematic code runs off with the icons, so the *topic* code (with a long *o* from *topos*, place, as in *topography*, not *topicality*) runs off with the space established by the tectonic code, turns it from space to place, gives the map its *subject*, bounds it (binds it), names it (via the linguistic code), sets it off from other space, asserts its existence: *this place is*. Just so the *historical* code. Only it works on the time established in the map by the temporal code. Are there bounding dates to the map's *durée*? Then the historical code appropriates them to an era, assigns it a name, incorporates it in a vision of history (it establishes the map's subject . . . in time). So an archeological map of Central America acquires the title, "Before 1500/Pre-Columbian Glory," one of 19th century plantation crops, political units, selected urban places, cart roads, railroads and battles the title, "1821–1900/Time of Independence," yet another of similar subjects (though with the addition of a sign for refugee centers) the caption "1945–Present/Upheaval and Uncertainty."[21] There is no time that cannot be reduced to these sequacious causal schemata, absorbed into these . . . platitudes, made comfortable and safe because grasped, understood.

If the thematic code sets the subject for the discourse, if the topic and historical codes secure the place and time, it is the *rhetorical* code that

sets the tone that, having consumed the presentational code, most completely orients the map in its culture (in its set of values), pointing in the very act of pointing somewhere else (to the globe) to itself, to its. . . *author*, to the society that produced it, to the place and time and omphalos of that society—the more dramatically as the aspect of the globe toward which it points is alien, is exotic, *i.e.*, can have its title set in a typeface that mimics . . . *bamboo*. It is a code of jingoisms, a code that beats its chest like Tarzan, a code of the sort of subtle chauvinisms that encourages the *National Geographic* to call it a "road" on its map of the Central Plains, 1803–1845, but to call it a "*cart* road" on its map of Central America, 1821–1900.[22] But after all, it is an "American" map, that is, a map that reflects the genius of the *North* Americans, or at least those north of the Rio Grande (for according to the *National Geographic* the ancient Maya had but "*trade* routes" and even the Camino Real was just a "trail"); and, if only because it *is* the mapping society, the mapping society stands at stage center, with all the others in the wings. For the rhetorical code, the mere existence of the map is a sign of its higher culture, its sophistication:



A television weatherman points to a map. At the same time, it points back to him, establishing and emphasizing his modernity, sophistication, and thus his reliability. In turn, this flatters our sense of self-esteem for having selected this station over others. This map is all but consumed by its rhetorical functions.

the map is rhetorical *au fond*, and for this reason no map can eschew it. It is like clothing: even not to wear it is to be caught in the net of meanings woven by the code of fashion. To attempt to shed the rhetorical code is but to shout the more stridently through it: it is its very disregard for the subtler aspects of the code of presentation that so completely characterizes the publisher of *The Nuclear War Atlas* as "socially conscious"[23]; it is nothing other than their violations of "good taste" that allows us to read the editors of *The State of the World Atlas* as angry.[24] Their *subversion* of the power of the rhetorical code amounts to a bold proclamation of their rhetorical stance (cartographic nudism, cartographic streaking, cartographic punk), the very opposite of the position occupied by the United States Geological Survey, which, as we have seen, obscures its stance beneath a rhetorically orchestrated *denial* of rhetoric (dressing itself in the style of science). Elsewhere the map will dress in the style of Art. Or in the style of the Advertisement. Or in the Vernacular (the North Carolina Highway map). The rhetorical code appropriates to its map the style most advantageous to the myth it intends to propagate. None is untouchable. All have been exploited.

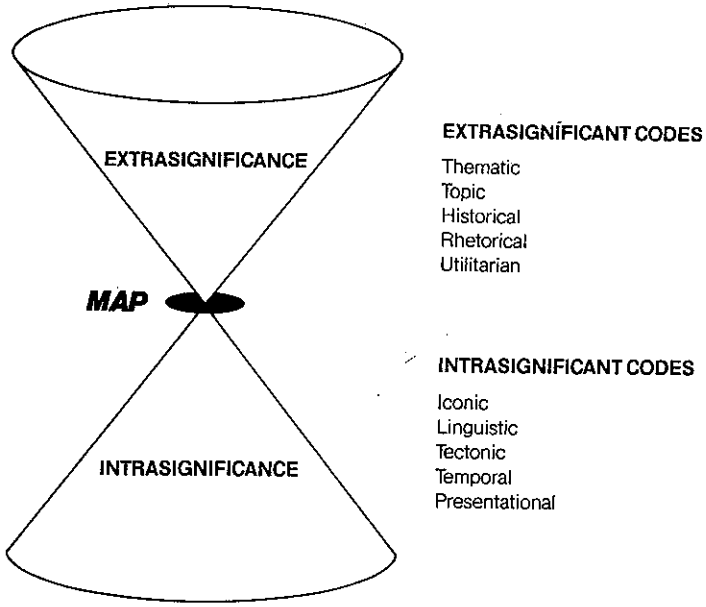
As the map itself is finally exploited, picked up bodily by the *utilitarian* code to be carted off for any purpose myth might serve. A professor of curriculum and instruction, commenting on the availability of state highway maps for secondary classroom use, remarks, "It has the governor's picture on it. You can get as many as you want." It is here that the academic model of the map with its scanning eyes and graduated circle-comparing minds breaks down most completely. It has no room for the real uses of most maps, which are to possess and to claim, to legitimate and to name. What great king, what emperor, what great republic has failed to signal its coming of age by the mapping of its domains? Whatever the pragmatic considerations (they are, after all, maps that speak also at the level of language), it has inevitably also been an act of conspicuous consumption, a sign of contemporaneity as well as wealth and power, a symbolic manifestation of the rights of possession. *These* are the uses of maps as certainly as it is the most important function of maps in geographic journals to certify the geographic legitimacy of the articles they decorate.

Despite our slight foray, the anthropology of cartography remains an urgent project: what *are* all those maps actually used for? Signs, badges, tokens, emblems, billboards, gestures, leases, deeds, wallpaper, pretty picture. Do not say "not *this* one"—not *that* topographic survey sheet—for as surely as you do, it will turn out to be the one with the most heinous agenda, it will be the one lying about the Love Canal, the one suppressing the missile silos.[25] Whatever else this might be, it is not a gesture of disinterested curiosity . . . it is one of exploitation. But, as we have seen, what else to make of Survey sheets? Dressed in their button-down white

shirts and suitable ties, these, in their metered regularity (so many sheets per unit area), their sensible no-nonsense layout, their methodical tiling, their obsessive coverage, know no other code. "To catalogue," Barthes notes, "is not merely to ascertain, as it appears at first glance, but also to appropriate."[26] In the end, survey sheets differ little enough from maps of . . . *military targets*.

Intrasignification

The map, then, is comprehended in two ways. As a medium of *language* (in the broadest sense) it serves as a visual analogue of phenomena, attributes, and spatial relations: a model on which we may act, in lieu or anticipation of experience, to compare or contrast, measure or appraise, analyze or predict. It seems to inform, with unimpeachable dispassion, of the objects and events of the world. As *myth*, however, it refers to itself and to its makers, and to a world seen quite subjectively through their eyes. It trades in values and ambitions; it is politicized. Signing functions that serve the former set of purposes we have termed *intrasignificant;* those



The map as a focusing device between the domains of extra- and intrasignification: the map gathers up the constituent signs governed by the codes of intrasignification so that they will be able to act as signifiers in the sign-functions governed by the codes of extrasignification—which specified them in the first place.

which serve the latter, *extrasignificant*. Whereas intrasignification consists of an array of sign functions indigenous to the map and which, taken jointly, constitute the map . . . *as sign*, extrasignification appropriates the complete map and deploys it . . . *as expression* in a broader semiotic context. The map acts as a focusing device between these two planes of signification, gathering up its internal or constituent signs and offering them up collectively . . . *as a map*. But what effers from the map is not substantially different from what is afferent upon it—these have simply been repositioned in the semiological function—and, whereas extrasignification exploits the map in its entirety, *we have seen how the initiatives of myth extend to even the most fundamental and apparently sovereign aspects of intrasignification, and are ultimately rooted in them*. How, then, does this happen?

The map is the product of a spectrum of codes that materialize its visual representations, orient these in space and in time, and bind them together in some acceptable form. The actions of these codes are, if not entirely independent, reasonably distinct. *Iconic codes* govern the manner in which graphic expressions correspond with geographic items, concrete or abstract, and their attendant attributes. A *linguistic code* (occasionally two or several) is extended to the map to regulate the equivalence of typographic expressions, and via the norms of written language, a universe of terminology and nomenclature. As the space of the map is configured by *tectonic codes*—transformational procedures prescribing its topological and scalar relations to the space of the globe—*temporal codes* configure the time of the map in relation to the stream of events and observations from which it derives. The diversity of expressions that constitute the map are organized and orchestrated through a *presentational code* that fuses them into a coherent cartographic discourse. Here we turn to each of these in turn.

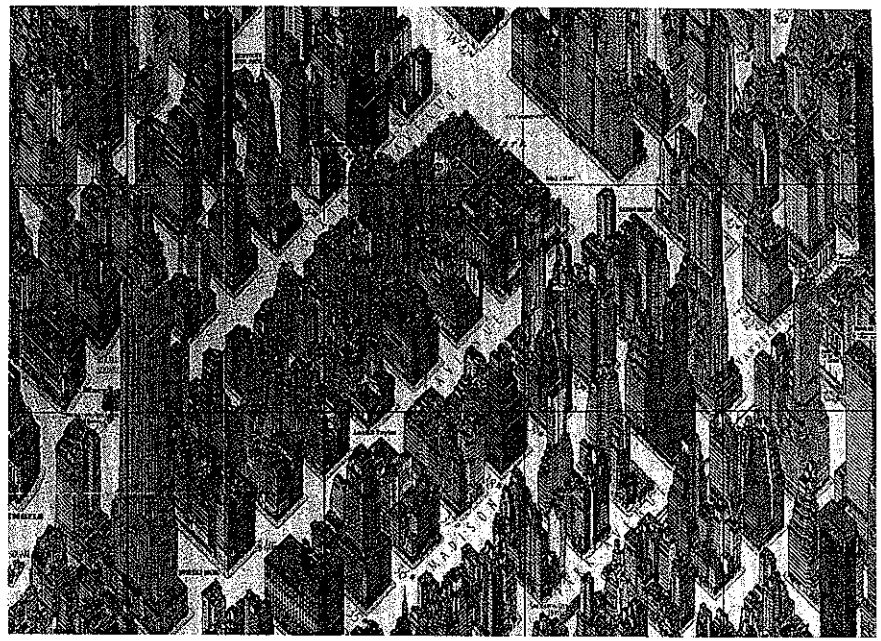
Iconic Codes

Iconicity is the indispensable quality of the map. It is the source and principle of the map's analogy to objects, places, relations, and events. In its capacity as geographic icon, the map subsumes a remarkable variety of visual representations and the codes, both general and specific, that underwrite them; yet the degree of iconicity evident in the map as a whole is not uniformly echoed among its constituents. The dot that represents a town is not iconic in the same way as the intricately shaped area representing a city; the blue line representing a river is not iconic in the same sense as the blue line representing a county road or, for that matter, a shoreline. Pursued far enough, every icon is seen as the product of two procedures: a *symbolic* (substitutive) *operation* that provides the

basis of its representative potential, and a *scheme of arrangement* that yields its specific and individual form. The balance struck between these has frequently been the canon by which we judge representations as symbolic (of the town, for example) or iconic (of the city); and although this distinction will not be abandoned here, it will be applied with extreme care. No symbol is *totally* arbitrary unless it can be stripped entirely of connotation (an unlikely and undesirable prospect), and no icon is motivated free of convention because *representation without convention is not possible.* We can only say that some representations are more explicitly iconic or symbolic in function; that media of cultural exchange—maps in particular—serve as proving grounds where iconic representations gradually acquire symbolic status through a process of reiteration and cultural distension.

The iconicity of Hermann Bollmann's *New York Picture Map* is so powerful that its representational conventions virtually disappear from view.[27] On inspection, the picture plane . . . *melts away,* and our attention falls into a landscape of tangible urban forms: streets, sidewalks, roofs, facades, doors, windows. It seems so literal, so transparent to interpretation, so . . . *natural* that it is difficult to accept as a highly conventionalized and essentially symbolic representation. Yet without our conventions of pictorial rendering, this arresting image would be opaque and meaningless.[28] Make no mistake: iconicity, as Bhattacharya has explained, is the product of a spatial transcription[29]; and its derived form is an arrangement of marks in relationship to one another and to the space they occupy. The icon is motivated not by a monolithic precedent form but by the formal and necessarily *spatial arrangement* it would transcribe on the page, and it can only materialize through a *transcriptive* procedure. This procedure, in Bollmann's map, turns out to be extraordinarily elaborate: involving 67,000 photographs taken with specially designed cameras, an axonometric projection spread in two dimensions by a calculated widening of streets, and, according to the map's jacket, "several unique devices which remain his secret." It emerges from a tradition of representation that is distinctly Western and intensively codified, and it speaks through a familiar (to us) regime of symbolic principles: lines demark intersections of planes and boundaries between solid and void; certain organizations of lines denote rectilinear volumes; recurring tonal patterns denote illuminated forms.

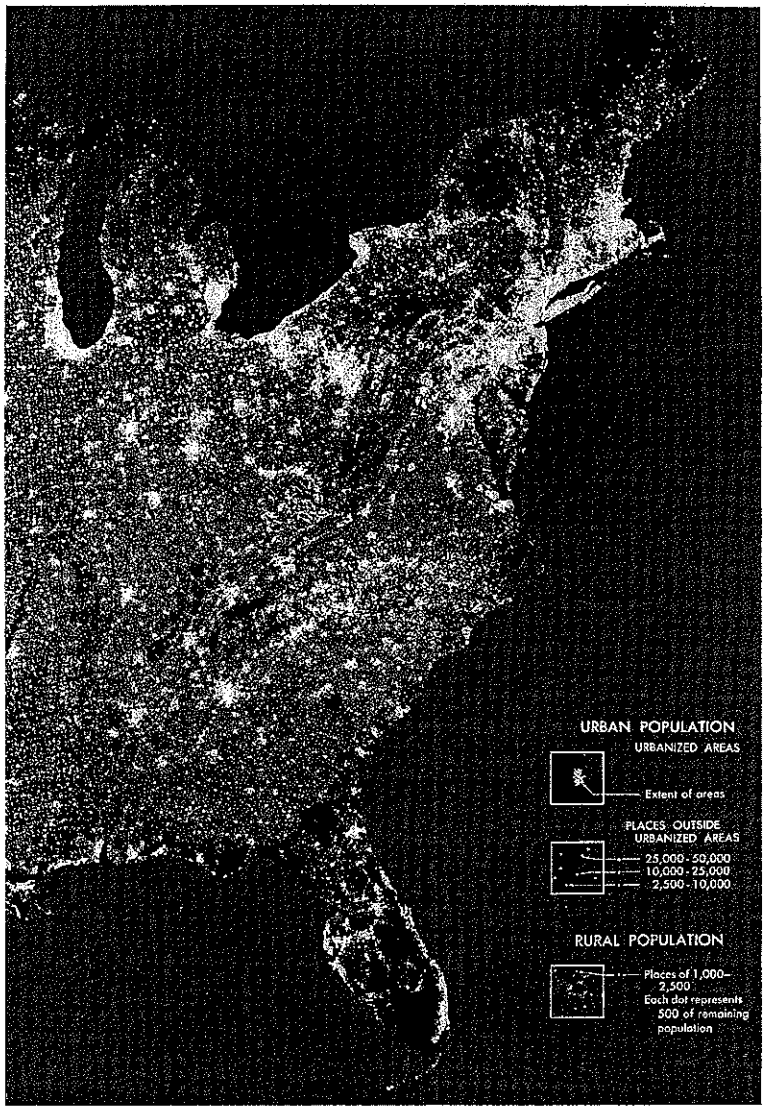
Thus, to describe iconicity as a simple matter of visual likeness (as if this *could* be a simple matter), or as a formal correspondence between expression and referent, is to mystify its explanation and divorce it entirely from cultural enterprise. Iconicity derives from our ability to transcribe arrangements in space and mark them out in conventional symbols—in other words . . . *to map them.* This ability is as fully realized in a drawing by da Vinci as in a Swiss topographic map, where the natural



A portion of Bollman's Manhattan. This compelling icon is an elaborate synthesis of Western representational conventions.

landscape—like Bollmann's urban landscape—is portrayed as a complex and continuous icon, bathed in light and rendered with the consummate authority of an iconism as richly meaningful for its audience as for its maker.

A map of population distribution produced by the U. S. Bureau of the Census has some of this same pretense.[30] Substitute night for day, luminosity for reflectivity, and city form for architectural or geomorphic form, and we have an equally credible—if more remotely viewed—icon of human settlement. But the symbolism of this map is more explicit, and less uniform; in fact it embraces several distinctly different representative principles. Urbanized areas, like Bollmann's office towers and Imhof's mountains, enter the map as geographic icons, shaped by the space of the features themselves transcribed onto the graphic plane. Isolated cities and towns, however, enter as geometrically pure squares and circles regardless of their geographic shape; they have undergone an abstraction conventionalizing their form and enacting their status as symbols.[31] Beyond and between these, symbols are disengaged from exact spatial correspondence and are referred to features that are in themselves abstractions. In the first instance, form is given as the consequence of the



From a lexicon of graphic symbols, a geographic icon. While significant in itself, each mark, like a point of color in a Seurat painting, is subservient to the impression of the whole. (From *Maps for Americans, by Morris M. Thompson, published by the U.S. Department of the Interior, 1979.)*

feature's spatial extension and the topological transformation that implants it on the page. Symbolism remains characteristic: white is city, dark blue is water (or foreign terrain), black is neither. In the second instance a formal symbolism is activated: white *square* is city or white *circle* is city. In the third instance, symbols are fixed not only in form but in value as well, and they acquire a limited but necessary mobility within a scheme that treats them not as localized occurrences (in which case they have no literal meaning) but as elements of a comprehensive system to be interpreted *en masse*. This map is truly a *tour de force*, an exemplar of cartographic representation deploying an arsenal of significant strategies from the most abstract and conventionalized to the most geographically constrained and overtly iconic. Although we might expect, from this description, a baffling and practically indecipherable stew of signs, what we have instead is a remarkably legible and coherent representation, one that correlates strongly with a photographic representation of the same phenomena.[32] Profoundly different principles of symbolism merge, almost seamlessly, in an icon that eschews the formal consequences of their application and takes their distribution as the basis of its own.

Signs formed, rather than just characterized, independently of geographic space are free to engage in formal metaphor. A lighthouse is signed with an ornamented triangle or an outlined circle and a complement of rays, a mine with an occluded dot or an emblematically crossed pick and shovel. Extracted from map context, these signs are icons in their own right—but icons of what? The triangular lighthouse sign and the circular mine sign are ostensible abstractions of their phenomenal counterparts and, regardless of their degree of abstraction, they remain icons insofar as they maintain a structural correspondence with them. But the circle and rays sign is iconic only in respect to the light, not the lighthouse, and it represents by virtue of a part-for-whole substitution. The pick and shovel sign (with no regard for technological currency) represents mining rather than mine by substituting artifact for process. These last two examples are conventional metaphors, parallels to which abound in maps.[33] They differ from the icons of urban form and symbols of city size in not referring literally to the phenomena they represent. They anticipate interpretation by singling out connotations and presenting them as surrogate icons. Icon is proffered, and taken, as symbol.

In signs which *are* geographically conformal, metaphor operates through *characteristic*. Green symbolizes trees and blue, water in our maps with the same conviction they did in the childhood drawings that implanted these metaphors in our vocabulary, never mind drought, autumn, and acid rain, and never mind the cubic miles of eroded silt that

choke our rivers. In the map, our forests glow with the robust verdure of a perpetual spring afternoon, and even the Mississippi shines with a pristine Caribbean blue. These metaphors proclaim the map as *ideal* (or at least hyperbole), at once an analogue of our environment and an avenue for cultural fantasy about it. False coloration is hardly restricted to remotely-sensed imagery; it is characteristic of *all* our maps, which it dresses in . . . *the most reassuring tones*.

The iconic code of the map is a complex mix of more specific codes—potentially any established or even *ad hoc* code of graphic representation, provided it either is or can be conventionalized. The map seems to have assimilated the entire history of visual communication, maintaining an immense pool of representational techniques and methodologies from which it draws freely, with little preference or prejudice, and which it augments through continual invention and recombination. Although this inventory is far too extensive to be catalogued here, we can summarize the object of its application. The map is an icon, a visual analogue of a geographic landscape. It is the product of a number of deliberate, repetitive, symbolic gestures, carefully arranged and explicitly or implicitly referred to elements of a content taxonomy. Formal items—the discrete elements of iconic coding—may be shaped within the space of the map, in which case their symbolism and metaphorical potentials are characteristic, or preformed and imposed on the map, activating formal symbolism and formal metaphor as well. The diversity of cartographic expression far surpasses that of written language or any other medium of practical exchange; but map signs are only as diverse as our abilities to interpret them, and their formation is as firmly prescribed by the confines of our own visual culture, the array of conventions that dictate how we may equate marks and meanings. The iconic code of the map is the sum of its various conventions of graphic representation; the comprehensive icon of the . . . *map image* . . . is the synthesis of their actions.

Linguistic Codes

It is difficult to imagine a map without language. However separate the evolution of iconic and linguistic representation, the map has, for millennia, embraced both. External to the map image, language assumes its familiar textual forms: identifying, explaining, elaborating, crediting, cautioning. Its main role, though, lies within the map image and in its interpretive template, the map legend. Like graphic marks, typographic marks sign the content of the map on different yet complementary grounds.

In the legend, semantic connections are made between classes of graphic images or image attributes and linguistic representations of the

phenomena to which they refer. In this capacity, the legend acts as interpreter between the unique semiological system of the individual map and the culturally universal system of language so that on seeing a red circle, for example, we may hear the words "Welcome Center" (even if we're not entirely sure what that means). In translating graphic expression to linguistic expression we make the map literate and its meanings subject to literary representation and manipulation. It seems our compulsion and need to do so.

Within the map image, linguistic signs address not only what things are called ("Lake") but also what they are *named* ("Superior"). Thus identification is a matter of both *designation* and *nomenclature*. Much of our geographic nomenclature carries a residuum of designation, as in "Union *City*," "Youngs*town*," "Louis*ville*," "Pitts*burgh*"; but it is practically obligatory with respect to natural features. One word, "river" for instance, may occur hundreds of times within a single map image. The cartographer who would erase this redundancy, however, finds that rivers are no longer distinguishable from creeks, nor lakes from reservoirs. Here language is not just naming features, but *illuminating content distinctions* that have, for whatever reason, escaped iconic coding.

If the function of language in maps were simply toponymic, we could assume that the linguistic signifiers themselves, if recognizably formed and correctly arranged, would be fixed in meaning. This is clearly not the case. Within the map image, elements of visible language serve as counterparts to iconic signs, overlapping their content and spatial domains and echoing their iconic properties. In the map image, entire words and arrangements of words are given iconic license, generating a field of linguistic signs best likened to concrete poetry. Letters expand in size, increase in weight, or assume *majuscale* form to denote higher degrees of importance. Stylistic, geometric and chromatic variations signal broad semantic divisions. Textual syntax is largely abandoned as words are stretched and contorted and word groups rearranged to fit the space of their iconic equivalents. Clearly this code invokes more than the disposition of phonetic archetypes.[34]

It's not that the map rejects the ground rules of textualized language; if it did, it would quickly degenerate to a vehicle for newspeak or nonsense. Even seemingly absurd statements like "Lac Champlain Lake" and "Rio Grande River" are grammatically functional in a bilingual or multilingual culture. *What this code gains in the cartographic context is nearly unrestricted access to the means of iconic coding.* Among attempts to produce maps entirely from linguistic signs, the more successful have been cognizant of these means[35]; and in even the most familiar maps the field of typographic signs, taken on its own, visualizes the geographic landscape in much the same way as the field of graphic signs. The map is simultaneously . . . language *and* image. As word lends

icon access to the semantic field of its culture, icon invites word to realize its expressive potentials in the visual field. The result is the dual signification virtually synonymous with maps as well as the complementary exchange of meaning that it engenders. The map image provides a context in which the semantics of the linguistic code are extended to embrace a variety of latent iconic potentials[36]; to the same end, it imposes a secondary syntax that shapes entire linguistic signifiers into local icons.

Tectonic Codes

To reiterate: a code is an interpretive framework, a set of conventions or rules, which permits the equivalence of expression (a graphic or typographic mark) and content (forest, population of less than 1,000 persons, or multilane limited-access highway). In effect, a code *legislates* how something may be construed as signifying, as representing, something else. In this respect signs are encoded in formation and decoded in interpretation; and it is only through the mediation of a code that signification is possible.

Each map employs a tectonic code—we have discussed this—a code of construction, which configures graphic space in a particular relation to geodesic space.[37] This code effects a *topological* transformation from spheroid to plane in sign production and plane to spheroid in interpretation. It has a *scalar* function as well, logically separable from the topological but not practically independent of it. Whereas the role of this code as representative principle is evident, its content and expression are less so, *because both of these functives are abstract space*. The tectonic code governs a *sign function* that has as its content a *topology* and as the product of its action a *correlative topology*. If cartographic projections and scales have not been widely recognized as codes, it is not, as we have seen, because, they are difficult to formulate as such (since in most cases they can be reduced to concise mathematical expressions, they are indeed *more easily* formulated than the iconic and linguistic codes). Rather it is because they do not in themselves produce material imagery: they offer space for space, abstraction for abstraction, *and their work is not visible until it is subjected to iconic coding*. The mesh of graticule lines cradling the map image is not the tectonic code itself, but an *icon* of the topology acted upon by this code. Nor is it obligatory to render this topology: frequently it is manifest only in the shape and disposition of features, and, when it is visualized, it serves primarily as a referencing system to implement the literalization or numeralization of space.

Yet as we have seen, this code traffics in spatial *meanings*, and the messages it allows us to extract from the map are messages of distance, direction, and extent. It shapes and scales the graphic plane in such a way

that these messages emerge from the map image. While iconic and linguistic codes access the semantic field of geographic knowledge, *the tectonic code provides their syntactical superstructure*; this is the code through which we signify not what, but *where*. In molding the map image, the tectonic code allows it to refer to the space that we occupy and experience; and inevitably it is laden with our . . . preconceptions about that space. It cannot therefore surprise to find the map projection at the center of political controversy, pretending as it does to validate our cultural centrism and objectify our territorial aims. It has these potentials because it allows us to view the world as we choose—as much or as little of it as we like, from whatever vantage point we like, and with whatever distortions we like—and, even though we know better, it nevertheless projects an aura of ubiquity and authenticity. It can do so because we recognize it as the only thing exact—if in the most limited sense—in a practice that propagandizes exactitude as if this were the reason for its existence.

Temporal Codes

"Every map is out-of-date before it's printed." This adage is a staple of the cartographic office. It is customarily dragged out for the benefit of the novice, held up as a fact of life (like death or taxes), and then put aside as an inevitable consequence of the complexities—of the *paradox*—of the mapping process. If meant seriously, it's as a barb at the sluggishness of the mapping bureaucracy—every member of the bureaucracy except, of course, the cartographer. But for the most part it evokes laughter or sentient smiles rather than angst (*let's not get too wound up over it; we said out-of-date, not obsolete)*, and it's really not the sort of thing that cartographers lose sleep over. (It just makes them . . . uneasy.)

Somehow we've gotten the idea that maps have nothing to do with time. We'll indicate a date of publication, and perhaps a time frame for data collection, but that's about as far as it goes—and these gestures have more to do with the status of the map as a document than with any issue of *map time*. We shrug that off, if a bit nervously, because we've learned to make maps in the terms they can resolve: *anything that changes fast enough to render the map genuinely obsolete before it can reach its audience doesn't belong in the map in the first place*. The map is opaque to these things: it filters them . . . out. That's partly a function of scale: maps are macroscalar and macroscopic, and, after all, we *are* mapping mountains and not the pebbles inching down their slopes. But the things we're increasingly interested in mapping don't have this short-term permanence at any scale; they're more in the nature of *behaviors* than geographic fixtures.[38] These interests may inspire new map forms, but

they haven't forced us yet to admit that maps *embody* time as surely as—in fact *because*—they embody space. It remains conventional to think of the map as either a snapshot—in time but not of it; something with time evaporated out of it (as the Van Sant)—or as akin to a 3-hour exposure of Grand Central Station in which actions, events and processes disappear, and all that register are *objects of permanence* (as implied by the durative code of the Geological Survey). We *may* be aware of emplacing time in the photograph, and even of permanence as the arbitrary consequence of this act, but we refuse to extend these understandings to the map. Time remains a . . . *hidden dimension*, a cartographic *Twilight Zone*. But the map *does* encode time, and *to the same degree* that it encodes space; and it invokes a temporal code that empowers it to signify in the temporal dimension. That the action of this code on temporal attributes should be explained by the action of two subcodes, which parallel those acting on spatial attributes, is hardly surprising. The map employs a code of *tense*, concerning its temporal *topology*, and a code of *duration*, which concerns its temporal *scale*.

Tense is the direction in which the map points, the direction of its reference in time. It refers to past, to present (or a past so immediate as to be taken as present), or future—relative, of course, to its own temporal position. So we have maps in the past tense (*East Asia at the time of the Ch'ing Dynasty*), maps in the present tense (the *1986–1987 North Carolina Transportation Map*), and maps in the future tense (of tomorrow's weather, or a simulation of nuclear winter). We also have temporal *postures*, the fantastic map (of Middle Earth, Dune, or Slobbovia) with its present and past separate, but not entirely detached, from our own; and the allegorical map (*The Map of Matrimony, The Gospel Temperance Railroad Map, The Road to Hell*[39]) that proclaims itself *atemporal* or *eternal* and, thus, presumes the *aorist* of the Greek. As maps slide into the past they become *past* maps ("antique" is a term reserved for past maps of some virtue or special appeal) where they continue to refer to *their* pasts, presents and imagined futures. The posture of the facsimile and the counterfeit is one of position rather than reference, the facsimile admitting (if only in a whisper) of its true temporal position.

The distinction between present and past is always difficult. A map positioned in the last century is obviously *past*—or is it? The physiographic map of 1886 is past by virtue of its cultural references—its references to the state of physiographic knowledge or the state of graphic representation in 1886—not by virtue of its content, which we still insist we can scale into . . . immutability. Erwin Raisz's physiographic maps, interleaved among the pages of the modern atlas, appear transported there from another time—*and they are*—but we take them all the same as maps *of the present*.[40] Without a more stable yardstick, the passage of cartographic time is marked off in editions. For the atlas these are

accelerated by the pace of political and developmental change and braked by the constraints of map production; for the topographic map it's modulated by the intensity of localized activity; and with the digital database it's fixed in a perpetual, virtual present.[41] Meanwhile, as we have seen, the Survey quadrangle expresses time—that between the map in hand and its predecessor—with a violent purple tint that says . . . *these things are new*. Cherished globes have been sacrificed to garage sales and flea markets, the megabuck atlas is becoming an art investment, and we even have a class of disposable maps (with a lifespan roughly equal to that of a newspaper) characterized not so much by their funk as their anticipated, and almost immediate, obsolescence. We are increasingly conscious of the distance between present tense and past tense; and while it's still remarkably elastic, it is—as everyone tells us—shrinking fast.

The *durative* code of the map operates on the scalar aspect of time. As spatial scale constitutes a relationship between the space of the map and the space of the world, temporal scale constitutes a relationship between the time of the map and the time of the world; that is, the map embraces this or that span of world time, it has a certain thinness, or thickness. For example, an electronic map of traffic density in downtown Raleigh. In 1 minute, it plays out on a color graphics terminal the events of an entire day. This map has a *temporal scale* that is the ratio of one interval (a minute) to another (24 hours), or 1:1440. *It's just like a spatial scale*.[42] Of course, that was a convenient example. Consider instead a newcomer to Raleigh mapping out his environment from a bus window. It's Saturday afternoon, and he's just boarded the South Saunders bus at the central transfer point on Martin Street.

4:51 It will be 4 minutes before the bus leaves. Outside a few dozen people sit around on benches talking, reading newspapers, or just waiting, enjoying the Spring sun slanting between the banks and commercial buildings lining the Fayetteville Street Mall. In one direction the Mall slides down to the glassed and steel-trussed Convention Center. At the other end, three blocks away, the turquoise dome of the State Capital bulges over its massive oaks. The view in both directions is fragmented by the Mall's decor: saplings, floral planters, a scattering of sculptures, a clock mounted on a mirrored kiosk. There are seven other passengers on the bus now, one of them thrusting his hand relentlessly into a box of candied popcorn. The next seat bears five knife slits, and here and there a *nom de plume* stands out in the faded graffiti: "Catbird," "The Non Stop Crew," "Woogie Tee."

4:55 The bus rolls from the curb, stops abruptly as another nudges in front of it, then groans away. The street is compressed by gray and beige walls rising a half dozen stories from the sidewalk. At eye

level the bus reflects dimly in the plate glass of old shop fronts. Everything is in shadow.

4:57 A right turn onto Blount Street. To the left, aging warehouses catch the sunlight head on. One of them announces its renovation. The next block's been leveled on both sides, and, to the right, a sea of asphalt and windshields foregrounds the city's nucleus of office towers. Several blocks of shotgun shacks, verandas crowded with laundry lines and painted metal chairs, then the expanse of South Street slashed clear around Memorial Auditorium, an imposing chunk of institutionalized Art Deco.

4:59 The bus dips beneath the Shaw University pedestrian bridge, careens right onto Smithfield, and stops beside a tiny parkette of juniper. Here Wilmington and Salisbury streets merge into Highway 50 and zip off in six grass-trimmed lanes of new pavement toward the Garner suburbs. As cars burst past in both directions, the driver weighs his odds . . .

5:01 Past the commuter's raceway, the bus rattles over a set of railway tracks and the backside of Memorial Auditorium jumps across the right windows. Swinging left onto old Fayetteville Street, it stops below a cascade of terraces capped by an archetypal red brick elementary school. Directly across the street, a project sprawls out, sheathed with brown wood siding and decorated in spray-bomb cursive. One person leaves the bus, and two teenage girls hoist a stroller through the front doors.

5:03 To the right a fresh canopy of leaves spreads over the weathered monuments of Mount Hope Cemetery, and to the left the project gives way to squared-off little homes. The bus wheels right onto Maywood and the small homes persevere, gradually brightening. On the neighborhood basketball court, a girl in a pink jumpsuit buries a fifteen-footer.

5:06 The bus lurches across a graded swath of red soil that imprints the future widening of South Saunders Street and brakes to a halt opposite Earp's Seafood. It turns right onto South Saunders, then left at Carroll's Used Tires, then right again onto Fuller. A stretch of tidy compact houses ends suddenly at Lake Wheeler Road. A tire swing (one of Carroll's?) hangs outside the near window. Several passengers disembark here; one boards and is recognized. "How you doing?" "All right!"

5:08 The bus cuts right onto Lake Wheeler Road and descends a long grade. To the left a high chain link fence tracks its descent, staking out the boundary of Dorothea Dix Hospital. To the right a precipitous slope tumbles into a clutter of rooftops and ahead Raleigh's best downtown panorama spreads over the windshield. At the foot of the grade, the road dovetails back into South

Saunders where a column of plaster hens files across the eaves of R. B.'s Chicken 'n' Ribs.

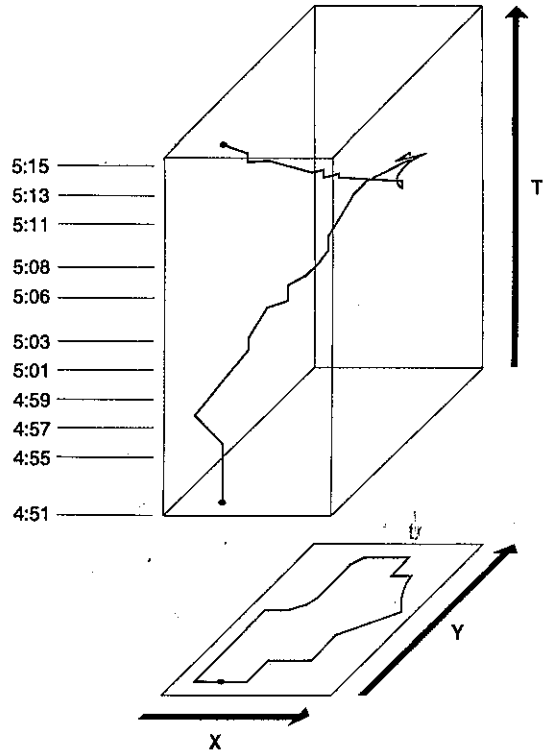
5:11 Passing the entrance to the Dorothea Dix grounds, the bus stops in front of Heritage Park (another housing project but far more ambitious than the one on Fayetteville Street). Three riders step out cradling their afternoon purchases, and a right turn onto South Street aims just off the downtown core. Another descent, bottoming out below a closely set pair of railway trestles, then a quick rise and a confusion of lanes. With Memorial Auditorium a block ahead the bus pivots left onto McDowell.

5:13 On the left, a parking lot, then a Chevy dealership. On the right, another parking lot, then another, then another. Cars everywhere. No people, just cars, waiting. The downtown towers against the right window and then disappears behind a four story parking deck. A cluster of satellite dishes crowds together on an office rooftop.

5:15 At the corner of McDowell and Martin the green expanse of Nash Square spreads out over the driver's left shoulder. A handful of people wander, without apparent intention, across the park. Turning right, the bus squeezes between the walls of Martin Street, gets lucky at the Salisbury traffic light, and then slips against the curb. The doors open. It's still 79° outside, but in the shadows it feels cooler.

If the bus hadn't returned to Martin Street, there would be nothing especially spatial about this experience; it unfolds *in time* as a sequence of impressions, and its spatial quality remains latent until it reconnects with its point of origin and becomes a *closed traverse*, At that point everything witnessed becomes . . . synchronous and the previously confounded immigrant exclaims, "I know where I am!" (implying that, to some degree, "I know where I've been"). Space has been surrounded and captured (unlike the tenuously connected scenes lingering along its perimeter, beyond the grasp of its closure): *time has collapsed into space*. It is still present in the map, but . . . *as space*.[43] In Minard's *Carte Figurative* of Napoleon's Russian campaign,[44] time is literally distance, marked out by the rhythm of falling boots and shrinking roll calls. Less dramatically, but more explicitly, the "Driving Distance Chart" at the back of the AAA road atlas recognizes each segment as simultaneously a spatial interval (255 miles) *and* a temporal interval (5 hours and 20 minutes).[45] Curiously—or perhaps predictably—it also tries to subvert its identity as a map, even proclaiming itself a "chart" (read, "*not* a map"), but it still looks like a map and it still functions as one.

We can pretend that the dimensions of the map are entirely synchronic, that it has no diachronic quality except as a specimen of technical or methodological evolution; but every cartographer who has



A spatio-temporal map of the bus trip, and a planar projection in which the temporal dimension has been collapsed to zero thickness. Space emerges as the product of synchronization (temporal flattening) and the closure of movement.

grafted a new road onto an old, or dropped the still warm symbols of his latest research onto the cool plate of a 20-year old base map, knows better. The potential for anachronism is vast; and sometimes it runs amok, as in the maps that drag our earliest continental explorers across a fabric of 48 American states or 10 Canadian provinces (*Native states? What native states?!*). Time is always present in the map because . . . it is inseparable from space. Time and space are alternative and complementary distillations, projections of a space/time of a higher dimensional order. We cannot have a map without thickness in time unless we can have a map without extension in space. We cannot squeeze time out of the map, only onto it.

Presentational Codes

The time of the map, the space of the map, the phenomena materialized in this framework, and the roster of terms and toponyms cast into it are

. . . not the map. Expressed through a complex of iconic and linguistic marking schemes, they become the content of the *map image*; but the *map*, as we have already pointed out, is much more than this solitary image orphaned on its audience's doorstep. The map image is accompanied by a crowd of signs: titles, dates, legends, keys, scale statements, graphs, diagrams, tables, pictures, photographs, more map images, emblems, texts, references, footnotes, potentially any device of visual expression. The map gathers up this *potpourri* of signs and makes of it a coherent and purposeful . . . *proposition*. How these signs come together is the province of a presentational code, which takes *as content* the relationship among messages resident in the map and offers *as expression* a structured, ordered, articulated and affective display: a legitimate discourse.

The more apparent aspects of this code are intrasignificant. It acts on the structure of the map, dividing and proportioning the space of the page, staking out the prospective geometry of blocks, columns, channels and margins. It proceeds from the primacy of the rectangle, echoing our Euclidean systemization of environment (objects, rooms, buildings, streets, cities), use (trims, folds, stacks, racks, packages, pigeonholes) and reading itself. Within this latent superstructure the ingredients of the map are laid out, ordered by a positional scheme fixing relations of sign to sign and sign to ground and imposing on the map a *program*, a discursive strategy. Discourse is articulated through emphasis (large or small, prominent or subdued) and elaboration (the relative complexity of signs, the intricacy of their meaning).

But the presentational code works beyond schemes of graphic organization. As it acts on the map as a whole, its effects are *manifest in the whole map*; and some of these are aimed clearly toward extrasignification. The map has a discursive tone: soft/loud, even/dynamic, complacent/agitated, polite/aggressive, soothing/abrasive. The majority of "good" maps position themselves on the left side of these oppositions, more conscious of the demands of . . . professional decorum than sensitive to those of their subject matter—or perhaps their intent is to pacify by shading even the most urgent and disturbing themes into Muzak (the reverse is equally incongruous: some of the most thematically mundane maps bludgeon their viewers with symbols that weigh on the page like musket balls). The map also reflects on itself. It asserts its status among maps in its consumption of resources as mean or lavish, frugal or conspicuous: the scale of its effort, the virtuosity of its craft, its opulence of color, material sensuality, the abundance of surface left unprinted, its sheer size. These gestures are all the more obvious in the atlas, where they can pile up into an object of palpable thickness and weight. So at one extreme we have the Park Avenue hedonism of the *World Geo-Graphic Atlas*, bound by a cloth-wrapped and gold-imprinted cover a quarter of an

inch thick and framed by striking end papers that sprawl over nearly five square feet.[46] At the other extreme we have the grim imperative of *The Nuclear War Atlas:* an anti-atlas in the form of a Marxist tabloid, a document one could well imagine run off after hours on a hand-cranked press and thrust at nervous yuppies on street corners, or nailed to a senator's door.[47] Government maps are especially status-conscious, announcing the cost of their printing or the percentage of recycled pulp in their stock in an effort to disarm the bellicose taxpayer. The map also proclaims its alignment: its professional camp (a Cartographer's map as opposed to a Designer's map), its institutional allegiance (a National Geographic map as opposed to a Bartholomew, a Rand McNally as opposed to an AAA) and occasionally the method and aesthetic of its author (a Bollmann map of Manhattan as opposed to an Anderson). It has a projective aspect as well: it's prepared for a particular audience. It is manufactured for the urbane or the profane, the casual or the attentive, for those at ease with maps or for the cartophobic, for the executive or the mercenary, the well-to-do or the student, the sighted or the blind. It speaks in *their* language: in clinical ascetic, in hot-color High-tech, in journalistic cartoon, in Country and Western, or suburban rec-room.

The presentational code of the map can't be explained as a simple set of rules for graphic organization, especially without defining *whose* rules. Its action is not limited to the structural aspects of presentation or confined to affairs of visual priority and reading sequence (not at least until computers produce maps *for* computers). The map isn't a debating club exercise; it's set firmly in the real world, where the abstraction of structure, order, and articulation cannot be cut away from issues of aesthetics or even belief—any more than the grammar of this text can be separated from its meaning or the attitudes and values of its author.

Sign Functions

Maps are about relationships. In even the least ambitious maps, simple presences are absorbed in multilayered relationships integrating and disintegrating sign functions, packaging and repackaging meanings. The map is a highly complex supersign,[48] a sign composed of lesser signs, or, more accurately, a synthesis of signs; and these are supersigns in their own right, systems of signs of more specific or individual function. It's not that the map conveys meanings so much as *unfolds* them through *a cycle of interpretation* in which it is continually torn down and rebuilt; and, to be truthful, this is not really the map's work but that of its user, who creates a wealth of meaning by selecting and subdividing, combining and recombining its terms in an effort to comprehend and understand. But however elaborate, this is not an unbounded process. Inevitably, it has a

lower bound, the most particular sign function that resists decomposition into constituent signs, and an upper bound, the integral supersign of the entire map that accesses the realm of extrasignification; and between these extremes it is stratified. Twofold stratifications have been repeatedly proposed,[49] and widely accepted, but these don't go far enough. If we intend to explain how the map generates and structures the signing processes by virtue of which it is a map, then we need as least four strata or levels of signification: the *elemental*, the *systemic*, the *synthetic*, and the *presentational*.

At the *elemental* level, visual occurrences (marks) are linked with geographic occurrences (features) in the set of germinal sign functions announced, if incompletely, by the map legend. At the *systemic* level, signs (supersigns) are composed of similar elements, forming systems of features and corresponding systems of marks. At the *synthetic* level (super-supersign?) dissimilar systems enter into an alliance in which they offer meaning to one another and collude in the genesis of an embracing geographic icon. We have at this point a map image; but we don't have a *map* without at least title and legend and, more typically, a host of supportive signs assuming textual, pictorial, diagrammatic, and even cartographic forms. *Presentation* is the level at which the map image is integrated with and positioned in relation to relevant signs in other significant domains, and with which we have finally—or primarily—a complete and legitimized map. We will not take the position that maps are assembled from constituents (perceptually composed) or that they are dismantled into constituents (perceptually decomposed), but we will assume that the map is entered at any level of signification (perhaps many all at once), and that interpretation proceeds in either direction, by integration or disintegration, toward map or toward mark.[50] But not necessarily in a straight line. It may be tempting to regard these levels of signification—partly because of the order of their discussion, partly because of logical predisposition—as stages in a sequential process, which, set in motion, moves inexorably toward a condition of greatest or least integration. That is not our view. These interpretive levels are *simultaneous states* and, although the map—or part of a map—may occupy only one of these states at one instant for one observer, they are all equally accessible through a process of perceptual transformation—that is, a restructuring or refiguring of the map.

Elemental Signs

Elemental map signs, by definition, cannot be decomposed to yield lesser signs referring to *distinct geographic entities*. They are the least significant units that have specific reference to features, concrete (Omaha) or

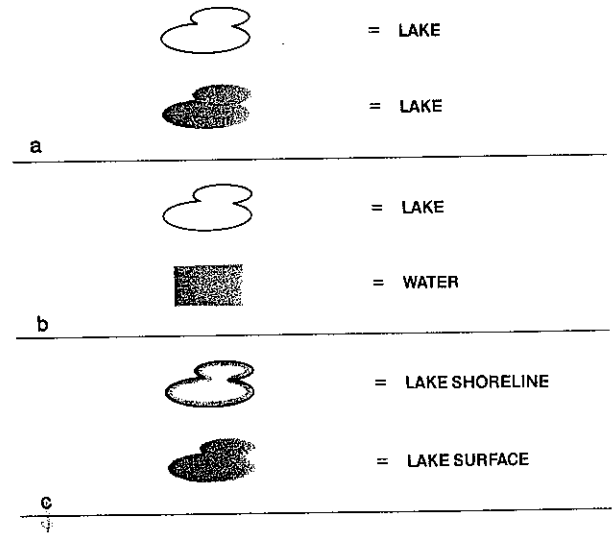
abstract (1,000 pigs), within the map image. Appraised in terms of the map's graphic signifiers, this criterion is easily confused; and we must keep in mind that a sign is not its expression, *but the marriage of expression and content*. The elemental map sign operates at the lower bound of the map's content taxonomy, and below this bound reside connotation and characteristic but nothing that can be construed as feature. Strict linguistic models of maps become hopelessly contorted over this issue if their analogies are pushed too far. *Q.—What is the graphic equivalent of a phoneme? A1.—There isn't one. A2.—It's a misguided question*. As we have seen, the map is an iconic medium that imposes its behavior on language, not the other way around; and there is no reason to expect graphic signs to observe the rigidly contrived, and separately evolved, protocol of phonetic representation.

At the elemental level, graphic mark (a triangular dot, a blue line) is equated with feature (an occurrence of cobalt, a river). But the elemental sign is not, of necessity, univocal. It is common practice in thematic cartography to invent map signs which (as elements) are polymorphic, polychromatic, polyscalar, and in consequence polysemic; and, although each sign generated through such principles refers to one feature, it expresses simultaneously several of that feature's attributes.[51] The elemental nature of map signs resides in the singularity of their geographic reference, not the simplicity of their meaning. Visual simplicity is no yardstick either; elemental signifiers are not restricted to visual primitives like dots and lines. They may just as easily assume more complex or more overtly iconic forms: a juxtaposition of flags signifies a border crossing, a bull's-eye a city, a string of dots and dashes a political boundary. In spite of their complexity, these are elemental signs; they are not decomposed in interpretation: one flag signifies nothing without the other; the dot of the bull's-eye cannot be stripped of its enclosing circle; the patterned line cannot be reduced to Morse Code. None of these will dissolve into autonomous signs.

The autonomy of a sign, and therefore its elemental status, can only be assessed in view of the *entire lexicon of the map that accommodates it*. Take, for example, the signification of a church with the image of a square surmounted by a crucifix. If the square is also deployed *sans* crucifix to represent buildings in general, or if other signifiers can be exchanged for the crucifix to denote a variety of building types, then the square is an elemental expression and the crucifix (or anything else) appended to it is subelemental. The crucifix is, in effect, a qualifier. Its content is characteristic, not feature; and, regardless of its symbolic potency or self-sufficiency outside the map, in the map it has no *geographic* reference independent of the square that serves as its vehicle. This is an elemental *construct*, the syntactical product of two signs, one conjugated with another. Its expression is structurally divisible into two

or more signifiers with both separate and joint meaning (building + Christianity = church). If, on the other hand, the square appears only in conjunction with the crucifix, it has no reference independent of their union, and they must be jointly taken, not as construct, but as an undifferentiated element similar to the juxtaposed flags. This distinction is an important one because it indicates the presence or absence of an elemental syntax.

How are we to interpret two signifiers that apparently claim equal reference to the same feature, as both blue line and blue-tinted area do in the cartographically standard lake sign? We could regard these as coextensive signs manifest, in Klee's terms,[52] as medial and active conditions of the same visual plane. This may be valid with respect to *possible* representations of lakes, but a map can only admit one such possibility to the exclusion of all others: we will not find one lake portrayed as outline, its neighbor as colored area and the next as both.[53] Neither signifier is redundant in the map, *which adopts both*, because, in that context, neither signifies in the other's absence. An alternative analysis, equally from the Formalist perspective, would identify the lake sign as one visual element: formed by its outline and characterized by the color blue (blue in this case has no form but is only an attribute *of* form). Taken as a basis for explaining how the sign functions, how it relates content and expression, this puts us in an absurd position. A lake is



Alternative interpretations of the lake sign: *a* and *b* from a Formalist perspective, and *c* as a sign contract. The resemblance between the shoreline in *c* and pre-lithographic lake signs is anything but coincidental.

signified by a blue line that closes on itself; and, if within that figure we find a blue tint, then the lake is characterized as having water in it! Both of these postures—the former accepting line and area as simultaneous signifiers of the same signified, and the latter accepting only the line as denoting feature and denying formal status to the area it encloses—refuse to acknowledge what we already take for granted . . . that the blue line represents the shoreline of the lake and the blue tint the surface of the lake. Correctly or incorrectly, with naive or deliberate motive, this is how we interpret it, and this is how we map it. Of course the shoreline feature, strictly speaking, does not exist except as a boundary between water and land or as a locus at which the depth of the water table reaches zero with respect to the land surface (whatever that is)—and Keates' objection to the use of boundary signs in street plans applies here as well.[54] But if we can accept contour lines, and other isolines, then we have certainly learned to accept the shoreline: the *surface* of the lake is no more concrete—it is just the boundary between water and air —and the fact that it's planar (we can water ski on it) rather than linear makes it no less an abstraction.

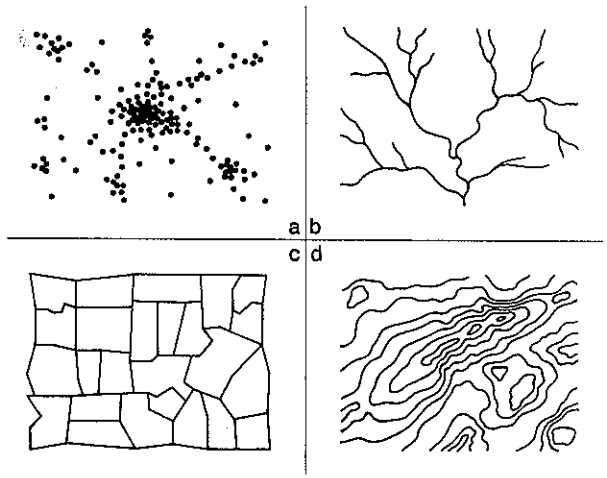
In principle, then, we regard the land surface and the water table as roughly parallel planes (and as everywhere coextensive), and where these planes intersect, we conventionally demark their intersection with a blue line and place a blue tint to one side of that line (preferably the wet side). What we have then are two abstractions, shoreline and water surface, that we are willing to grant status as features (and to map accordingly) while at the same time recognizing them as two of many aspects of *connotations* of the lake (or pond or ocean) feature. So we have another type of sign construct (shoreline + surface = lake), only this time both of its components are features. And it turns out that the blue line, in and of itself, does not represent the shoreline after all (although it may represent a river in the same map) but does so only in the presence of a blue tint on one side and none on the other: *as part of a sign construct*.[55] Thus whereas the language of the map is drawn from a store of culturally prescribed possibilities, its terms are specifically defined only in application, where the semantic field and syntactical procedures of the individual map form a unique dialect or *sémie*.

We have tried to demonstrate why we must insist that map signs be considered in terms of both expression *and* content, and to point out the inadequacy of a Formalist perspective that regards only signifiers but not signs, as well as to suggest the degree to which our conceptualization of phenomena structures, even dictates, the manner in which we represent them. Thus an elemental sign is a *sign of elemental meaning*, one which refers to an element of the landscape that, however artificial, we are not inclined to tear into constituent bits. With this premise it is possible to build systems of signs, and systemic meaning, from elements.

Sign Systems

By sign system we mean a set or family of similar elemental signs *extensive in the space of the map image:* a distribution of statistical units, a network of channels, a matrix of areal entities, a nesting of isolines. In this respect, we identify a road system, a river system, or a system of cities. It requires that we interpret many like signs as one sign, again a syntactical product but now one of . . . *geographic* syntax. This systemic signifier is shaped by the disposition of its corresponding set of phenomena in geodesic space and by the topological transformation that brings this space to the surface of the page. It is also shaped by the way we define elements in the first place. If we were to map, say, the distribution of mountainous regions in the United States by taking as our criterion the (rather over-simplified) notion that all lands elevated 1500 meters or more qualify and that those of lesser elevation do not, we will find in our map a quite different sign system than if we had chosen 2000 meters as our benchmark. It isn't usually this innocent. What if we were mapping toxic levels of airborne pollutants? What the map says on this subject is determined by what standards, *whose* standards, we accept as a yardstick of toxicity. *In content a system is, after all, a system of features—and features only exist when we recognize them as such.*

An arrangement of signifiers on the map constitutes a system only, of course, by virtue of our ability perceptually to organize its elements into something whole. At the systemic level, the bases of



Typical cartographic sign systems: *a*, a discrete distribution; *b*, a network of signs; *c*, a sign matrix; *d*, nested signs. Regardless of implantation or graphic symbolism, each system structures the landscape in a distinctly different manner.

affinity among elements are those of *implantation* (yielding point, line, or area systems) and those formal and chromatic attributes variously termed *qualitative, nominal, distinguishing,* or *differential.* Not surprisingly, the latter are as effective among linguistic signs as among iconic signs, distinguishing hydrographic nomenclature, for example, by italic form or blue color. What is surprising, however, is the degree of variation the systemic signifier will tolerate without falling to pieces. Our highway maps, almost to the last, serve up pavement in a *smorgasbord* of colors: red, blue, yellow, black, brown, whatever is in the printer's pantry. If the object is to represent a coherent highway *system,* then we could hardly do more to subvert its recognition. But that object is secondary to the marking out of politically based *subsystems,* the sifting out of the relative accomplishments of federal, state and county treasuries. These maps can't just be written off as the products of illogical design or aesthetic insensitivity; they are graphic examples of how the extrasignificant functions of the map . . . *penetrate* to its most practical and seemingly dispassionate design decisions.

The reason we can get away with this sort of thing is that, with the exception of scattered distributions, cartographic sign systems are typified by connectivity. Their elements link up, abut, cradle or nest within one another. *They have anatomies.* We recognize primarily their structure and utilize the characteristics of their elements mainly to highlight subsystems that would be otherwise undifferentiated, or to unstick systems of similar structure. *That is to say, we attend more to the syntax of the system than the semantic import of its components.* We don't distinguish blue highways from rivers because their signifiers are a little wider and a little less sinuous, but because they are *structured differently as systems,* because they are manifestly *different landscapes.* The system is a landscape because, whereas the element simply *is* somewhere, the system . . . *goes* somewhere.

Synthesis

As we have said before, there is no such things as a monothematic map. Consider this emblem of thematic cartography: an array of graduated circles against the barest outline of subject area. Such a map image may signify a shoreline (usually elaborated beyond any conceivable utility), the water surface, the land surface, and one or more proprietary boundaries, and—almost forgot—whatever it is the graduated circles might represent. Stripping off the circles leaves us with an absolute minimum of three sign systems, and usually twice that many, lurking behind the ostensibly servile trace of the pen. Certainly cartographers design maps for cartographers—as architects design buildings for

architects and politicians make laws for politicians—but to pretend that this is monothematic is . . . *insane.* Can we really take that much for granted? Are we so thoroughly hypnotized that we can't even *see* the map?

Maps are about relationships. In other words, they are about how one landscape—a landscape of roads, of rivers, of cities, government, sustenance, poison, the good life, of whatever—is positioned in relation to another. The map synthesizes these diverse landscapes, projecting them onto and into one another, with less than subtle hints that one is correlative to another or that *this* is an agent or effect of *that.* The map can't simply say that something is present (present . . . *in what?*) or that it is distributed in a certain way (distributed in relation . . . *to what?*). At this level the map image as a whole is the supersign, and the various *systems* it resolves to are its constituent signs, signs that can only have meaning in relation to other signs. Merleau-Ponty puts it this way:

> What we have learned from Saussure is that, taken singly, signs do not signify anything, and that each one of them does not so much express a meaning as mark a divergence of meaning between itself and other signs. Since the same can be said for all other signs, we may conclude that language is made of differences without terms; or more exactly, that the terms of language are engendered only by the differences which appear among them. This is a difficult idea, because common sense tells us that if term A and term B do not have any meaning at all, it is hard to see how there could be a difference of meaning between them; and that if communication really did go from the whole of the speaker's language to the whole of the hearer's language, one would have to know the language in order to learn it. But the objection is of the same kind as Zeno's paradoxes; and as they are overcome by the act of movement, it is overcome by the use of speech.[56]

What could be signified by any system of distributed dots, or branching lines, or nested lines? *Not much.* If juxtaposed with a sign system that we could recognize, or furnished with a nomenclature that allowed us to supply that system, they could become signs, not by virtue of any abstract geographic reference but *in relation to* another sign system that holds meaning for the observer.[57] If you have to resort to the map title to determine that *this* map of teenage suicides takes place in Los Angeles, then you're probably too far removed to be concerned. What the map *does* (and this is its most important internal sign function) is permit its constituent systems to open and maintain a dialogue with one another. It is obvious why a road folds back on itself when we can see the slope it ascends, or why two roads parallel one another a stone's throw apart when we can see them on opposite banks of a river, or why an interstate cramps into a tense circle when we can see the city and its

rush-hour torment. We *know* the behavior of this system so well, in fact, that we can take it as an index[58] of other systems in the total absence of their direct representation. On the face of it, the map confirms these understandings; but they are understandings . . . *that have already been created by maps*.

The *gestalt*[59] of each sign system is positioned against the semiotic ground of another sign system, or a subsynthesis of systems. The roads in the state highway map aren't grounded against an insignificant white surface; they're grounded against North Carolina or Illinois or Texas. What lies between the roads isn't aether (it isn't 40 lb. Springhill Offset either): it's tobacco and loblolly pine and patches of red dirt rolling over the Piedmont, or rugose mats of corn dotted with crows and John Deeres, or relentless miles of sand and prickly pear rippling in the heat. *There is nothing in the map that fails to signify*. Not even in a map of the Moon. So the flow of water is interpreted against the ground of land form, and *vice versa;* and the pattern of forestation is interpreted against the ground of both, as both and each are interpreted against it. In the synthesized map image . . . *every sign system is potentially figure and every sign system is potentially ground*. There is nothing inherently or irrevocably ground about even the land mass: try telling a truckload of surfers the shoreline in the highway map is just a backdrop to the road system. They'll let you know you have it all backwards.[60]

The map image is a synthesis of spatially and temporally registered *gestalten*, each a synthesis in its own right; and to pretend that this whole is no more than the sum of its parts, or that we can do no more than recommend a certain alignment of their priorities, is to reduce our concept of the map to that of a diagram. No degree of thematic constriction can silence the conversation among map signs. The map models the world as an interplay of systems and presents it to us as a multi-voiced analogue, with harmonies and dissonances clearly discernible. Through the map we observe how systems respond to one another, and appraise the nature and degree of that response. We *explore the world through the map*, not as vicarious Amazon travelers hacking across the pages of *National Geographic*, but by remaking it in our own chosen terms and wringing as much meaning as we can out of what we've made.

Presentation

In presentation the map attains . . . *the level of discourse*. Its discursive form may be as simple as a single map image rendered comprehensible by the presence of title, legend, and scale; or as complex as those in *The New State of the World Atlas*,[61] hurling multiple map images, diagrams, graphs, tables, and texts at their audience in a raging polemic. It may be as diverse

as vacation triptiks, rotating cardboard star finders, perspex-slabbed shopping center guides, chatty supermarket video displays, or place mats for formica diner tables. Presentation is more than placing the map image in the context of other signs; it's placing the map in the context of its audience. Robert Scholes identifies discourse, in the arena of literature, as:

> Those aspects of a text which are appraisive, evaluative, persuasive, or rhetorical, as opposed to those which simply name, locate, and recount. We also speak of "forms of discourse" as generic models for utterances of particular sorts. Both the sonnet and the medical prescription can be regarded as forms of discourse that are bound by rules which cover not only their verbal procedures but their social production and exchange as well.[62]

And he notes that the: " . . . coding of discourse is a formal strategy, a means of structuring that enables the maker of the discourse to communicate certain kinds of meaning."[63]

Discourse is preceded by a code of presentation and by the notion of an audience capable of applying that code to reach meaning *through* structure. For us, this means that the idea of "percipient" must be extended to the entire culture of mapmakers and map-users and include, as one of its most prominent aspects, their ability to generate and utilize strategic codes that permit maps to speak *about* the world rather than simply of it.

In bringing the map to this point we make it entirely accessible to the processes of extrasignification, and subject to their appropriation. It can be seized and carried off whole (necessarily whole) to serve the motives of mythic representation. The plan of the shopping center, color-coded, with shops topically and alphabetically organized and numerically keyed—a paradigm of logical graphic representation for the illogical masses—becomes an expression of the fact that "We've got it all: trendy clothes, trendy shoes, books, records, tools, cameras, jewelry, fondue pots, exotic coffees, pizza and parking." The diner placemat ceases to be a regional guide to places of interest and focal points of recreation (it was never meant as a gravy blotter or it wouldn't have been printed in the first place) and becomes the Chamber of Commerce's propaganda vehicle, complete with smiling checker-shirted fishermen tugging against smiling bass the size of Volkswagens. Which brings us back to where we started. The map is simultaneously an instrument of communication—intrasignification, given the benefit of doubt—and an instrument of persuasion—extrasignification and its propensity toward myth.

Presentation locates the map front and center in all this action, at the vertex of both planes of signification. It's not a quirk of house style

that populates the *National Geographic* map with maize-laden Cherokee or the state highway map with trees, bees, civil war artifacts and cavorting tourists. It's the deliberate activation of popular visual discourse. It's not just pragmatism or objectivity that dresses the topographic map with reliability diagrams and magnetic error diagrams and multiple referencing grids, or the thematic map with the trappings of f-scaled symbols and psychometrically divided grays. It's the urge to claim the map as a scientific instrument and accrue to it all the mute credibility and faith that this demands. Presentation, as the end and the beginning of the map, closes the loop of its design. It makes the map whole and, in doing so, prepares it for a role that begins where its avowed attention to symbolism, geodesic accuracy, visual priority, and graphic organization leaves off.

It injects the map into its culture.

CHAPTER SIX

Each Sign Has a History

And the culture accepts the map. The culture receives it, is at home to it, welcomes it with open arms. A kid picks up *Winnie-the-Pooh* and makes complete sense of the map on the endpapers . . . without having had the slightest instruction in map reading. Another opens *The Hobbit* and, though the map lacks a legend, is nonetheless able to follow Bilbo and the dwarves across Wilderland. The children who read *Swallows and Amazons* experience no difficulty in understanding the relationship between Beckfoot and Holly Howe, even though the map is oriented with east at the top. Readers of *Mistress Masham's Repose* understand Raymond McGrath's map of Malplaquet, despite the fact that it's been reversed out. Although the legend to the map in *Big Tiger and Christian* omits the desert symbol, no one mistakes the pattern of dots for anything else. What kid has had a problem with the map in *Treasure Island?* With making sense of the map—and its two scales—in *Astérix le Gaulois?* With the map in *Paddle-to-the-Sea?* or the one in *Scuffy the Tugboat?*[1] Why is there so little . . . *resistance* on the part of even children to what we have just seen is an endlessly coded synthesis of sign systems, a veritable baroque of sign functions layered, one on top of the other, in dizzying density?

It is because the map is not apart from its culture but instead a *part* of its culture. It is because, as a map-immersed people, its history is our history. It is because we grow up into, effortlessly develop into, this culture . . . which is a culture of the map. Why does no kid find it difficult to make sense of the map on the endpapers of *Winnie-the-Pooh?* Because the conventions of that map are all but continuous with those *of the rest of the illustrations* in that book, and the rest of the illustrations are all but continuous with the larger *world of illustration* of which *Winnie-the-Pooh* is only a part. In its turn this *world of illustration* is seamlessly connected to a still larger *universe of representations* in which the child has been

58. Quoted in Samuel Eliot Morrison and Henry Steel Commager, *The Growth of the American Republic*, Oxford University Press, New York, 1937, p. 131.

59. Nevins, *op. cit.*, p. 409. Adams says "he was the more struck by Hewitt's saying, at the end of his laborious career as a legislator, that he left behind him no permanent result except the Act consolidating the Surveys," *op. cit.*, p. 275. But what I'm the more struck by is the contending presence, a hundred and twenty years ago of precisely the same forces—*advancing the same arguments*—that Mack documents for the Landsat satellite.

60. Thompson, *op. cit.*, p. v. The quote stands alone in splendid isolation just after the copyright page as, one presumes, the guiding spirit of the project, not only the Survey's project of mapping America, but Thompson's in writing its "official" description, whose "primary emphasis . . . is on topographic maps" (p. 14).

61. How will it be emptied? By mapping. First the topographers will describe the surface. Then field geologists, using these as base maps, will describe what's underneath. Then the prospectors will show up, mines will sprout, towns, schools, *yellow* school buses. Soon enough it will seem never to have been otherwise. Nevins refer to it as, "the work of reducing the vast trans-Missouri West to the uses of civilization" (*op. cit.*, p. 407). Isn't that perfect? *Reducing it to . . .*

62. In 1992 this optimistic vision is no longer sustainable, because, as Maurice Strong, Secretary General of the United Nations Conference on Environment and Development, recently put it, "The development model which has produced the life styles that we in the industrialized world and the privileged minority in developing countries enjoy is simply not sustainable." He goes on to describe what will be necessary to put us on the path to a more secure and sustainable future: "At the core of this shift there will have to be fundamental changes in our economic life—a more careful and caring use of the earth's resources and greater cooperation and equity in sharing the benefits as well as the risks of our technological civilization" (quoted by Alan P. Ternes, "Great Expectations," *Natural History*, June, 1992, p. 6). The *best* face we can put on the mission of the Survey is no longer a very positive one.

63. These recall to us the rest of Thompson's list of purposes topographic survey sheets might serve: exploring, selecting damsites, locating communication facilities, selecting industrial sites, routing pipelines, planning highways.

64. Rarely has this voice seemed as hollow as when David Love speaks it in John McPhee's *Rising From the Plains* (Farrar, Strauss, Giroux, New York, 1986). Love is a preeminent field geologist of the United States Geological Survey, "the grand old man of Rocky Mountain geology." Born and raised among them, he loves the Wyoming Rockies. When his science leads him to the discovery of oil under Yellowstone National Park, he does not hesitate to follow. McPhee says that, "In pursuing this project, the environmentalist in him balked, the user of resources preferred the resources somewhere else, but the scientist rode on with the rod. He knew he would bring scorn upon himself, but he was not about to stifle his science for anybody's beliefs or opinions"(p. 205). McPhee quotes Love saying, "A scientist, as a scientist, does not determine what should be the public policy in terms of exploration for oil and gas" (p. 204–205), especially when the agency of the government he works for is dedicated to the description of the

resources of the country for *their economic exploitation*. McPhee describes Love's tone of voice as seeming "to exclude both emotion and opinion" (p. 204), that is, as . . . *the voice of science* . . . but one reduced to a simple instrument of the capital which sustains it.

Chapter Five

1. As will become more apparent below, it is not irrelevant that were our legend a photograph in the *National Geographic Magazine*, it is this pendent sentence that would be called the "legend." At the Geographic, caption writing is an art practiced by those in the Legends Division.

2. Arthur Robinson *et al.*, *Elements of Cartography, Fifth Edition*, John Wiley & Sons, New York, 1984, p. 159. It is instructive that, despite their indispensability, legends are granted but two paragraphs in the chapter on *design*, where they play the role of illustrations of the principles of figure-ground relationships. In light of the discussion, below, of the "naturalization" function of myth, it is not surprising that Robinson *et al.* should have said, 'naturally indispensable.'

3. *Ibid.*

4. Ulla Ehrensvärd says, "the role color plays on maps has yet to receive thorough historical scrutiny," and this remains true despite her, "Color in Cartography: A Historical Survey," in David Woodward, editor, *Art and Cartography*, University of Chicago Press, Chicago, 1987, pp. 123–146. See my review in *Cartographica*, *24*(3), Autumn, 1987, pp. 76–82, especially, on color, pp. 80–82.

5. Of course the contradictions here are . . . *terrifying*. Animals and roads don't, after all . . . *mix*. In this afternoon's mail, comes this from James Berry:

> "The rabbits are all gone," someone said. "I haven't seen a rabbit in years; they used to be everywhere." And in Halifax [North Carolina] the other day at a meeting of retired school teachers someone said, "Do you ever see rabbits anymore?" And everybody shook their heads and wondered. And on the way from Raleigh to Chapel Hill Tuesday, I saw six run-over possums and two raccoons and three thousand pushed-over trees and fifty earth movers smoking and chugging and doing the only thing they can do: clearing and grading. So the creatures had to flee. Where could they go? Someone spoke up. "That's what it means to have a job. You have to have a job to get money, and you have to have money to live, and having a job means you have to be doing something, and everything you do changes the world. So you see, it's just the way it is. The creatures have to go. Rabbits and possums and raccoons and trees and woodpeckers and all, what do they matter? Roads! That's what North Carolina's all about. North Carolina's about roads and more roads. And it's about automobiles. You got to be able to go from anywhere to anywhere at sixty miles an hour; without stopping. The creatures can just get out of the way." (James Berry, "It's People or

Rabbits, Reprise, March, 1985," *The Center for Reflection on the Second Law, Circular 146*, May, 1992, p. 1)

And of course . . . this is the North Carolina of the road map!

6. This is no longer, if it ever was, quite true, though with 77,058 miles to Texas' 77,075 miles, it's as close as possible (according to "Officials say bridges still get less attention," *News and Observer*, May, 18, 1992, p. B2).

7. Roland Barthes, *Mythologies*, Hill and Wang, New York, 1972, p. 109. Felicitously translated by Annette Lavers, *Mythologies* consists of a number of 'mythologies' followed by the long essay, "Myth Today." It is from this latter that this reference and the following quotation come.

8. *Ibid.*, p. 115–116.

9. *Ibid.*, p. 115.

10. *Ibid.*, *p. 131.*

11. This is even more obvious at the county level: it would be genuinely helpful to distinguish counties prohibiting the sale of alcoholic beverages from those selling beer and wine and mixed drinks. But in fact the carefully delineated counties are not distinguished in any way. Then why show them? It is not a question that can be answered at the level of language. Only on the level of myth is their presence explicable, where North Carolina (and any other state), defender of states' rights (as it has to be), can be seen to dissolve in turn into its constituent counties, their boundaries an unscreened application of the yellow used to demarcate the sovereignties surrounding North Carolina, leaking, as it were, into the state via these county edges.

12. This is the sole acknowledgment of the presence of native Americans in North Carolina, though North Carolina has the largest number of them of any state east of the Mississippi. Is this information that properly belongs on a state highway map? Maybe, maybe not, but at this point it has become difficult to ignore the fact that North Carolina exists at all only because the native Americans were dispossessed of the territory our map so convincingly *possesses* in the name of North Carolina. Brian Harley treats the theme pretty generally in "Victims of a Map: New England Cartography and the Native Americans," paper read at the Land of Norumbega Conference, Portland Maine, December, 1988.

13. In Chapter One we saw how this issue reduced the editors of *The Times Atlas of the World* to gobbledygook. The question is whether mapmakers are ever going to be willing to accept their personal responsibility for the decisions they make, or will forever . . . pass these off onto the world.

14. Or even the fact, highly relevant to motorists, that along with its award for most miles in a state maintained highway system (or close to it), North Carolina *also* gets the award for *most substandard state-owned bridges*. According to *Better Roads*, a transportation trade magazine, 8,286 of the state's 16,828 bridges were either substandard or functionally obsolete. Commenting on the issue, Bill Holman, an environmental lobbyist, observed that part of the trouble is that businesses are more interested in new roads than in improving old ones: "You don't open up new areas to development when you replace a bridge," Holman said ("Officials say bridges still get less attention," *News and Observer*, May, 18, 1992, p. B2). As I write this Barry Yeoman, writing in the Raleigh-area *The Independent*,

has inaugurated a five-part series, "Highway Robbery: How Campaign Do Rule the Roads," in the first part of which he documents the relationship betw routes and campaign contributions (Barry Yeoman, "Paving Under the Ir ence," *The Independent*, *10*(21), May 20–26, pp. 8–13). It just underlines contention—here, in this immediate, local context—that what gets mapp what makes money for those who have money. And all the rest of it is a kin technical handwaving.

15. It is also a sixth as many as the state printed of its *1988–1989 N Carolina Coastal Boating Guide* (100,000 copies) and a third as many as it pri of its *North Carolina Variety Vacationland 1989–1990 Aeronautical Chart* (40 copies). The state's priorities could not be clearer: road maps, 1.6 million co boat maps, 100,000 copies; maps for private planes, 40,000 copies; maps for pu transportation, 15,000 copies. North Carolina publishes the edition size and per copy on all public documents. Our copy of the *Public Transportation Gui* the map's second edition—carries a 1985 date. Curiously, although the go nor's wife's photograph graces the highway map, it is missing from the pu transportation guide, where he stands alone.

16. See, for instance, the beautiful treatment of the "Top Hat, White and Tails" number from Astaire's *Top Hat* in Gerald Mast's *Howard Ha Storyteller*, Oxford University Press, New York, 1982, pp. 21–24, which consi each of these elements (except for Ginger, of course).

17. Umberto Eco, *A Theory of Semiotics*, Indiana, Bloomington. 1976. 48–49.

18. *Ibid.*, p. 49.

19. Jonathan Culler, *The Pursuit of Signs: Semiotics, Literature, De struction*, Cornell, Ithaca. 1981, p. 24.

20. Roland Barthes, *Camera Lucida*, Hill and Wang, New York, 1981. 100–102.

21. These examples come from the verso of "Central America," publishe a supplement to the *National Geographic*, April 1986, 466A.

22. The Central America map is as cited above. That of the Central Pl comes from the verso of "Central Plains," published as a supplement to *National Geographic*, September 1985, 352A.

23. The reference is to the original edition of *The Nuclear War Atl* two-by-four foot sheet with 28 two-color maps recto—in inflammatory black red—and text verso published by The Society for Human Exploration, Victo ille, Quebec, 1982; although the Backwell version we have cited previous socially conscious enough (William Bunge, *Nuclear War Atlas*, Basil Black Oxford, 1988).

24. Michael Kidron and Ronald Segal, *The State of the World Atlas*, Si and Schuster, New York, 1981. This was followed by a second edition, *The State of the World Atlas*, Simon and Schuster, New York, 1984; a third edition, *New State of the World Atlas Revised and Updated*, Simon and Schuster, New Y 1987. A fourth edition has since been published. It has spawned a whole fa of similarly engaged atlases: Michael Kidron and Dan Smith's *The War Atlas*, Books, London, 1983; their *The New Atlas of War and Peace*, Simon and Schu New York, 1991; Joni Seager and Ann Olson's *Women in the W*

Atlas, Simon and Schuster, New York, 1986; and Joni Seager's *The State of the Earth Atlas*, Simon and Schuster, New York, 1990. In each of these the violation not only of good cartographic taste, but map reticence about its interests signals . . . *righteous indignation*.

25. See Mark Monmonier's trenchant treatment of the Love Canal issue in *How to Lie with Maps*, University of Chicago Press, 1991, pp. 121–122. With respect to the absence of this infamous toxic waste site on recent Survey quads he argues, "Although both federal and state mapping agencies might contend that topographic maps should only show standardized sets of readily visible, more-or-less permanent features, such assertions seem hypocritical when these agencies' maps routinely include boundary lines, drive-in movie theaters, and other elements far less important to human health." Why couldn't he be equally perspicacious with respect to maps in general? Brian Harley, of course, notes that "Official map-making agencies, usually under the cloak of 'national security,' have been traditionally reticent about publishing details about what rules govern the information they exclude especially where this involves military installations or other politically sensitive sites," in J. B. Harley, "Maps, Knowledge, and Power," in Denis Cosgrove and Stephen Daniels, editors, *The Iconography of Landscape*, Cambridge University Press, Cambridge, 1988, p. 306.

26. Roland Barthes, "The Plates of the Encyclopedia," in *New Critical Essays*, Hill and Wang, New York, 1980, p. 27.

27. The *New York Picture Map* was created by Hermann Bollmann for Pictorial Maps Incorporated, New York. The recto carries Bollmann's rendering of midtown Manhattan in five colors, and the verso a two-color planimetric map of the city of New York. Approximately 34 by 43 inches, the map sheet folds to fit a jacket that includes 48 pages of text. It is not dated. For another approach to a not dissimilar issue, see Edward Tufte's treatment of Constantine Anderson's highly similar axonometric of a nearly identical portion of midtown Manhattan (*Envisioning Information*, Graphics Press, Cheshire, Connecticut, 1990, p. 37). Tufte's conclusion? A most unconventional design strategy: "*to clarify, add detail.*"

28. R. L. Gregory, in *Eye and Brain: The Psychology of Seeing* (McGraw-Hill, New York and Toronto, second edition, 1973, pp. 160–176), identifies *personal experience* and the *geometry of environment* as key ingredients of our ability to decode perspective transcriptions.

29. Nikhil Bhattacharya, "A picture and a thousand words," in *Semiotica*, *52*(3/4), 1984, pp. 213–246. This, and several of the references that follow, are from this special issue titled *The Semiotics of the Visual: On Defining the Field*, edited by Mihai Nadin.

30. *Pretense* because unlike the *Earth at Night* (W. T. Sullivan, *Earth at Night* Hansen Planetarium, Salt Lake City, 1986), this map is really a map of population distribution, not night lights: *Map GE-70, No. 1, Population Distribution, Urban and Rural in the United States: 1970 (nighttime view)*, Bureau of the Census, U.S. Department of Commerce, Washington, D.C.

31. The distinction being drawn here is essentially the same as that of Hansgeorg Schlichtmann, "Characteristic Traits of the Semiotic System 'Map Symbolism,'" in *The Cartographic Journal*, *22*(1), June 1985, pp. 23–30. Schlichtmann differentiates "plan information" from "plan-free information" on the basis

of the former's inclusion of location, and content items contingent thereon (*i.e.*, transcribed shape and extent).

32. Compare, for example, the satellite image reproduced on pages 28 and 29 of the *Atlas of North America: Space Age Portrait of a Continent*, National Geographic Society, Washington, D.C., 1985; or that on page 54 of Michael and Susan Southworth, *Maps: A Visual Survey and Design Guide*, Little, Brown, and Co., Boston, 1982; or, of course, the Hansen map, *op. cit.*

33. The term "metaphor" is used here in the most general sense of representation through a surrogate interpretant. Bethany Johns, in "Visual Metaphor: Lost and Found" (*Semiotica*, *52*(3/4), 1984, pp. 291–333), distinguishes between metonymy (whole-for-part metaphor) and synechdoche (part-for-whole metaphor). Some authors invert this terminology. Within written language, distinctions among metaphoric types are numerous; but their applications to graphic signs are largely unexplored and of questionable utility.

34. Barbara S. Bartz, "Type Variation and the Problem of Cartographic Type Legibility—Part One," in *The Journal of Typographic Research*, *3*(2), April 1969, pp. 130–135, summarizes the iconic ("analogous") characteristics of letterforms in the cartographic context as those referring to location (point location, linear and areal extent, shape and orientation of feature), quality, quantity, and value (relative importance).

35. Southworth and Southworth, *op. cit.*, p. 189, reproduce two examples; Kevin Lynch reproduces another (*Managing the Sense of a Region*, MIT Press, Cambridge, 1976, pp. 158–159 and dust jacket).

36. Paschal C. Viglionese, "The Inner Functioning of Words: Inconicity in Poetic Language," in *Visible Language*, *19*(3), 1985, pp. 373–386, foregrounds these potentials in a series of analyses attentive to the pre-phonographic origins of linguistic expression and the cultural bases of iconicity.

37. In Chapter Three we referred to this by its more familiar name, *projection*, though we actually treated it, explicitly, as a code. By reducing *all* aspects of map production equally to codes, we hope to reveal the similarity among what are usually entirely segregated. Thus, ordinarily, projections are treated as problems in . . . mathematics, but map layouts as ones of . . . design (whence a lot of the old science/art distinction, despite the fact that science can hardly be reduced to math, or art to design). In fact, both are equally . . . *coded* (only the codes are different).

38. A classical example would be the 23 small multiples of Los Angeles air pollution showing the average hourly distribution of reactive hydrocarbons that Tufte illustrates in *The Visual Display of Quantitative Information*, *op. cit.*, p. 170; but Stephen Hall illustrates images he calls maps of phenomenon transpiring in small parts of nanoseconds. See the image of the creation of the first Z particle observed in Stephen Hall, *Mapping the Next Millennium: The Discovery of New Geographies*, Random House, New York, 1992, between pp. 240 and 241.

39. These examples are from J. B. Post, *An Atlas of Fantasy*, Mirage Press, Baltimore, 1973. A revised edition is published by Ballantine Books, New York, 1979.

40. We refer here to the maps occupying pp. 80–81 and 148–149 of *Goode's World Atlas, Sixteenth Edition*, Rand McNally and Co., Chicago, 1982.

41. One might reflect here on the currency of data drawn from geographic

information systems, the difference in time between their point of acquisition and point of use, and the liability potentially incurred. Given the naive tendency of most users to accept any electronically-coded information as current, the onus is clearly on the purveyor of information to inform the user to the contrary. Political bubble-bursting notwithstanding, this is a responsibility that the system manager ignores at his own peril: unearthing a telephone cable is one thing; cracking open an oil tanker is quite another.

42. Recently this similarity has been increasingly acknowledged. See, for example, Nina Siu-Ngan Lam and Dale A. Quattrochi, "On the Issues of Scale, Resolution, and Fractal Analysis in the Mapping Sciences," *Professional Geographer*, *44*(1), 1992, pp. 88–98, where "scale" and "resolution" refer equally to spatial, temporal and "spatio-temporal" domains. Note the up-to-date use of "mapping sciences". What Lam and Quattrochi really make clear, however, are the number of *new* avenues for political activity in the process of mapping.

43. Tommy Carlstein, *Time Resources, Society and Ecology*, George Allen and Unwin, London, 1982, pp. 38–64, argues convincingly for a 'time-space' framework of geographic notation. So does Allan Pred, most comprehensively in *Making Histories and Constructing Human Geographies: The Local Transformation of Practice, Power Relations, and Consciousness*, Westview, Boulder, 1990.

44. This map is reproduced, with some fanfare, in Edward R. Tufte, *The Visual Display of Quantitative Information*, Graphics Press, Connecticut, Cheshire, 1983, pp. 41 and 176.

45. The example at hand concludes the *North American Road Atlas* published by the American Automobile Association, Falls Church, Virginia, 1984.

46. *The World Geo-Graphic Atlas: A Composite of Man's Environment*, edited and designed by Herbert Bayer, was produced in 1953 for the Container Corporation of America. Described in the foreword as "an effort to contribute modestly to the realms of education and good taste," it is, as a gesture of corporate good will or a device of corporate promotion (take your pick), an exceptionally lavish and ambitious volume. On the role of "exchange value" at the expense of "use value" in Bayer's involvement with the Container Corporation of America, see Folke Nyberg's comments in his "From *Baukunst* to Bauhaus," *Journal of Architectural Education*, *45*(3), May, 1992, p. 136.

47. Which is pretty much, but not quite the story. In his preface to the Blackwell edition, Bunge has this to say about the original, poster version:

> On a brief visit back to Toronto, James Cameron, a geographer at York University, suggested that I do an atlas on nuclear war. York provided newspaper clippings and some cartographic work through the efforts of Gerry Bessenbrugge but soon broke off its involvement. Yet my wife and I persisted, and this resulted in the poster edition of this atlas which was on the streets in June, 1982, just one week too late for the great United Nations demonstration in New York City. The first edition of the atlas was designed for field use among the unemployed of Detroit's black slum ghetto ... The original edition was in the tradition of *Lobeck's Physiographic Diagram of North America*, with 20,000 words of text on one side and 28 maps on the other, suitable for poster display upon completion of reading it. The 20 in. x 34 in. poster folded into a 5 in. x 8 in. size designed for peace demonstrations, where it was abundantly sold. Selling the atlas as an excuse to talk peace during the summers of 1982 and 1983, talking to thousands of people door-to-door, often at great length, especially in Toronto, retaught me Detroit's lesson that people needed, as well as a dire warning, hope and a more articulated plan for saving children (William Bunge, *The Nuclear War Atlas*, Basil Blackwell, Oxford, 1988, pp. xxi–xxii).

Although hardly likely to inspire envy among many professiona cartographers, this atlas in its poster form assumed the form appropriate to it purpose. It would be hard to imagine as an expensive coffee-table book like th *World Geo-Graphic Atlas* except, perhaps, as a device of the blackest humor.

48. This term is more widely accepted among graphic designers than amon linguists. Thomas Ockerse and Hans Van Dijk, "Semiotics and Graphic Desig Education," [*Visible Language*, *8*(4), 1979, p. 363] describe the supersign as, " sign which allows for a complex simultaneity of possible interpretants." I "De-Sign/Super-Sign" [*Semiotica*, *52*(3/4), 1984, pp. 251–252], Ockerse elabo rates on,

> The problem of defining the so-called 'super-sign.' This means to provide a rational system for communication wherein the sum forms the major mode of signification. The participating elements within this complex whole contribute bits of information. The whole is actually a sign made up of other signs; more precisely, the supersign is a sign system. This system is intended to include all signs that operate within the system or that can/will influence the system: the bits, their structural relations, the sum representations created by the juxtapositions of micro- and macro-elements (bits to bits, bits to groups, groups to groups, groups to the whole, the whole to others, etc.). Involved are potential layers and levels of information (in terms of importance, denotative and connotative references) for reader/viewer. The supersign is like a text; but its potential is even intertextual, a characteristic of signs. In fact, the supersign concept even provides a system that invites the reader/viewer to become an active participant in a generative process.

It will become apparent that, in our analysis, the term "system" has a mor specific meaning than that intended by Ockerse; but this does not indicat disagreement over the nature or function of the supersign.

49. C. Grant Head, "The Map as Natural Language: A Paradigm fo Understanding" (*Cartographica*, *21*(1), 1984, pp. 1–32) stresses two levels o interpretation, citing the following: Barbara Bartz Petchenik, "From Place t Space: The Psychological Achievement of Thematic Mapping," *The America Cartographer*, 6, 1979, pp. 5–12; Judy M. Olson, "A co-ordinated approach t map communication improvement," *American Cartographer*, 3, 1976, pp 151–159; and Jacques Bertin, "La test de base de la graphique," *Bulletin d Comitrancais de Cartographie*, *79*, 1979, pp. 3–18. Among these, however, it turn

out that only Petchenik's analysis is entirely restricted to two levels ("being-in-place" and "knowing-about-space"): Olson's "Level One" and "Level Two" are supplemented by a "Level Three" that is curiously distinct in its attention to meanings; and Bertin, in *Semiology of Graphics* (University of Wisconsin Press, Madison, 1983, pp. 141 and 151), acknowledges a variety of "intermediate" levels between the "elementary" and the "overall". Schlichtmann (*op. cit.*, pp. 25 and 27–28) identifies three levels of signification—"minimal signs, macrosigns, and texts"—which seem to differ more in extent than degree of synthesis. While none of these analyses recognizes a presentational, or discursive, level of signification, our terms are probably in closest agreement with Schlichtmann's.

50. Our concern here is not the neurological processing of stimuli, but the *interpretation* of visual signs. The map user, regardless of—and oblivious to—physiological means, is obviously capable of both composing and decomposing complex signs; one of these abilities is of little use without the other. There seems to be a tendency among cartographers to regard perception as an exclusively constructive—even additive—process, encouraged perhaps by an affinity for mechanistic perceptual models that, for the most part, simply invert the biological metaphors of technological design (offering cameras for eyes, telecommunications systems for neural systems, or industrial robot vision for human cognition), and driven by a virtual obsession with the measurement of responses to largely decontextualized cartographic expressions. But the issue at hand is one of interpretive strategy: a strategy that operates on the organization of meanings, and the construction and deconstruction of *meaningful structures*. Its application is bidirectional and comprehensive.

51. This subject is given thorough treatment by Jacques Bertin, *op. cit.*, pp. 195–268 and 321–408.

52. Paul Klee, *Pedagogical Sketchbook*, Faber and Faber, London, 1968, pp. 18–21. First published in 1925, and first translated in 1953, this, together with Wassily Kandinsky, *Point and Line to Plane* (Dover, New York, 1979), root the Formalist approach to visual design firmly in the curriculum and practice of the Bauhaus. Contemporary treatments of a general nature include Donis A. Dondis, *A Primer of Visual Literacy*, (M.I.T. Press, Cambridge, 1973), Wucius Wong, *Principles of Two-Dimensional Design* (Van Nostrand Reinhold, New York, 1972) and, despite its title, Jacques Bertin's *Semiology of Graphics* (*op. cit.*). For decades, Formalism has dominated the methodology of cartographic design: its appearance in the modern textbook is effectively compulsory, and a bibliography of papers that construct "design guides" from Formalist principles would be too extensive to present here. For a relatively concise, cartographically-oriented, review see Howard T. Fisher, *Mapping-Information: The Graphic Display of Quantitative Information*, Abt Associates, Cambridge, 1982, pp. 60–115.

53. Though why not? The roads on the North Carolina road map are. What, of course, we understand in this way is that "roads" *per se* are not features. Rather federal roads are, state roads are, county roads are, and so on.

54. J. S. Keates, *Understanding Maps*, Longman Group Ltd., London and New York, 1982, p. 82.

55. However the blue line, in and of itself, does represent a road on the North Carolina highway map.

56. Maurice Merleau-Ponty, *Signs*, Northwestern University Press, Illinois, Evanston, 1964, p. 39.

57. In the case of cadastral maps this other sign system is often purely linguistic (the description of the boundary, the names of the owners, and so on).

58. This term is used in the sense intended by Peirce: to express a causal relation between object (steep slope, river, city) and interpretant (twisting road, parallel roads, circular highway segment). For Peirce, *icon*, *index* and *symbol* constitute the second of three trichotomies which jointly define and elaborate taxonomy of signs. See Charles Sanders Peirce, *Philosophical Writings of Peirce*, Dover, New York, 1955, pp. 98–119, or *Collected Papers of Charles Sanders Peirce, Vol. II, Elements of Logic*, Harvard University Press, Cambridge, 1960, pp. 134–173.

59. The familiar example of the musical theme, which retains its identity despite transposition to another key or rescoring for a different ensemble of instruments, is remarkably evocative of the cartographic sign system that retains *its* identity throughout numerous topological and scalar transformations, spatial reorientations, and symbolic representations. Clearly, the recognizable whole, in both cases, is an artifact of structure rather than sensation—a *gestalt*.

60. Bill Bunge made a similar point with his map "The Continents and Islands of Mankind," which shows—against a white ground in black—simply those portions of the globe harboring more than 30 persons per square mile. Period. About the map he made these comments:

> When the original explorers went out they searched for people too, for instance, good slaves. But mapping people was very dangerous. People are also mobile. Compared to mountains, rivers, coastlines, they are nearly invisible. But at least the names of 'tribes' were placed on original maps. And as this material was accumulated it became known as 'the map'. It became the stuff of the 'base map'. And once the 'base map' for a region was complete, it was 'explored'. It has been impossible evidently to conceive even philosophically of a more appropriate base map for our times. We use as the absolute irreducible element the distinction between what is wet and what is dry. Might it not be better to distinguish between what is populated and what is empty of people? The deserts of the world, the ice caps, have more in common with most of the oceans than with South Asia. The North Atlantic, with its permanently transient population, might be better classified with Iowa than the South Pacific. Even recognizing that some human interest has always been shown in humans—the priorities have been so reversed that the base map itself should be reexamined. It might be sanguine to start having grade school children around the world memorizing the continent and islands of people as the basic ingredient in their mental maps. (W. Bunge, *Detroit Geographical Expedition, Field Notes, 1*, 1969, p. 2).

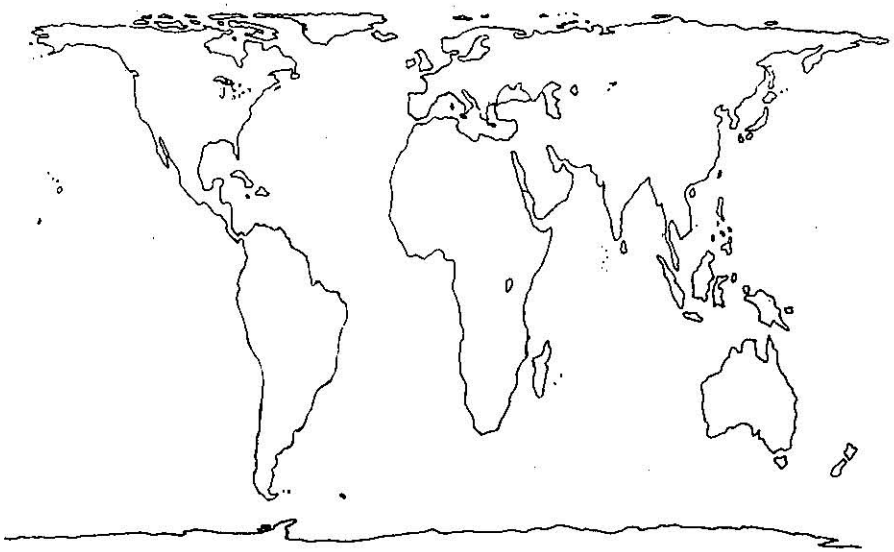
61. Kidron and Segal, *op. cit.* This atlas presents 57 map plates, and corresponding micro-essays, addressing urgent (and frequently controversial) socio-political issues of global scope. Its overcrowded page layouts, animated

excerpt from Wood
Chapter 3 to follow:

"An infinite number of distinct projections are possible," writes Tobler.[29] Robinson *et al.* say, "An infinite number of map projections is possible."[30] "There are an infinite number of possible map projections," intone the editors of *Goode's World Atlas*.[31] How to chose? This is *the* question, for the answer determines the way the earth will look on the map. How different can this be? Well, in a Lambert Azimuthal Equal-area projection centered on the north pole, the pole is a point. Of course the further you get from this point, the more weird everything looks (at the edge of such a map Australia and Antarctica are so long and skinny as to be hard to recognize). On the other hand, on a Mercator projection centered on the equator, the pole can't be shown at all; it's turned into a line of *infinite* length, so the closer you get to the pole the greater the areal distortion (thus though actually one-fifth the size of Brazil, Alaska appears on the Mercator to be the same size). Yet no projection is without its advantages. The Mercator may distort areal relationships, but it preserves shapes (it's conformal), and it's the only projection on which loxodrones (lines of constant compass bearing) are straight. Therefore it's widely used for charts.[32] Equal-area projections, on the other hand, are essential for displaying things like population, vegetation, crops, religions, and other distributions.

And *every* projection is like this, good for one thing, but not another. As Wellman Chamberlin puts it, "One must choose between equal-area scale and conformality. These two most important qualities in map projections are mutually exclusive. The same map cannot have both," because he goes on, "equivalence of area is maintained by decreasing the scale in one direction as it increases in another. In conformal maps the scale changes equally in all directions so that any small portion of the map has its correct shape."[33] Each quality is valuable, but for different things. What this means is that the selection of a map projection is always *to choose among competing interests*; that is, to *embody* those interests in the map . . . even if we confine ourselves to such superficially technical issues as the representation of angles and areas, distances and directions.

It is easy to pretend this isn't so, to act as if the choice were an "objective" one, that somehow it were possible to . . . *rise above interest*.



The equal-area Peters projection. (*World Map: Peters Projection* by Arno Peters. Copyright Akademische Verlagsanstalt. Distributed in the United States by Friendship Press, New York. Used by permission.)

In explaining the decision of the *National Geographic* to adopt the Robinson projection for its world maps, Chief Cartographer John Garver, concludes, "The projection does not espouse any special point of view, and we believe that its compromises are the most reasonable for a general reference map of the world."[34] *Sans doute*. This would be the easier to accept if John Garver had not made such a big deal about the personal reasons for his satisfaction with this decision (former graduate student of Robinson's *et cetera et cetera*), and if Robinson had not been the leading voice in a perfidious and vitriolic attack on a competing projection.[35] What is at stake? Certainly nothing . . . "scientific."

The object of Robinson's attack? The Peters projection. In the index to Mark Monmonier's tendentious little *How To Lie With Maps* this is cross-referenced to . . . the *Gall*-Peters projection . . . where we read (*how to lie with indexes*): "not first equal-area projection, 97; preservation of area and distortion of shape by, 97–98; used in media campaign, 98–99."[36] These entries epitomize the concerns of the American academic cartographic establishment, that German historian Arno Peters made an unjustified priority claim,[37] that his projection is ugly,[38] and that it was adopted by the World Council of Churches, the Lutheran Church of American and numerous United Nations and other international agencies only because "Dr. Peters knew how to work the crowd."[39] What Peters was on about was the fact that the most popular projections

consistently exaggerated the size of the higher latitudes—in effect the land masses of the northern hemisphere since that's where most of the land is—at the expense, not only of some version of the truth (double-bladed sword), but of the self-image of the developing world. Hall is good here:

> By correcting one distortion, projections inevitably create another, and the historical evolution of map projections is like a mathematical shell game that always seems to cheat the southern hemisphere. In the Van der Grinten projection, used by the National Geographic Society between 1922 and 1988, some parts of the globe were wildly out of scale; Greenland, long the bane of cartographers because its high latitude incurs spatial exaggeration, was 554 percent larger than actual size, the United States 68 percent larger. On the Robinson projection, which improves considerably upon Van der Grinten, the Greenland exaggeration is only 60 percent. Less wrong, but wrong nonetheless. Africa, significantly, is 15 percent *smaller* on the Robinson projection. As cartographic expert John Synder puts it, the Robinson projection was selected because it offered "the best combination of distortions."
>
> Why does it matter? Such errors can have an impact out of all proportion to their size, as the American Cartographic Association well understands. "A poorly chosen map projection can actually be harmful," the association recently noted. "We tend to believe what we see, and when fundamental geographic relationships, such as shapes, sizes, directions and so on, are badly distorted, we are inclined to accept them as fact if we see them that way on maps."[40]

Peters did more than insist that whatever its appearance *an equal-area projection* was the only fair way to show most things worth showing about the world. He implied—no, he *pointed out*—that the use of most other projections had a powerful built-in bias. Here's Hall again:

> Peters argues that the Mercator projection has promoted the "Europeanization of the earth," and that the customary practice in atlases of using many different scales to show different parts of the world is literally belittling to Third World nations. Terry Hardaker, chief cartographer of the *Peters Atlas*, goes further. He has written that other map projections offer "the equivalent of peering at Europe and North America through a magnifying glass and then surveying the rest of the world through the wrong end of the telescope."[41]

David Turnbull asks questions to a similar end: "If you compare the Mercator projection with the Peters projection, a map which endeavours to preserve relative size, what differences do you discover which might have cultural or political significance?" He explicitly pushes us to ask what *interests* might be served by the use of a Mercator

projection: "Is it a coincidence that a map which preserves compass direction (a boon for navigation) shows Britain and Europe (the major sea-going and colonizing powers of the past 400 years) as relatively large with respect to most of the colonized nations?"[42] Not only does the cartographic establishment take umbrage at the implication of their complicity in these nefarious imperialist activities (they labor only for science), but they object to the emphasis on the Mercator projection, which they point out is 400 years old and has been succeeded by, as we know, an all but infinite collection of alternatives. Therefore, they insist, the "Peter's approach is more propaganda than science."[43] But as we have already seen, the attention to "propaganda" is an alibi. It does nothing but deflect attention from the fact that the selection of *any* map projection is *always* to choose among competing interests, is *inescapably* to take—that is, to *promote*, to *embody in the map*—a point of view. Robinson's is essentially . . . *aesthetic*. His description of the Peters projection is that of an art critic—"wet, ragged, long winter underwear hung out to dry"—not a scientist. This is fine. Robinson has always arrogated to himself the mantle of the artist.[44] But if it is only with respect to the *aesthetic* dimension of the continents that his projection bests the Peters, it is not only difficult to justify the *Geographic's* ennoblement of the Robinson, but to understand what Garver is talking about when he characterizes it as matching "reality more closely than its venerable predecessor."[45] *In what way?* No one claims the Peters departs from reality—*it just looks funny.*[46]

It really is a shell game. When the aesthetic issue gets hot, switch to science and talk about accuracy, but when that bluff is called, bring on the "wet, ragged, long underwear." But as Brian Harley has testified, it's a shell game that is played for keeps:

> Yet cartographers, though they are fully aware how maps *must* distort reality, often engage in double-speak when defending their subject. We are told about the "paradox" in which "an accurate map," to "present a useful and truthful picture," must "tell white lies." Even leaving aside the element of special pleading in this statement (the map can be "truthful" and "accurate" even when it is lying), there is the corollary that cartographers instinctively attribute the worst forms of "ignorance," "blunders," and "distortions," and so on to non-cartographers. For instance, when they come to talk about propaganda maps or the cartographic distortions presented by the popular media, a quite different order of moral debate is entered into. The *cause célèbre* of the Peters projection led to an outburst of polemical righteousness in defense of "professional standards." But ethics demand honesty. The real issue in the Peters case is power: there is no doubt that Peters' agenda was the empowerment of those nations of the world he felt had suffered an historic cartographic discrimination. But equally, for the cartographers,

it was their power and "truth claims" that were at stake. We can see them, in a phenomenon well-known to sociologists of science, scrambling to close ranks to defend their established way of representing the world. They are still closing ranks. I was invited to publish a version of this paper in the ACSM *Bulletin*. After submission, I was informed by the editor that my remarks about the Peters projection were at variance with an official ACSM pronouncement on the subject and that it had been decided not to publish my essay![47]