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COMMENTARY

# The Natures of Maps: Cartographic Constructions of the Natural World

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Excerpt from Denis Wood and Jon Fels, *The Natures of Maps: Cartographic Constructions of the Natural World* (Chicago: University of Chicago Press, 2008). © 2008 by Denis Wood and Jon Fels. All rights reserved.

## Editor's Note

We are pleased to introduce a new section in *Cartographica* devoted to a series of invited critiques and commentary on a target article. For the inaugural contribution, we have chosen to examine chapter 1 of a new book by Denis Wood and John Fels, *The Natures of Maps* (University of Chicago Press, 2008). Responses to this piece have been provided by Chris Perkins (University of Manchester, UK), Gwilym Eades (McGill University, Montreal, Canada), and Rob Kitchin (National University of Ireland, Maynooth). Wood and Fels then offer a short reply. Note that, for reasons of space and of clarity, some notes have been modified in the version provided here, and the colour figures that appear in the book have been omitted. Except in quoted material, US spellings have been replaced by Canadian spellings. (Jeremy W. Crampton)

The nature of maps: an ambiguous phrase.

Furthermore, a comparatively famous one. In 1976 Arthur Robinson and Barbara Bartz Petchenik used it for the title of a book they subtitled *Essays Toward Understanding Maps and Mapping*. In 1991 J.B. Harley added *New* to the phrase to give the book he was proposing the title, *The New Nature of Maps: Essays in the History of Cartography*.<sup>1</sup>

Harley's was an explicitly subversive gesture. Although Harley died before he was able to write the introduction that would have justified his title, he gave his publisher the following description of his intentions:

The dominant view of modern Western cartography since the Renaissance has been that of a technological discipline set on a progressive trajectory. Claiming to produce a correct relational model of terrain, maps are seen as the epitome of representational modernism, rooted in the project of the Enlightenment, and offering to banish subjectivity from the

image. Cartographers have thus promoted a standard scientific model for their discipline, one in which it is claimed that a mirror of nature can be projected through geometry and measurement. Furthermore, this model for maps has colored the critical values of historians of cartography; they often assess early maps by this modern yardstick, thereby excising from the accepted canon of mapping not only maps from the pre-modern era but also those from other cultures that do not match Western notions of accuracy.

The essays in this book – through historical examples and by a critical examination of the practices of modern cartography – seek to offer an alternative view of maps. Drawing on ideas in art history, literature, philosophy, and the study of visual culture, they subvert the positivist model of cartography, replacing it with one that is grounded in iconological and semiotic theory of the nature of maps. The interest of maps is shown to lie not so much in mimetic value but as simulacra which nevertheless may exert a profound influence upon the way space is conceptualized and organized within different

societies. The theme of power is central to many of the essays. The way in which power – whether military, administrative, religious, or economic – is inscribed on the land through cartography is dissected and the nature of the political unconscious in maps is explored and illustrated. In new introductory and concluding essays aspects of this debate will be updated. The conclusion addresses the ultimate cartographic paradox: the map is not the territory yet it often precedes, and even becomes that territory.<sup>2</sup>

Despite their differences, Harley’s and Robinson and Petchenik’s ideas about the nature of maps – and certainly Harley intended his first paragraph to be a description of Robinson and Petchenik’s nature of maps – refer to the nature of *maps*, that is, to the nature, or inherent character, of *maps* as distinguished from the nature of *painting*, *sports*, or *small dogs*. But with equal grace the phrase can refer to the *nature* of maps, that is, to concepts of the natural – as distinguished from the cultural – figured by and brought into being on and by maps.

It is our intention both to insert ourselves into this history of ideas about the nature of the map *and* to embrace the ambiguity of the phrase, to explore the nature of *maps* by exploring the *nature* of maps and the *nature* of maps by exploring the nature of *maps*. We contend there can be little understanding of the one project except in the light of the other. We will show that the *nature* maps bring into being is one – actually it is a multitude – dependent on the nature of *maps*, while the nature of *maps* is best understood through its mapping of *nature*. This follows from the very idea of nature, which is about the intrinsic, the essence, the physical, the out-of-doors, the forces of the physical world, the primitive, the untouched-by-civilization, the uninfluenced-by-artificiality: the real. Nature wants to be the just-born, the innate, the native, the naïve, the untutored, the untaught, the unsophisticated, the unpolluted, the apolitical, the above-all-else *nonideological*, which is the one-word way Harley described what he’d been writing in those essays of his – an “inquiry into ways in which maps are ideological constructions and have been used as a classic form of power/knowledge in past societies.”<sup>3</sup>

In the years since Harley wrote these words it has grown apparent that many people (if by no means all) are willing to accept maps as ideological constructions when it comes to zoning, school attendance districts, legislative districts (people love to say “gerrymander”), and national boundaries. But, then, the subjects of such maps are understood to be human constructions *in the first place*. There is nothing (it is said) natural about political boundaries; all are ideological creations. In this way, the ideological construction gets displaced from the map to its subject. The map itself remains uncontaminated; it is recovered as (what it claimed to be all along) no more than a conduit through which the ideological content – as *all* map content – passes undistorted, or if at all, then by

no more than the “white lies” necessitated by the difficulties of printing the world on paper.

We reject this sophistry in all its parts.

### The Structure of the Map's Construction of Knowledge

By focusing our attention on the *nature* of maps, that is, on what above all is supposed to be free of ideological construction – mapped wildlife, earthquakes, hurricanes, mountains, canyons, birds, butterflies, pinnipeds, ecosystems, landforms, vegetation, topography – we show that it is the *map*, hardly alone, in collaboration with other sign systems, which *creates* ideology, transforms the world *into* ideology, and by printing the world on paper *constructs the ideological*. It doesn’t matter what has the map’s attention. Whatever its subject is will be turned into something it isn’t and in the process inescapably, unavoidably made ideological. At a minimum, at the most atomistic, it will be a construction, an invention, a conception, something drawn not from the world but from the mind of men and women; for maps are made not of wildlife, earthquakes, hurricanes, mountains, canyons, birds, but of *signs* – these themselves composed of marks and concepts.

The map: a field of concepts. There can be no escaping this.

But it’s worse, much worse, for as slippery as these conceptual atoms may be, to make a map they must be aggregated into molecules and macromolecules of meaning in which constructions, interests, and ideologies enter at every point. But no sooner have we realized this than we find ourselves dealing with the nature of the *map*. We will show that the map is nothing more than a vehicle for the creation and conveying of authority about, and ultimately over, territory. We will demonstrate that the authority the map claims is the social manifestation of what the map presents as its “intrinsic” and “incontrovertible” factuality. We will spell out the way this factuality is constructed through the social assent given to the propositions maps embody. We will show how these propositions take the form of connections made among conditions, states, processes, and behaviours. Finally, we will make clear the way these connections are realized through the fundamental spatial/meaning propositions we propose to call *postings*. The posting is a proposition of the form, “*this is there*.”

By uniting an existence claim and a location, the posting locks together the *nature* of the map and the nature of the *map*. It is here, at the level of the posting, where it is claimed that *this* of nature *is* – a waterfall or cliff, sequoia or syncline, high pressure cell or coral reef, mountain range or river – *and* that it is *there* – at this bend in the river or on that face of the mesa, in this grove or beside that anticline, in this system of winds or surrounding that island, rising above that plain or draining that basin – that

the *this* takes on its *there* form, and the *there* takes on its *this* form. It is with the posting that nature is made spatial. The claims, that it *is*, and that it is *there*, reinforce each other. The *there* claim implies a reality test, that you can go there and look, a test that rises to the level of a challenge: “Why would we put it there if it weren’t so? Check it out if you want!” Insisting that something is *there* is a uniquely powerful way of insisting that something *is*. Mapped things – no matter how conceptually daunting – possess such extraordinary credibility that they’re capable of propelling into popular discourse abstruse abstractions cantilevered from abstruse abstractions: high pressure cells, El Niño, seafloor spreading, thermohaline circulation.

“You don’t believe it? Check it out.”

*This is there* – that tree – and *this is there* and *this is there*: through spatial magic the existence of the tree is transmuted into the existence of a forest, the existence of the forest is transfigured into the existence of an ecosystem, the existence of the ecosystem is transmogri-fied into the existence of nature. Nature. In space. As a spatial thing.

But the map can’t leave well enough alone. It wouldn’t be a map if it did. If it stopped at this atomic level – at the level of spatialized thing – the map would amount to a kind of spatial ontology. What makes the map a *map* is its exploitation of spatialized things – themselves propositions (this is there) – as the subjects of yet higher order propositions (this is there and *therefore it is also . . .*). The map *is* these propositions. Technically, a proposition is a statement in which the subject is affirmed or denied by its predicate (this is there). Take this ginseng plant. The map affirms of this ginseng plant (the proposition’s subject) that it *is*, and therefore that it is also *in*, which is to say *of*, the Great Smoky Mountains National Park (the proposition’s predicate). It could be the other way around (there is this). The map equally affirms of the park (the new proposition’s subject) that it *is*, and therefore that it also *contains* ginseng (the new proposition’s predicate). Either way the map *links* the plant and the park.

In so doing it connects the plant to the system of rules and regulations that is just another way of saying “national park.” The park is not a collection of trees, shrubs, and other wildlife. That would just be a forest. The park is a way of *relating* to trees, shrubs, and other wildlife. These ways of relating are codified in rules and regulations. Some of these forbid the culling of ginseng. To cull ginseng in the Great Smoky Mountains National Park is therefore to poach. To cull ginseng outside the park, say across the road in a national *forest* (Pisgah or Nantahala), or on private land, is either to harvest or to steal, depending on how the map in question links the *theres* of the plants in question to the relevant systems of rules and regulations, codes and laws (to the relevant property rights). In the national forest, where trees can be cut,

animals hunted, and plants gathered and sold, anyone can get a permit to cull ginseng. Poaching from private land, on the other hand, is a larceny.

Note that at this point a territory has been invoked. It has a national park, national forests, and parcels of private property. These are all equivalently subjects of different propositions made by the maps that invoke the territory. It is through the simultaneous affirmation of these propositions that the territory *as such* is brought into being. What assures us that the propositions are true? That they state facts? Only the *social assent given them*, the confirmation by the courts and by the court of public opinion, the voice of newspapers, and friends: “You shouldn’t have been in the park. You should have stayed in the forest on the other side of the road.”

### Social Assent and Reference Authority

The continual assent given to the propositions made by maps endows them with the authority that is uniquely that of *reference objects*. These include catalogues, calendars, concordances, encyclopaedias, directories, phone books, dictionaries (*Merriam-Webster’s*, the *OED* [look it up!]), thesauruses (*Roger’s!*), glossaries (at the end of every textbook), textbooks (*Organic Chemistry* – no subtitle), the *National Geographic*, the *Times* (*New York, London, Los Angeles*), *TV Guide*, style guides (*The Chicago Manual of Style* [fifteenth edition!]), Turabian, Strunk and White), cookbooks, field guides, travel books (“What does the *Mobil Guide* say?”), footnotes, citations, legal citations, priests, eye witnesses, constitutions, parliamentary procedures. All of these constitute objectifying resources that permit a claimant to insist that, “It is not I, not I who says this, but –” before dropping, like a tombstone, the name of some revered reference object (*Langenscheidt’s*, *Grove’s*, the *Britannica*, *Larousse*, *Merck*). Maps too are objectifying resources: the maps of Hammond, Bartholomew, Rand-McNally, Esselte, the National Geographic Society, AAA, Mobil, Michelin, the United States Geological Survey, other national mapping services, state highway maps, the Thomas Guides, Falk’s, bus maps, maps of metro lines. Maps objectify by winnowing out our personal agency, replacing it with that of a reference object so constructed by so many people over so long a time that it might as well have been constructed by no one at all (“It is not I who says this, but . . . *the entire human race*”). Citation enhances a source’s authority but also the authority of the one who cites it. The reflected light is blinding. Opposition is extinguished.

“You don’t believe the map? Check it out!”

This authority, apparently descriptive, is inherently prescriptive. The phone book is not a guide to numbers from which one may feel free to pick and choose (though plenty evidently do): it *tells* you what to dial, it *prescribes*

the number. A street directory *gives* you the address. There is no “Hmmm” here as there is over the choices a thesaurus offers or among the shades of meaning provided by decent dictionaries, where even so there is little hemming or hawing over spelling. The dictionary is *absolutely* prescriptive about spelling, a social fact we acknowledge – that we *dramatize* – in the annual rite of the National Spelling Bee. Among the mutual validations – spellers validating the authority of the dictionary, dictionary validating the speller’s spelling – the prescriptive, the authoritative, is hard to miss.

Here: in this morning’s paper there is an article about the new legislatively mandated North Carolina social studies curriculum. The large, colourful photo illustrating the story is an overhead shot of an eighth-grade girl crouched over the state’s transportation map. Her left hand, forefinger extended, is on the transportation map, while her right hand transfers features – interstate highways and state and national forests – to a small outline map of the state. She is a human pantograph, literally reproducing – and by reproducing affirming – the existence (the *this-ness*) of state and national forests. As she traces their location (their *there-ness*), she simultaneously reproduces – and by reproducing affirms – the existence of North Carolina as a *state* of state and national forests. North Carolina’s *there-ness* is established later, in an exercise caught in another colour photo on an inside page, where another student uses a globe to establish the state’s coordinates. In all of this the map’s authority is absolutely taken for granted.

The newspaper validates, with its literally glowing presentation, this power of the map to establish, almost in the religious sense: the world as a sphere; North Carolina as a state of roads and forests; and the state and national forests as enclaves of green (the students colour them green). It is these validations – the newspaper’s, the curriculum’s, the school’s, the girl’s – repeated uncountable times (hundreds and hundreds of times in this classroom alone) – that makes the map the potent vehicle it is for the creation and conveyance of authority about, and ultimately over, territory.

### The Paramap Tells Us How to Read the Map

The map itself – the piece of paper covered with ink – *insists* on this authority. Rare is the map that fails to advertise *in itself* its claims to be taken authoritatively. This advertisement takes the form of what, by analogy with Gerard Genette’s coinage of “paratext,” we propose to call the *paramap* (see Table 1). Genette distinguishes paratext into *peritext* and *epitext* (thus, the *perimap* and *epimap*). “In other words,” Genette says, “for those who are keen on formulae, *paratext* = *peritext* + *epitext*.”<sup>4</sup>

The *peritext* consists of all the verbal and other productions that surround and extend a text in order to

**Table 1.** The paramap can be broken down into perimap elements and epimap elements.

Paramap	Epimap
Titles	Accompanying article(s)
Photographs	Advertisements that refer to the map
Illustrations	Marketing copy
Charts, graphs, timelines	Letter from the editor
Legends, scale bars, north arrows, other standard cartographic elements	Letters to the editor about the map
Callout text, blurbs	Behind the scenes info (how the map was created)
Credits	
Borders, decorative elements	

present it: the quality of the paper, the quality of the binding, the character of the type, that of the printing, the dust jacket copy, the series indication (if any), the author name (anonymous, pseudonymous, with titles, without, etc.), and the work’s title, together with whatever dedications, inscriptions, epigraphs, prefaces, forewords, intertitles, notes, and illustrations there may be.<sup>5</sup> The *epitext* consists of all the paratextual elements “not materially appended to the text within the same volume, but circulating, as it were, freely, in a virtually limitless physical and social space” – for example, advertisements, the letters publishers send out with review copies, promotional appearances by the author, interviews, lectures and so on, again, *surrounding* the text in order to present it, in order to shape its reception.<sup>6</sup> We have in hand, for example, a book club flyer, “Bonus Book Selections: Choose from a Wide Range of Reader Favorites” advertising *The Smithsonian Atlas of the Amazon*.<sup>7</sup> Copy promising an “exhaustively researched volume” is decorated with a cover shot, an inset map, and a blue bubble enthusing, “More than 150 Color Maps!” The exclamation point, the large number, the assurances that the book is a “Reader Favorite,” that it’s been “exhaustively researched,” and its institutional affiliation with the Smithsonian conspire to position the atlas as authoritative *and* desirable. In Genette’s terms, the flyer is a piece of the *epitext*; it also happens to be a piece of the *epimap* of every map in the atlas.<sup>8</sup>

The *perimap* carries out its labour closer in. “Australia Under Siege,” a map supplement from the National Geographic Society, smothers its primary map (equivalent to Genette’s “text”) with seventeen ancillary maps, a timeline, a chart, four graphs, five photographs, twenty-seven blocks of type, several dozen call-outs, legends, titles, scales, and credits. The map’s construction of Australia as a biological horn of plenty besieged by its human inhabitants is largely a function of this rich

perimap, though the epimap – the accompanying article in the *National Geographic* and its paratext (the title, “Australia – A Harsh Awakening,” the blurb on the contents page with its “. . . now barren fields of salt and dwindling marsupial populations,” the note “From the Editor,” the photographs with *their* titles and captions [“A graveyard of skeletons with gray arms raised in good-bye”], the “Behind the Scenes” item, and the later letters to the editor) – contributes to the construction substantially.

Ignoring the paramap, as contemporary cartography textbooks do (except for titles, legends, and scale bars, it’s like the paramap doesn’t exist), makes it much easier for such texts to ignore the claims of ideological construction to which the paramap is the essential guide. As a way of suggesting what’s at stake we ask, “Would the projection promoted by German historian Arno Peters have stirred an iota of interest had it not been for its paramap?”

This is easy to answer, since *except for its paramap* the Peters projection is identical to James Gall’s 1885 Orthographic Projection, which never attracted any attention at all. But then Gall’s perimap said, “Gall’s Orthographic Projection/ Equal-area Perfect/ for Physical Maps, chiefly statistical,” and its epimap more of the same at greater length.<sup>9</sup> Whereas Peters’ perimap said, among much, *much* else (in large type along the margins of the map):

Five thousand years of human history have brought us to the threshold of a new age. It is an age typified by science and technology, by the end of colonial domination, by a growing awareness of the interdependence of all nations and all peoples.

Such a moment in history demands that we look critically at our understanding of the world. This understanding is based, to a significant degree, on the work of map-makers of the age when Europe dominated and exploited the world. Surprisingly, maps still reflect that bygone era.

The new map, the work of German historian Arno Peters, provides a helpful corrective to the distortions of traditional maps. While the Peters Map is superior in its portrayal of proportions and sizes, its importance goes far beyond questions of cartographic accuracy. Nothing less than our world view is at stake.

. . . In the complex and interdependent world in which the nations now live, the peoples of the world deserve the most accurate possible portrayal of their world. The Peters Map is that map for our day.<sup>10</sup>

Peters’ perimap essentially accused cartographers of producing distorted maps in the service of a discredited European colonialism – of being ideologists in a bad cause – and positioned his map as a unique antidote. Next to the UN seal in the map’s lower right-hand corner it said,

“This map is produced with the support of the United Nations Development Program.”

Cartographers flipped! Driving them even more insane was an epitext, Peters’ inflammatory book, *The New Cartography*.<sup>11</sup> The most reputable review of *The New Cartography* – Arthur Robinson’s – opened with, “The review of a book such as *The New Cartography* would ordinarily be short since much of it is misrepresentation, is illogical and erroneous, and one’s initial reaction is simply to dismiss it as being worthless.” The review nevertheless proceeded to eviscerate Peters for another eight pages.<sup>12</sup> As a scholar and a gentleman, Robinson did not stoop to mudslinging, but characterizations like, “Arno Peters, the German architect of this novel map, was in fact not a cartographer at all but a journalist and propagandist for leftist causes who had mastered ‘the art of writing press releases,’”<sup>13</sup> by other critics made them sound like right-wing ideologues on an AM talk show. An entrenched profession attacked *everything* – especially the claim that the map was new (Peters hadn’t known about Gall) – but remarkably, the critics didn’t confine themselves to Peters’ paramap or even the rechristened Gall-Peters projection: they launched an attack against *rectangular world maps in general*.

Like Mercator’s and many others, the Gall-Peters projection produces a rectangular world, unlike those of, say, Robinson and Mollweide, which are curved. At the very height of the controversy, the American Congress on Surveying and Mapping adopted a “sternly worded resolution condemning [rectangular maps] for ‘showing the round earth as having straight edges and sharp corners.’”<sup>14</sup> This preposterous (and wholly ineffectual) resolution was endorsed by the American Cartographic Association, the American Geographical Society, the Association of American Geographers, the Canadian Cartographic Association, and the National Geographic Society and all because of the *paratext* – which few of those endorsing the resolution would even consider part of the map – of a map they universally dismissed.<sup>15</sup>

That the paramap should have this power is no surprise. Rare is the image that can dispense with words. Roland Barthes wondered whether *any* system of signs could do without them: “Is there,” he asked, “any system of objects which can dispense with articulated language? Is not speech the inevitable relay of any signifying order?”<sup>16</sup> By *relay* Barthes always understood a second-order message, a connotation parasitic on a first-order message, as a caption to a photograph (say in a fashion magazine), or the text on a map (say in the title or legend). Among what Barthes called the relay effects of speech were its ability to fix – to immobilize – perception at a given level, first of all at the level of the photo or map, say, rather than at that of the paper, the printing screen, or the typeface; but then to draw attention, as to the collar or hemline (in the fashion photo) or to the system of highways (in a road map).

Other relay effects of speech include its ability to go beyond the image, to interpret, to say what the narrow collar *means* (it's sexy) or the tint of red in the legend (the road is limited access), and its ability to direct attention, to emphasize ("Pay attention to *this!*"). In Peters' case, the paramap attempts to keep us focused on the equal-area property of his map, to force us to compare it *along this dimension* to the unequal-area Mercator, and to pretty much ignore everything else. His paramap immobilizes our perception on his chosen ground. Every map does this.

### Cognitive Cartographics

Given a main map, legend, texts, seventeen ancillary maps, a timeline, a chart, four graphs, five photographs, several dozen call-outs, legends, titles, scales, and credits as in "Australia Under Siege"; or even a main map, text, seven ancillary maps, titles, scales, and credits as in *The Peters World Map*; given this heterogeneity, what is one to do? That is, what sense is one to make of it? How to assemble it, pull it all together?

Contemporary cartography textbooks treat this as a problem in graphic design: "Titles, legends, scales, and insets may be arranged in various ways in the graphic organization of a map," say the authors of *Elements of Cartography, Sixth Edition*, where none of their examples comes near to approaching the complexity of ours:

Nothing should seem out of place. Layout is the process of arriving at proper balance. In a well-balanced design, nothing is too light or too dark, too long or too short, too small or too large, in the wrong place or too close to the edge . . . The cartographer's job is to balance visual items so that they "look right."<sup>17</sup>

In the illustration accompanying these remarks, circles and squares balance or unbalance a beam depending on their size and distance from the fulcrum. Another illustration displays differently proportioned rectangles with the admonition that those in the ratio of three to five make "the most stable and pleasing map format." Yet another illustration shows different arrangements of title, legend, and locator inset, all *three* of which map-makers are encouraged to retain no matter how difficult the design. The text does *not* contemplate a text (with citations to other texts), twenty-six supplementary maps, titles, scales, and credits. Another text, Borden Dent's *Cartography: Thematic Map Design*, is more sophisticated, but again *nothing* like the complexity of our examples is contemplated.<sup>18</sup> This whole tradition of thinking about maps as graphics comes out of an illustration, out of an advertising tradition. Indeed, the text in *Elements of Cartography* (whose first edition came out in 1953) could have been lifted from something like

William Longyear's *Advertising Layout* (whose first edition came out in 1946). For example, Longyear says:

Balance is most important in a layout. The various sizes and shapes of the elements in the layout must have good artistic composition. There are few, if any, distinct formal rules to guide the layout man in deriving good balance. Balance has some of the qualities of a seesaw. By setting a vertical line through the center of the layout to serve as a fulcrum, elements may be balanced for both size and weight.<sup>19</sup>

Given the prevalent idea that maps amount to a kind of "seeing," none of this is surprising. Committed as most cartographers are to the idea that maps "present information," cartographers rather appropriately approach map design as they would the design of an advertisement . . . or a smorgasbord . . . where the aim is to make everything as attractive as possible to draw the grazing eye.

Doubtless this is all sound advice (though what heart a designer is to take from knowing that in a well-balanced design nothing is "too light or too dark, too long or too short" is open to question) but, given that *we* see maps as systems of propositions (as *arguments*), nothing could be further from what we have in mind. The question is *not* for us how things are arranged for the eye, but how the design promotes and constrains, how it directs, the construction of meaning. It is not about the "presentation of information." It is about the construction of meaning as a basis for action. It is for us a question of cognition.

The discipline that has contributed most substantially to our thinking is the new and rapidly evolving one of cognitive linguistics. We're proposing that cognitive linguistics is a good model for thinking about cartography, for thinking about *cognitive cartographics*.

Why cognitive linguistics? Because it is a nonrepresentational approach to language that is concerned with how we think, act, and communicate. Unlike historical forms of linguistics, which were essentially concerned with the nature of the *signal*, cognitive linguistics is concerned with the *meaning construction* upon which language operates. For cognitive linguists, "meaning construction refers to the high-level, complex mental operations that apply within and across domains when we think, act, and communicate."<sup>20</sup>

This makes it a form of linguistics analogous in intent to the theorizing we're doing about cartography, which is directed toward the thinking, acting, and communicating that maps facilitate (i.e., cognitive cartographics). No surprise then that cognitive linguistics critiques historical forms of language theorizing in much the same way that we have critiqued traditional theories of cartography. For example, cognitive linguistics critiques traditional forms of language theory for their predisposition to sharply separate components (syntactic, semantic, pragmatic), and to study these in isolation, especially independent of

their use in the world for reasoning and communication. This parallels traditional cartographic thinking, which not only compartmentalized map-making from map use, but within map-making, compartmentalized projection, generalization, symbolization, design, and the rest. In its interest in understanding the role of, say, grammar in discourse configuration, cognitive linguistics is a model of appropriate procedure for, to give one example, understanding the role that the choice of map projection plays in shaping world view. As we've already quoted Gilles Fauconnier in the introduction, "Language data suffers when it is restricted to language,"<sup>21</sup> not just because language depends on highly structured background knowledge, conversational meaning, negotiations, and the like, but because it is directed toward an end in action. The same has to be said of maps: map study suffers when it is restricted to maps.

Furthermore, unlike historical forms of language analysis, including semiotics (which we nonetheless hang on to), cognitive linguistics is dynamic, committed to understanding the way meaning is constructed *on the fly*, which is certainly the way we propose to understand – and model – map reading, as a process in time, which encourages the construction of certain kinds of meaning and ultimately behaviour. We're not interested in maps as pictures. We're interested in maps as the significant players they are in the world of action. Maps – let us acknowledge this – are not just *of* the world, but *in* it, very much *a part* of it.

At the heart of cognitive linguistics is what its developers think and write about as *mental spaces*. Mental spaces, says Fauconnier, "are partial structures that proliferate when we think and talk." Since these constructions take place on a *cognitive* level, they are partial *cognitive* structures. This is to mark their distinction from the structure of language. Such a cognitive structure "is *not* an 'underlying form,' it is *not* a 'representation' of language or of language meaning, it is *not* bijectively associated with any particular set of linguistic expressions." Such a cognitive structure is not a representation of the world either, but it relates language *to* the world by providing "real-world inferences and action patterns." Fauconnier and Mark Turner characterize these mental spaces as "small conceptual packets constructed as we think and talk, for purposes of local understanding and action." These small conceptual packets (or partial cognitive structures) "correspond," Fauconnier and Turner elaborate, "to activated neuronal assemblies," which are linked or link themselves to other activated neuronal assemblies.<sup>22</sup> Cognitive linguists think about these neuronal linkages as *mappings*. For example, the configurations of words you're reading right now are opening up thinking spaces in your brain, that is, activating assemblies of neurons, which are connected to, project to, are mapped onto, other thinking spaces in the process of constructing meaning.

These *mental space mappings* are the essential subject of cognitive linguistics (giving rise to an alternative name – *space grammar*):

In terms of processing, elements in mental spaces correspond to activated neuronal assemblies and linking between elements corresponds to some kind of neurobiological binding, such as co-activation. On this view mental spaces operate in working memory but are built up partly by activating structures available from long-term memory. Mental spaces are interconnected in working memory, can be modified dynamically as thought and discourse unfold, and can be used generally to model dynamic mappings in thought and language. Spaces have elements and, often, relations between them. When these elements and relations are organized in a package that we already know about, we say that the mental space is framed and we call that organization a "frame."<sup>23</sup>

George Lakoff says that these frames can be structured by idealized cognitive models (ICMs). ICMs are descended from the earlier *plans* and *scripts* of Roger Shank and Robert Abelson's "script theory," where a *script* was a hypothetical knowledge structure capable of generalizing about a socially appropriate sequence of events. A script was a sort of ideal, an ideal you attempted to follow, or that you expected others to follow. Schank and Abelson's best known example was the Restaurant Script. Script theory, in turn, made powerful connections to Steven Toulmin's theory of logic as "generalized jurisprudence" and to Mikhail Bakhtin's ideas about speech genres.<sup>24</sup>

One of the appealing things about cognitive linguistics is the way it absorbs, integrates, and updates so many worthwhile concepts from the past, while at the same time promising to connect them to neurophysiologic evidence being developed tomorrow from PET scans and functional MRIs. Via cognitive linguistics, yesterday's hypothetical knowledge structures promise either to disappear into the junkyard of failed models (still always worth braving the junkyard dogs to visit) or to transform themselves into *actual* knowledge structures. It's all very heady.

"The dynamics of mental space construction and space linking are technically abstract, but conceptually straightforward," Fauconnier and Eve Sweetser write. "The basic idea is that, as we think and talk, mental spaces are set up, structured, and linked under pressure from grammar, context, and culture. The effect is to create a network of spaces through which we move as discourse unfolds."<sup>25</sup> Similarly, as we read the main map and the various elements of the paramap – text, ancillary maps, title, photos, scale bar, graphs – one or more mental spaces open up that are structured (frequently by ICMs or frames) and linked under pressure from the graphic structure, context, and culture to create a network of

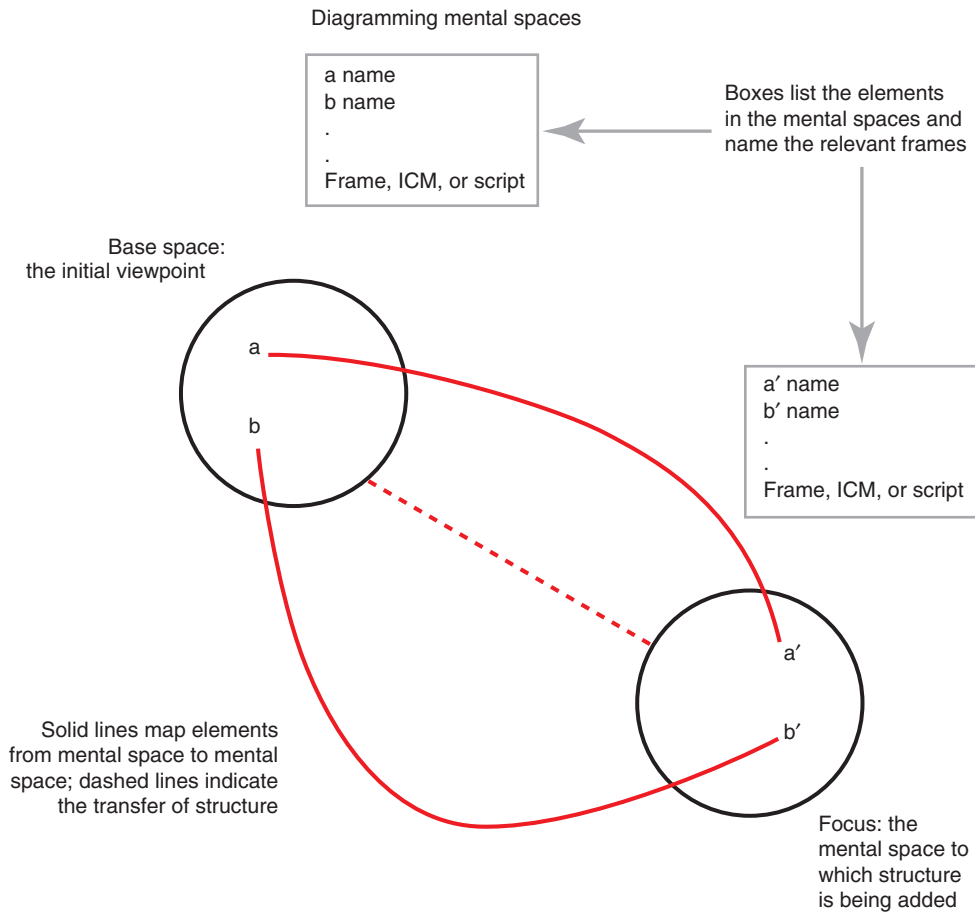
spaces – one space opening up after another – through which we move as we read and make sense of the map.

In Figure 1, motion through this network starts from a *base space*, which establishes the initial *viewpoint* (the space from which, at a given point in the reading, other spaces can be accessed or created) and *focus* (the space to which structure is actively being added); and then *shifts* viewpoint and focus as the reading unfolds. In natural languages, it is grammar that helps answer such questions as Where is the starting point (the base space)? What space is currently the viewpoint? What space is currently in focus? What is the relationship of the viewpoint to the base? What is the nature of the connections between spaces? In maps it is graphic structure – the design – that helps answer these questions.

Contemporary cartography texts are not entirely unaware of this parallelism. For example, *Elements of Cartography* says:

The task of map design has much in common with writing. An author – a literary designer – must employ words with due regard for many important structural elements of the written language, such as grammar, syntax, and spelling, in order to produce a first-class written communication. Likewise the cartographer – a map designer – must pay attention to the principles of graphic communication.<sup>26</sup>

Of these so-called principles we have seen a sample (“nothing too dark or too light, too long or too short”), and despite infusions of psychophysics over the years this remains state of the art.<sup>27</sup> As such, these “principles” bear



**Figure 1.** Cognitive linguistics diagrams represent mental spaces with circles, a network of which is propagated as discourse unfolds. The first space that a discourse opens is considered its *base space* (here upper left). The elements in the space are lettered. If a frame, ICM, or script structures these elements, it appears as a box containing the elements and naming the framing structure. For example, the frame “buying and selling” with its buyer, seller, consumables, money, price, and rich set of inferences about owning, exchange, and so on; or the frame “vegetation map” with its locative field and vegetation classes, and inferences relating to hierarchic relationships, adjacency expectations, and the like. Continuing discourse spawns further spaces. The space to which structure is being added is the *Focus* (here lower right). Dashed lines indicate the transfer of structure from space to space, while solid lines map the movement of elements. The diagrams are a graphic way of keeping track of what’s going on.



little relationship to the structure provided by grammar and indeed, absent explicit scaling arguments, offer no guidance to map-makers – and so no guidance to map readers – whatsoever. Yet however unarticulated, implicit principles masked by the chatter about aesthetically pleasing appearance and “looking right” must in fact be structuring the elements of the map, that is, guiding the creation of spaces through which we move as we read and make sense of the map.

Space mapping has convinced us – and we are convinced it will convince you – that the principles underwriting the graphic design of maps are wholly at the service of *the structure of the map's construction of knowledge*. That is, the principles of map design are concerned with the straightforward display of postings amenable to consumption by propositions appearing on the plane of the map as incontrovertible characteristics of the territory the map thereby evokes and over which it exhibits its authority. The essential goal of these principles is not “looking right” but the preservation and enhancement of authority, and nothing supports this goal more strongly than the pretence, and so the impression, that all maps do is “present information.”

Did we mention how preliminary the work in cognitive linguistics is, how tentative its conclusions? Even more preliminary are our proposals, which nonetheless we advance as a model for understanding how maps hoist themselves off the page into our brains, spawning world views, images of the city, and a spatialized, a regionalized nature; a nature plucked equally from the vagaries of veneration and from the toils of taxonomy; a nature capable of being isolated as a region, capable of coming into conflict with other regions, and capable of being legislated and commercialized. This spatialized nature can threaten and be threatened; it can awe and it can be cuddled; it can be collected and it can be systematized; it is unknowably remote and it is underfoot. It is a nature, ultimately, *quietly put in its place*.

### Eight Natures of Maps

Which is our question: the place of nature, *what is it?* Our contention is that, today, maps play a significant role in the way we frame this question and in the answers we give to it. Since what nature is taken to be affects the possibilities of its being mapped, and since what mapping is taken to be affects the nature we can imagine being mapped, there has been a continuous evolution in the mapping of nature over the half millennium during which maps have played a significant role in human affairs.<sup>28</sup> This evolving history, being eagerly explored, has not yet been written – nor do we propose, despite its importance, to write such a history ourselves. Our interest lies elsewhere, in the present, in the ways in which everyday map readers, encountering maps throughout the course

of their lives, find maps participating in the construction and reconstruction of their ideas of nature.

Nature, as we suggested earlier, is a powerful concept, circling as it does around ideas of the real and the nonideological. It can be used as a heavy hammer to attack the “unnatural” and as a powerful flag around which to rally the “natural.” So it has been interesting, as we have worked our way through the maps that came to hand, to discover so many *different* natures. There is the nature that is threatened, but there is also the nature that threatens. There is a sublime, awe-inspiring nature, but there is also a pretty, endearing, and bounteous nature. There is a nature that we collect, which may be different from the nature that we study. There is an unfathomable, mysterious nature, but there is also a nature in which we can picnic.

#### 1. THREATENED NATURE

Nature as victim, susceptible to countless threats, is inescapable these days. This is nature harassed by man. It is nature on the ropes. “Wildlife as Canon Sees It” is the headline in a series of full-page advertisements that Canon has run for years in a broad range of magazines with an enormous readership: *Scientific American*, *National Geographic*, *Natural History*, *The Smithsonian*. A photograph of an animal (doubtless taken with a Canon camera) fills the top half of the page. A text – one of Barthes’ relays – says (in the case at hand), “In the relative cool of early morning, a terrestrial long-tailed ground-roller probes among leaf litter and around thorny thickets, hunting for insects and their larvae. The shy bird stands quietly for extended periods surveying an area, slowly lifting and lowering its long tail. Then, with a few quick hops, it disappears into the scrub.”<sup>29</sup> Another sentence sketches the bird’s domestic economy (“stays with its mate while nesting”), and another its imminent peril: “Confined to a small strip of unprotected coastal forest, the long-tailed ground-roller is threatened by loss and degradation of habitat.” A map is invariably appended: it shows, in green and blue, the Indian Ocean, southeast Africa, and Madagascar. An ageing eye can hardly discern the miniscule dot (in red) on the southwest coast of Madagascar that signifies the bird’s remaining – *shrinking, threatened* – habitat. By translating “habitat” into space the map gives the habitat real credibility at the same time it dramatizes how small this habitat is. Beleaguered nature. Canon wants to help. Canon wants us *all* to help.

#### 2. THREATENING NATURE

Yet every bit as common are maps of a beleaguering nature: nature threatening man, nature on the rampage. Every summer newspapers in our part of the country publish inserts with titles like, “Stormtracker 2005, Your Official Hurricane Survival Guide.” A joint effort

of Raleigh's *News and Observer* and a local television station, this one was widely distributed and "proudly sponsored" by Jiffy Lube and North Carolina's Electric Cooperatives. Stuffed with sound advice ("Prepare a Family Disaster Plan"), these inserts are really all about the maps. There are usually two of them. One describes areas prone to flooding and sketches the evacuation routes. The other – typically a couple of feet across – is a hurricane tracking map showing the East Coast and Atlantic Ocean, and extending to 30deg west. The water area is gridded in one-degree increments. Inset is a graph for you to record facts about the storm, the time, its latitude and longitude, and other statistics, sort of like a line score in baseball. Transferring the storm's latitude and longitude to the map lets you keep track of the storm.<sup>30</sup> As you keep updating its location, you transform the hurricane into something spatial. *You* spatialize it. It's a short step from this to synoptic hurricane maps (like the widely reproduced satellite map NASA's Goddard Laboratory made of 1989's Hurricane Hugo), maps compiling tracks of hurricanes, and maps of hurricane *regions*. On the National Geographic's "Hurricanes: Where Ill Winds Blow" map, gradations of blue demarcate the frequency of hurricanes per hundred years in steps of forty.<sup>31</sup> Hurricaniana: it's now a region – a place – like any other.<sup>32</sup>

### 3. NATURE AS GRANDEUR

What can threaten also can awe, and the sense of powerlessness and personal insignificance that hurricanes inspire is not unrelated to what people experience standing on the rim of the Grand Canyon, looking up at Everest, down on Victoria Falls, or across the Amazon. With their majesty, their sublimity, each inspires a sense of the *power* of nature, less its strength (hurricanes are strong), than its boundlessness, its magnanimity, its *glory*. As we write these words, a new *National Geographic* map of Everest arrives, an extraordinary image, photographic in detail. Here Everest, vast beyond understanding, is caught at a resolution of nineteen inches. But . . . didn't *National Geographic* just publish a map of Everest? Wholly different but just as awesome? A joint production of the *Geographic*, the Boston Museum of Science, and the governments of Nepal and China? Actually, that was fifteen years ago (November 1988), and it came in a long line of powerful Himalayan images. *The Kingdom of Sikkim*, glorious mountains from north to south, appeared as a supplement to the *Annals of the Association of American Geographers* in 1969. Four years earlier the *Annals* had published *The Kingdom of Bhutan*, twelve square feet of Himalayas folded up and shipped along with the journal.<sup>33</sup> Before that . . .

But the list is long. Each of the great sublimities has been mapped, the maps as extraordinary in their way as their subjects, the efforts invariably daunting (so high, so deep,

so far away). This is not a nature we can threaten (not one we can *dream* of threatening), nor yet is it one that threatens. This is a nature *beyond us*.

### 4. NATURE AS CORNUCOPIA

There is yet another nature, the nature that we embrace, that we cuddle. This is the nature of the small and the soft, the fuzzy and the warm. This is the nature of fur and feathers, birds and bees, flowers and seed. If the mountain is awesome, its flower-strewn meadows are beautiful. If the oak is sublime, the dogwood is sweet. Anything but austere, this nature is giving, prodigal. It is a gigantic cornucopia, an unceasing gush of bounty: flowers, fruit, berries, nuts. "The sublime *moves*," Immanuel Kant wrote, "the beautiful *charms*."<sup>34</sup> But it also feeds, also nurtures, and the soul no less than the stomach: "Emblazoned with beauty, this floral map shows the origins of 117 of man's favorite flowers" begins the perimap of one called "The World of Flowers." Beguiling bouquets burst from the hearts of continents. A clump of tulips sprouts in Turkey. A branch of a *flamboyan* flowers in Madagascar. Oriental poppies bloom in Pakistan. The theme of profligacy mingles with that of beauty. The abundance of this nature is inexhaustible: in yet another *National Geographic* map, individual portraits of sixty-seven birds – from "hundreds of kinds" – festoon a map of migratory routes in the Americas.<sup>35</sup> The routes lace the continents from pole to pole. The numbers are insane: the arctic tern may travel 25,000 miles a year! *Ain't nature something else!* The maps demonstrate that this nature – flowers, trees, birds, seals, furry friends – is everywhere.

### 5. POSSESSABLE NATURE

The beautiful, the profligate (and so the exotic) is also the collectible. We yearn to tally it, catalogue it, photograph it, and perhaps even own a small piece of it. Maps of this collectible, possessable nature – bird sightings, birds' nests, rocks and minerals, gemstones, big game animals, highest points, stars – are less interested in display than they are in inventory. At stake here are lists, head counts, censuses, catalogues, statistics. We're holding in our hands *A Bird Lover's Life List and Journal*, a luxurious, hardbound volume, based on the checklist of the American Ornithological Union, in which birdwatchers can keep score. It lists 715 species and is decorated with illustrations by John James Audubon. While life lists rarely include maps, field guides almost always do. There are 362 maps, for example, in Peterson's *Birds of Britain and Europe*, each map distinguishing breeding and winter ranges for an individual species. Here the maps are corralled into an "atlas" in the back of the book, but in *The Audubon Society Field Guide to North American Birds (Western Region)* the maps accompany the text, one per species, each with its textual relay: "Southeastern Arizona,

southern New Mexico, and western Texas, where it breeds at the northern fringes of its otherwise all-Mexican range.”<sup>36</sup>

Historically, the construction of spatial identities for species led to the construction of synthetic regions composed in different ways of numbers of species,<sup>37</sup> and these syntheses, too, appear in the field guides, as in *Trees of North America* (a Golden Field Guide), where hundreds of thumbnail maps are preceded by a map of forest regions. Here, for example, we read that in the Northern Forest region “far northern tree associations” consist of conifers, birches, and willows. In Hugh Johnson’s *The Principles of Gardening* we find maps not only of where domesticated plants originally grew wild, but of plant hardiness zones which pretty much amount to maps of zones of consistent annual average minimum temperature.<sup>38</sup> Maps like these hint at the systematization – that is, at the science – that consumes the collectible nature.

#### 6. NATURE AS SYSTEM

The nature of science, of system, is anything but collectible, for it is a nature that exists less in its parts than in the whole. It is an inherently spatialized nature, and maps are a primary way of knowing it. Here individual outcrops metamorphose into strata and strata into geologic formations; soil series aggregate into soil associations and these into soil groups; plant species fall into plant associations and associations combine into plant communities; variations in barometric readings grow into weather systems and these merge into climate. It is a paradigmatic nature. With *Seasonal Land Cover Regions* we have already glanced at a representative of the genre, but other examples abound: Robert Bailey’s *Ecoregions of North America*, USGS’s *A Tapestry of Time and Terrain*, Simon and Fels’ *Plant Associations of the Chattooga River Basin*, the endless suites of thematic maps (of landforms, climate, temperature, winds, precipitation, ocean currents, natural vegetation, soils) that stand in the front of so many atlases. This nature is neither threatened nor does it threaten. It does not awe nor is it cute. It is anything but collectible. It is nature that is *known*. It is that of science.

#### 7. NATURE AS MYSTERY

Out of science a new nature has lately risen: it is a nature seen but mysterious, *unknown*. It is that from space. Its construction reverses the usual process through which careful measurements are compiled over time to reveal, for example, a continent (as in the gradual emergence of the Americas on European maps in the fifteenth and sixteenth centuries), an ocean current (as on Ben Franklin’s map of the Gulf Stream), a hole in the ozone layer (as with the TOMS data from the Nimbus 7 satellite). This new seen-but-unknown nature emerges whole,

apparently unscarred by conceptual categories. Maps of this nature pass for photos, of which Barthes famously remarked, “the feeling of ‘denotation,’ or, if one prefers, of analogical plentitude, is so great that the description of a photograph is literally impossible.” This special status of a photograph? *It is that of a message without a code*. At least it *appears* to be without a code. Barthes showed that photos did have a code, but one developed on the basis of a message without one: “It is *read*, connected more or less consciously by the public that consumes it to a traditional stock of signs.”<sup>39</sup> It also turns out that these new maps are not photographs, they are maps after all, the connotation – the code, the concepts – has been imposed in their production (looking *like* a photograph is part of this code). This new genre of “portrait” maps presents a nature of gradations without distinctions. “What is *that*?” The map does not answer. It is whatever you wish to make of it. This nature is fragile. It is threatened. Or it is tough, resilient. It is enduring. It is distant. It is somewhere else. It is unknowable. It is a vehicle for our anxiety; a recipient of our admiration.

#### 8. NATURE AS PARK

One final nature, the *intimately known*, that nature mapped at a scale of two and a half inches to a mile, with a contour interval of ten feet (or less). This is the nature of the USGS topographic quad and other national mapping surveys. Here again is the sense that everything can be seen, but here *everything* is coded. In fact, here *only* the coded exists, anything not on the (admittedly capacious) legend doesn’t. “What is *that*?” The map returns an answer. It is an intermittent stream; it is a mangrove; it is a dry lake; it is a sunken rock; it is scrub; it is a gravel beach. But nature is not brought to the foreground here. The map is as loquacious about exposed wrecks, landing strips, railroads under construction, vineyards, gauging stations, built-up areas, and dams as it is about glaciers and permanent snowfields, shorelines, mountains, swamps, and rivers. Here nature is subject to no rhetorical flourish, no isolation, no highlighting. It is not the *theme* of these maps. It is along for the ride. This is the nature of the *phenomenological* inventory. At this level nature lies so deep in the conceptual frame that it manifests itself in things instead of attitudes. But the things it manifests itself in are not hills, rivers, or trees, which, undifferentiated from culture, here lie *below* the level of nature. Here nature shows up as parks, monuments, sanctuaries, and preserves. It is a fenced-in nature that we can visit, that we can protect, that we *have* to protect . . . because it is threatened.

\*

So we have come full circle. Only it is not a circle. It is a multidimensional space of contradictions. It is a dialectical space ripe with the interpenetration, struggle, and

unity of opposites. Eight natures – doubtless there are others – each spatialized, each areal, each hoisting itself off the page, taking shape in the mental spaces of cognitive linguistics as we read the map, as we unfold it, turn it over, and refold it; as we bring it closer to our eyes or move it away; as we scale its distances with our fingers: nature as victim, bully, spectacle, cornucopia, collectable, paradigm, mystery, park.

Ours is not a systematic survey. We have made no effort to search for maps of nature but taken as examples those that came to hand in our grappling with the nature of maps. We shall proceed by unfolding in each chapter a map or maps of a different nature, and to use this reading as an opportunity for probing one component or another of our model of the map – the logical structure of the map's construction of knowledge; the physical structure of the paramap; the intellectual structure of the act of map reading itself – as well as probing the nature of the nature in question. Inescapably, we attend closely to the concept of nature as it intertwines itself with economic structures, class formations (nature is above all else a construction of class), and official systems of construal. As we scan sheet after sheet, more and more the maps appear as players in a complicated social game defining the relationship of our species to the rest of existence. Pretending to be no more than scorekeepers, maps stand revealed as more like the ball, the very medium through which the game's moves are made.

### Notes

1. Robinson and Petchenik, *The Nature of Maps: Essays toward Understanding Maps and Mapping* (Chicago: University of Chicago Press, 1976); Harley, *The New Nature of Maps*. Note that although Harley's book wasn't published until 2001, the manuscript, lacking the promised introductory and concluding essays, was submitted for publication ten years earlier. The title originally bandied about was *Maps and Society*, which Harley had found "a bit tame: could we devise something more arresting?" (letter to George Thompson, 15 October, 1991). In a postscript a month later Harley wrote, "Please note the new title which is final as far as I'm concerned: *The New Nature of Maps: Essays in the History of Cartography*" (letter to George Thompson, 26 November 1991).
2. This is from the questionnaire prospective authors were asked to file with the Johns Hopkins University Press. Harley dated it 11/25/91.
3. Ibid.
4. Genette, *Paratexts: Thresholds of Interpretation* (Cambridge: Cambridge University Press, 1997), 5.
5. Jacques Derrida plows related ground in his treatment of the *parerga*, those elements *about, outside, or around* a work – in short, the frame; but also the columns of a building, the drapery on a statue – in short,

hors d'oeuvres. See especially pp. 53–82 and the whole section "Cartouches" (183–253) in his *Truth in Painting* (Chicago: University of Chicago Press, 1987). Be forewarned: "Parergon" is a reading of Kant's *Critique of Aesthetic Judgment*, and "Cartouches" is a catalogue essay for a show of Gérard Titus-Carmel's drawings. Where Derrida and Genette are closest is in their understanding of the paratext/*parerga* as liminal, as threshold. See also (always) Goffman's *Frame Analysis: An Essay on the Organization of Experience* (Cambridge, Mass.: Harvard University Press, 1974).

6. Genette, *Paratexts*, 344.
7. Scientific American Book Club, August 2003.
8. While rarely discussed in the cartographic literature as such, the epimap has become an issue in the liminal area between the history of cartography and the history of science. Jane Camerini, for instance, is explicit about her interest in "the notion that the meaning of a map resides not only in the map, but in relation to the written text of which it is a part." See her PhD dissertation "Darwin, Wallace and Maps" (PhD diss., University of Wisconsin, Madison, 1987), or her "Evolution, Biogeography, and Maps: An Early History of Wallace's Line," *Isis* 84 (1993): 700–27. The quotation comes from this latter, p. 702.
9. Gall, "Use of Cylindrical Projections for Geographical, Astronomical, and Scientific Purposes," *Scottish Geographical Magazine* 1 (1885): 119–23.
10. There are many versions of this map in circulation, with more or less inflammatory perimaps. This is from a copy distributed by ODT in 2000.
11. Peters, *Die Neue Kartographie/The New Cartography* (Klagenfurt and New York: Universitätsverlag and Friendship Press, 1983).
12. Robinson, "Arno Peters and His New Cartography," *American Cartographer* 12, no. 2 (1985): 103–11. Considering how completely batty Peters' book is, Robinson's treatment is surprisingly temperate.
13. Jonathan Yardley, review of Mark Monmonier's *Drawing the Line*, *Washington Post*, December 18, 1994 (p. X3). Yardley developed his jibe by stringing together phrases of Monmonier's. The tone, however, cannot be attributed to Monmonier whose treatment of the Peters affair in *Drawing the Line* is thorough and thoroughly scrupulous (9–44). Monmonier's list of sources for both sides is the best available (301–2).
14. This is from *The Wall Street Journal's* front page story about the resolution, June 8, 1989.
15. All this commentary, the reviews, the ACSM resolution, its coverage by *The Wall Street Journal*, and the rest (and see Monmonier's treatment for an idea of how extensive this "rest" was) constitute what Genette calls the "metatext." See the presentation of the five varieties of "transtextuality" – intertextuality, paratextuality, metatextuality, hypertextuality, and architextuality – in Genette's *Palimpsests: La littérature au second degré* (Paris: Seuil, 1982). Each of these forms of transtextuality plays an important role in the world of maps.

16. Barthes, *The Fashion System* (New York: Hill and Wang, 1983), 11.
17. Robinson, et al., *Elements of Cartography*, 6th ed. (New York: John Wiley & Sons, Inc., 1995), 333.
18. Dent, *Cartography: Thematic Map Design*, 3rd ed. (Dubuque: William Brown Publishers, 1993).
19. Longyear, *Advertising Layout* (New York: Ronald Press, 1946), 11.
20. Gilles Fauconnier, *Mappings in Thought and Language* (Cambridge: Cambridge University Press, 1997), 1.
21. Fauconnier, *Mappings*, 7.
22. Fauconnier, *Mappings*, 11, 36 (emphasis ours). Fauconnier and Turner, *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities* (New York: Basic Books, 2002), 40, 102.
23. Fauconnier and Turner, *Way We Think*, 102.
24. Lakoff, *Women, Fire, and Dangerous Things* (Chicago: University of Chicago Press, 1987), chap. 4. Schank and Abelson, "Scripts, Plans, and Knowledge" in *Thinking: Readings in Cognitive Science*, ed. P.N. Johnson-Laird and P.C. Wason (Cambridge: Cambridge University Press, 1977), 421–32. A cool, accessible, book-length treatment of the restaurant script is Schank's *The Connoisseur's Guide to the Mind* (New York: Summit Books, 1991). Toulmin, *The Uses of Argument* (Cambridge: Cambridge University Press, 1958). Bakhtin, *Speech Genres and Other Late Essays* (Austin, Tex.: University of Texas Press, 1986).
25. Sweetser and Fauconnier, "Cognitive Links and Domains: Basic Aspects of Mental Space Theory," in Fauconnier and Sweetser, *Spaces, Worlds and Grammar* (Chicago: University of Chicago Press, 1996), 11.
26. Robinson et al., *Elements*, 316.
27. In fairness to *Elements*, it must be acknowledged that its discussion of the principles of graphic design is relatively more sophisticated and revolves around the concepts of legibility, visual contrast, figure-ground, and hierarchical structure (324–38). Discussions of these issues occupy hundreds of subsequent text pages. Much of this, however, is the development of technical production vocabularies. The principles themselves remain at the level of "If these visual relationships coincide with the cartographer's intentions, effective communication can take place. If not, the map design is likely to fail" (324), which is – effectively – meaningless.
28. More or less. Not that maps played no role in human affairs prior to, say, 1400, but that after that time they begin to play the role they continue to play today. Our decision to draw the line here is akin to Ian Hacking's drawing the line for the birth of statistics at 1660. It's not that there weren't all kinds of precursors but that "We do not ask how *some* concept of probability became possible. Rather we need to understand a quite specific event that occurred around 1660: the emergence of *our* concept of probability. If there were Indian concepts of probability 2,000 years ago, they doubtless arose from a transformation quite different from the one we witness in European history," and so on (*Emergence of Probability*, Cambridge: Cambridge University Press, 1975, 9). Similarly, we are not concerned with the host of potential precursor map-like things, but with the map as we know it, and *have* known it for five or six hundred years. See Wood's "P.D.A. Harvey and Medieval Mapping: An Essay Review," *Cartographica* 31 (Autumn 1994): 52–59; and his "Maps and Mapmaking" in *Encyclopedia of the History of Science, Technology and Medicine in Non-Western Cultures*, ed. Helaine Selin (Dordrecht, Boston: Kluwer Academic, 1997), 549–54.
29. Our example comes from the May, 2001, issue of *National Geographic*, among the unpaginated front matter.
30. Americans have been known to similarly track the war front. For more about the practice of publishers to package maps in kits with little flags and pins during World War II, see the section, "War Is God's Way of Teaching Us Geography," in Susan Schulten, *The Geographical Imagination in America, 1880–1950* (Chicago: University of Chicago Press, 2001), 206–14.
31. An element of the "Great Disasters: Nature in Full Force" poster, supplement to *National Geographic*, July 1998.
32. Marita Sturken observes this and more in her "Desiring the Weather: El Niño, the Media, and California Identity," *Public Culture* 13, no. 2 (2001): 161–89. She focuses on TV not maps, but her paper is all but a disquisition on the spatialization of the weather in which all such media collaborate.
33. Pradyumna P. Karan, *The Kingdom of Sikkim*, supplement to *Annals of the Association of American Geographers* 59 (March 1969), and *The Kingdom of Bhutan*, supplement to *Annals of the Association of American Geographers* 55 (December 1965).
34. Kant, *Observations of the Feeling of the Beautiful and Sublime* (Berkeley: University of California Press, 1960 [1763]), 47.
35. "Bird Migration" was a supplement to the August, 1979, issue.
36. Norman Boucher, ed., *A Bird Lover's Life List and Journal* (Boston: Museum of Fine Arts, 1992); Roger Tory Peterson, Guy Mountfort, and P.A.D. Hollom, *A Field Guide to the Birds of Britain and Europe*, 4th ed. (Boston: Houghton Mifflin, 1983); Miklos D.F. Udvardy, *The Audubon Society Field Guide to North American Birds (Western Region)* (New York: Knopf, 1977), 647. John Law and Michael Lynch compare and contrast a number of these field guides in their "Lists, Field Guides, and the Descriptive Organization of Seeing: Birdwatching as an Exemplary Observational Activity" in *Representation in Scientific Practice*, ed. Michael Lynch and Steve Woolgar, 267–99 (Cambridge, Mass.: MIT Press, 1990).
37. See Jane Camerini, "The Physical Atlas of Heinrich Berghaus: Distribution Maps as Scientific Knowledge" in

- Non-Verbal Communication in Science Prior to 1900*, ed. R.G. Mazzolini, 479–512 (Florence: Olschki, 1993).
38. C. Frank Brockman, *Trees of North America: A Field Guide to the Major Native and Introduced Species North of Mexico* (New York: Golden Books, 1968); Johnson, *Principles of Gardening* (New York: Simon & Schuster, 1979). The maps in *Principles* came from the Mitchell Beazley studio.
39. Barthes, *Image – Music – Text* (New York: Hill & Wang, 1977), 18, 19.