CHAPTER 13

INTRODUCING THE CARTOGRAPHY OF REALITY

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The recent interest of behavioral geographers in cognitive maps and cognitive mapping has highlighted the disjuncture between the everyday perception of distance and space and the cartographic standard that serves to represent them.[1] While the map maker's metric itself may be arbitrary, its fixed scales often fail to coincide with the variability, contingency, and fluidity of cognitive assessments.[2] This paper introduces some preliminary propositions for the development of a cartography of reality based upon the anthropocentric notions of distance and space we all know in everyday experience.

A cartography, a geography, of reality cannot be based on unsuspected and unsupportable abstractions of the *n*th degree but must be rooted in palpable daily human experience. Unlike contemporary academic cartography, a cartography of reality must be humane, humanist, phenomenological, and phenomenalist: humane because it must be founded in an unflinching respect for people and the reports they make of their experience; humanist because it must concern itself with the conditions and qualities of being human rather than being a yardstick or camera; phenomenological because it must embrace the totality of human experience of space with considerations of objective reality and purely subjective response left temporarily out of account; and phenomenalist because it must be underwritten by the radical prepositivist empiricism of David Hume.[3] It must reject as inhumanly narrow both the data base and subject matter of contemporary academic cartography and repudiate the untenable distinction currently drawn in the behavioral geographies between the world within the head and the world without.

Three principles will enable the translation of these intentions into maps of the real world. The primary given is that individual experience is the only valid measure of the world. Implied by this is the second principle, that the real world is accessible only to each of us alone. True

in the sense that each of us has a unique autobiography—a unique fund of experience out of which to construct the world—this is further true in the sense that these experiences are of worlds literally unique. It is not so much a matter of our experiencing unique slices of a common world as it is the existence of a multitude of worlds to only one of which each of us alone has access. Bertrand Russell reached a similar conclusion in his attempt to derive the space of physics consistent with the great traditions of empiricism and logical analysis. After arguing that ". . . it does not appear probable that two men ever both perceive at the same time any one sensible object" and that all position is relative, he concluded that:

> . . . it follows that the space of one man's objects and the space of another man's objects have no place in common, that they are in fact different spaces, and not merely different parts of one space. I mean by this that such immediate spatial relations as are perceived to hold between the different parts of the sensible space perceived by one man, do not hold between the parts of sensible space perceived by different men. There are therefore a multitude of three-dimensional spaces in the world.[4]

With respect to time Russell similarly urged that, "The one all-embracing time, like the one all-embracing space, is a construction; there is no direct time-relation between the particulars belonging to my perspective and particulars belonging to another man's."[5] The isolates of individual experience so completed, private time imbricating private space, are of course none other than the real worlds the cartography of reality seeks to portray.

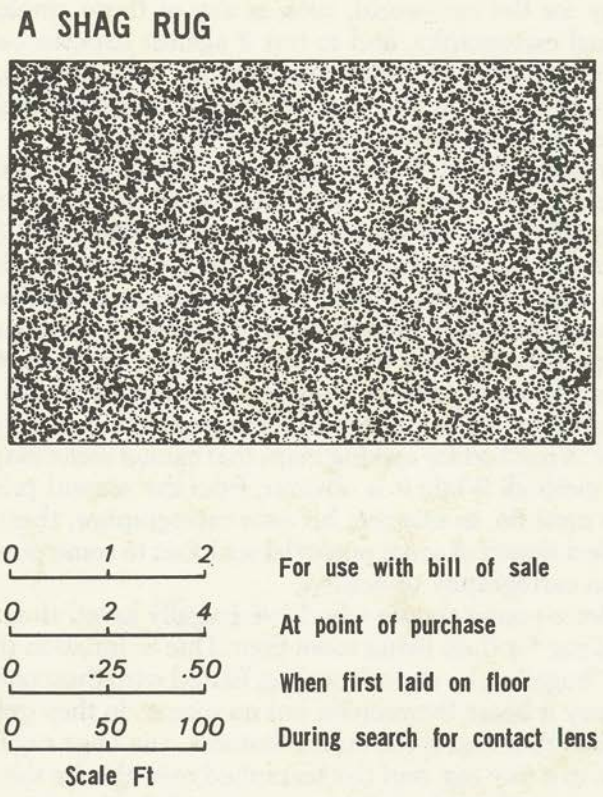
It goes without saying that little is known of the structures of these worlds—after all, little enough is known of the structure of the imaginary world. As Russell put it, "The truth seems to be that space—and time also—is much more complicated than it would appear to be from the finished structure of physics."[6] It follows, then, that no a priori structure can be adduced for mapping the real world, and from this follows the third principle. The geometry of maps of the real world must be a natural geometry; and, as A. S. Eddington has put it, "Natural geometry is the theory of the behavior of material scales."[7] But it follows from the first principle that these scales will be constituted solely of individual human experience, since, from the second principle, this is the only means of access to the real world; and thus it follows that the geometry of the cartography of reality will be a theory, or description, of the nature of individual human experience. While it might seem

reasonable, given the style of contemporary geography, to hypothesize a geometry for the real world, such as any of those employed in the conventional cartography, and to test it against experience, upon further reflection it seems infinitely wiser to say with Newton, *"Hypotheses non fingo"* and allow the accumulating data of experience to speak for themselves in the fashion of classical empiricism.

The three principles of the cartography of reality, (1) that individual human experience is the only valid measure of the real world, (2) that the real world is accessible only to each of us alone, and (3) that the structure of the real world must be a natural geometry based on individual human experience, mean that the cartography of reality is likely to remain more a method, or a groping for a method, for encountering and embracing reality than it is to remain a generator of products like maps and atlases; yet its validity as a process for grappling with reality will depend precisely on its ability to produce genuine artifactual maps of that reality. A method for making maps that cannot make maps is indeed an empty method! While it is obvious, from the second principle, that each of us must be, in essence, his own cartographer, there is nothing to preclude a sketch of some potential solutions to some potential problems in the cartography of reality.

Consider a young couple who have frugally saved their pennies to purchase a rug for their living room floor. Due to inflation they can just manage a "huge" six by eight foot shag. Elated with their purchase, they elect to carry it home themselves, but no sooner do they get the rug on the floor than they regret the entire business. The huge rug they bought has shrunk to a tiny rag, and the tears shed over this by the young lady cause her contact lenses—floating on an invisible film of tears—to come unstuck and fall into the forest of the shag. Falling to their knees the two are shocked: their tiny rug has miraculously assumed Saharan proportions! You may say it only "seemed" so, but I shall credit your estimation only after you too have searched a shag for a pair of contacts. Asked to draw the rug prior to purchase, the young lady might have shown it filling the room, give or take a foot or so to reflect the size of her purse; after getting it on the floor she might have shown it as a postage stamp on the proverbial infinitely extensible plane; during the search, she would have shown the rug as this extensible plane, overlapping the very confines of the room itself. While each of these images would have reflected the size of the rug, there is another reality that would not have been reflected in any of these individual images; namely, the fact of the change itself. The rug really changes size: how can this fact of reality be graphically portrayed? One solution, employing a number of scales, each to be used in the appropriate context, is presented in figure 13-1.[8] A more general solution, in which the rug is of no—that is, any—size, is presented in figure 13-2.[9] A combination of these two solutions, a

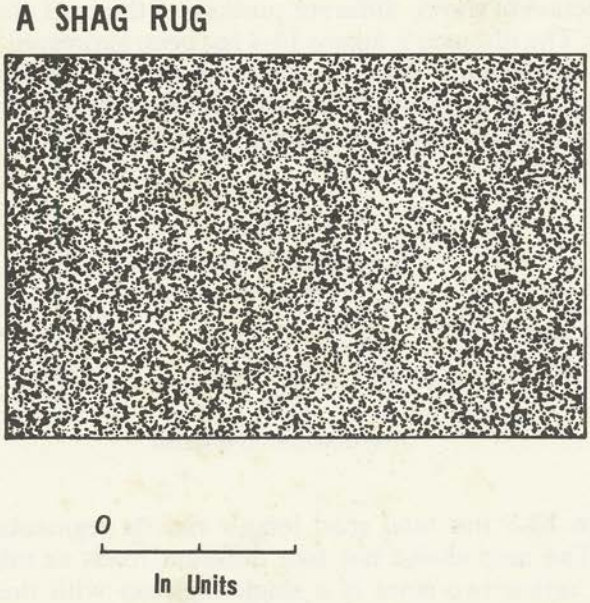
Figure 13-1



specific indication of past sizes coupled with an indeterminate scale (or set of scales) for future use, should probably be regarded as more fruitful than either alone.

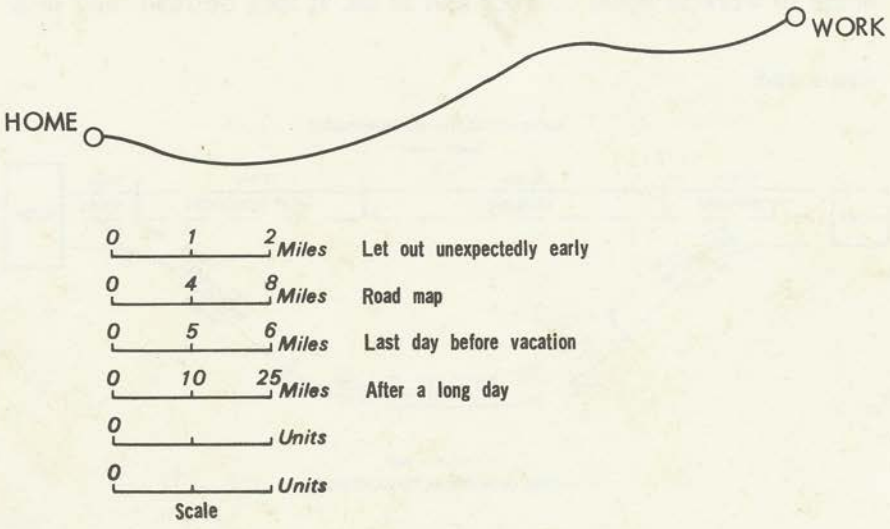
An identical approach might work for the distance between two points like work and home, as sketched in figure 13-3. At first glance it seems not terribly different from the combined shag rug solutions; that is, it presents some scales useful for mapping past realities, while it leaves a few blank for future events. A couple of the scales, however, represent new wrinkles. The first two are obvious: for this traveler the road is shorter than it appears on the road map when he is unexpectedly let out from work early. But the third scale shows that road distance varies with distance traveled, at least on the way home from work on the last day before vacation. Thus in the beginning of this particular journey, the road is longer than shown on the road map, but the road continuously grows shorter and shorter as the traveler approaches his goal. In contrast, after an especially long day at work, the road grows progressively longer as the goal is approached, so that the closer the traveler gets to home, the longer each road segment becomes.

Figure 13-2



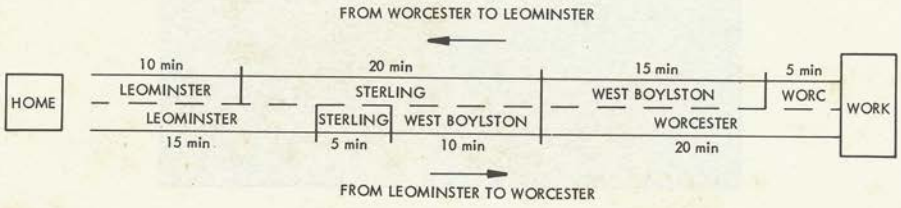
In figure 13-4 the road between home and work is represented as composed of segments that vary in length depending on the direction of the trip.[10] The total length of the trip or road is, however, the same in either direction.[11] This represents a situation different from that

Figure 13-3



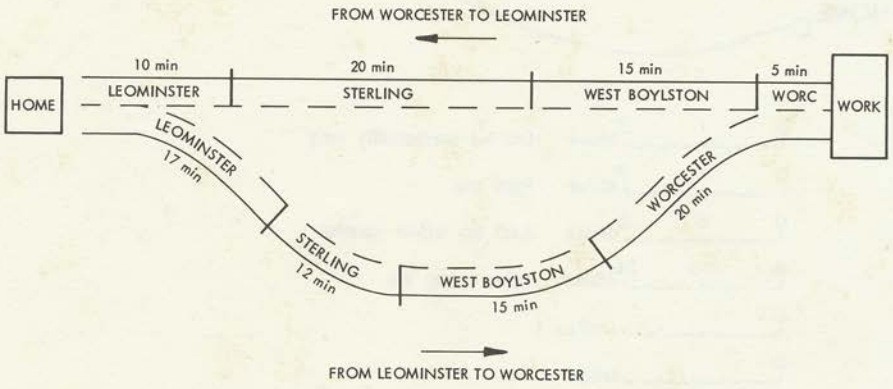
encountered above, for no matter the day or situation, depending solely on the direction of travel, different portions of the road assume different lengths. The distance in figure 13-4 has been expressed in temporal rather than spatial units. The choice is purely arbitrary, since life is lived in space and time together. "Nobody," Minkowski pointed out, "has ever noticed a place except at a time, or a time except at a place."[12]

Figure 13-4



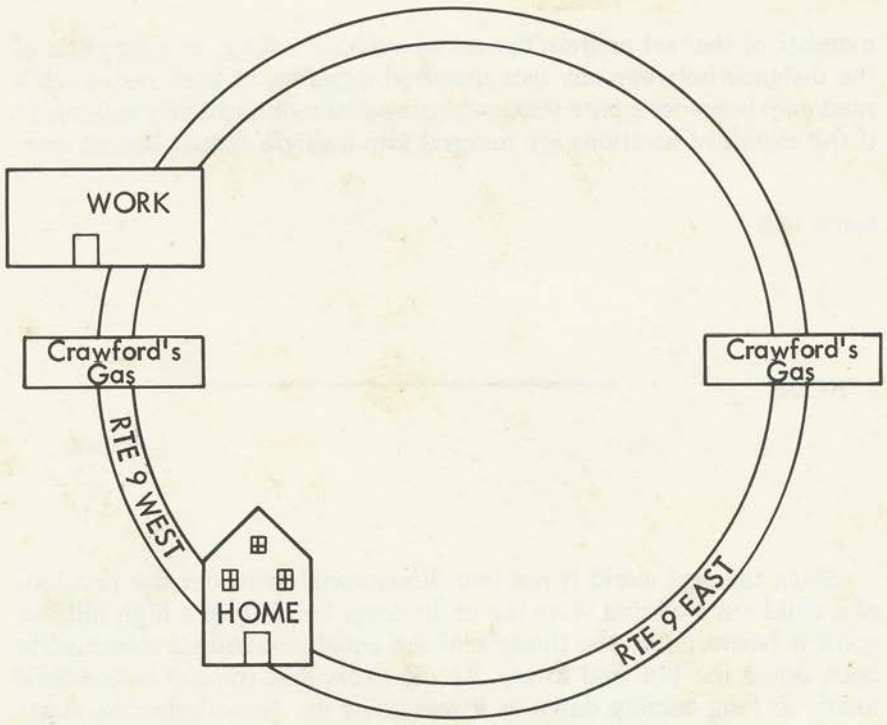
In figure 13-5 the *total* road length and its segments vary with direction. The map shows not two different roads as might at first appear but rather two lanes of a single highway with the time from home to work sixty-four minutes and the time from work to home, fifty. It was again decided to represent the distance in temporal units, although conversion to spatial units is simple (you could, for example, call each minute a mile) and does no violence to the significance of the map. The blank space appearing to separate the two lanes is an artifact of the map not an attribute of the road portrayed.[13] In an attempt to obviate this convention, the map shown in figure 13-6 was devised. This is a noncommutative route map showing the trip from home to work to home to work to home to work and so on. It may be read only in a

Figure 13-5



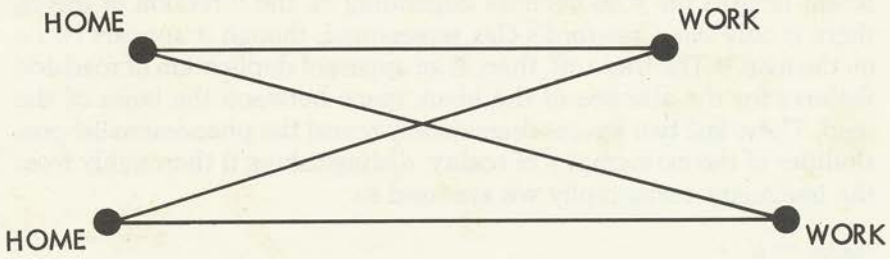
counterclockwise direction. Since what is represented here is the different lengths the road assumes depending on the direction of travel, there is only *one* Crawford's Gas *represented,* though it appears twice on the map.[14] The trade off, then, is an apparent duplication of roadside features for the absence of the blank space between the lanes of the road. These last two figures dramatically reveal the phenomenalist possibilities of the cartography of reality, distinguishing it thoroughly from the imaginary cartography we are used to.

Figure 13-6



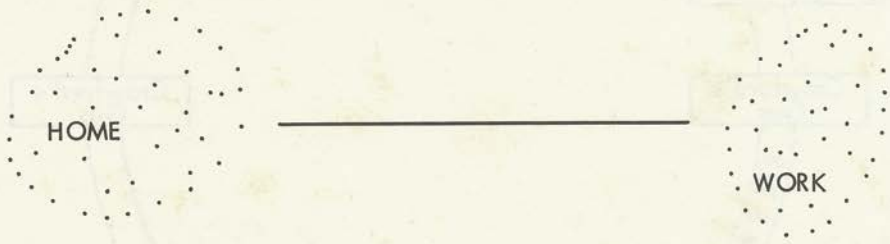
So far the length of the road has been treated as if it were independent of the locations of its end points. It is just as easy to hold that if the length of the road varies it does so because of *changes in the locations of its end points.* This line of reasoning leads to a second family of solutions, the simplest of which is sketched in figure 13-7. The change in the length of the road is here revealed to result from a change in location of home, work, or both. Continuing this line of reasoning we find that in figure 13-8 variation in route length results from variation in goal locations, where goal locations comprise infinitely large sets so that no member of either set may be distinguished from any other

Figure 13-7



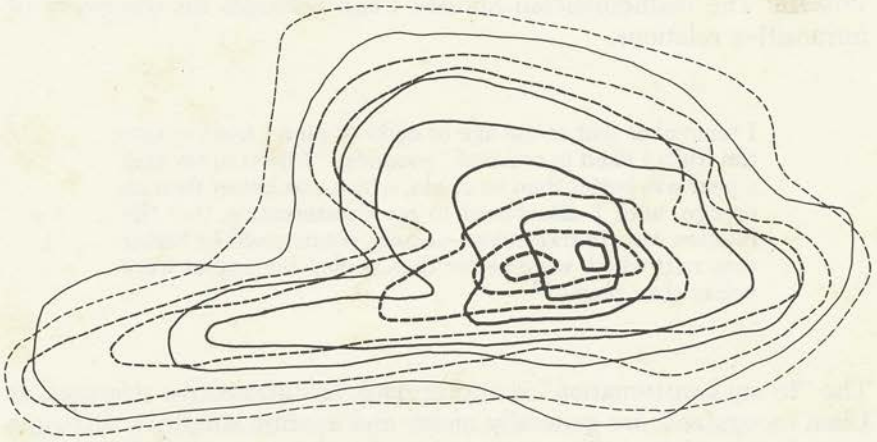
member of that set or from the set as a whole, except as a function of the distance between any two specified members of both sets. Such a road map becomes a pure statement of spatial indeterminacy especially if the clouds of locations are merged into a single spatial bee swarm.

Figure 13-8



Since the real world is not two dimensional, consider the problem of a child out sledding.[15] As the child drags his sled up a high hill, his spirit is bolstered by the thought of the equally unending return slide back down the hill. Sad to say, he discovers that the hill is nowhere nearly as long coming down as it was going up. Nonetheless he starts up again only to discover the hill higher than before and considerably steeper. But as soon as he slaps his sled off the top of the hill, it flattens right out to nothing. Eventually the hill becomes so high as to preclude his reaching the top again, and he goes home to supper. In figure 13-9 two different hills are *shown* to emphasize the fact that there are *at least* two different hills in the real world; though, as the scales reveal, there are many, many more. One set of scales is provided for those who climb the hill once; another set, for those who do so more often. A whole plethora of hills is indicated in this last set. Alternate approaches could indicate one hill with contour lines, another with shading.[16] The possibilities are as endless as the final hill is high.

Figure 13-9



FOR ONE ASCENT AND DESCENT

Descent —— Contour Interval 10 Ft

Ascent ----- Contour Interval 15 Ft

FOR SEQUENTIAL ASCENTS AND DESCENTS

Contour Interval 10 Ft —— Descent: Subtract 1 additional foot per descent from interval, up to five descents. Add ½ foot per descent to last figure for descents 6 to 9. All additional descents remain the same.

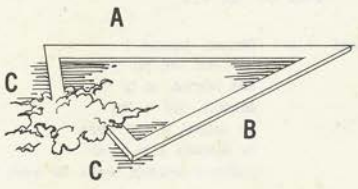
Contour Interval 15 Ft ----- For second ascent, multiply by 2; for third, by 4; for fourth, by 16. Continue until tired.

So far we have dealt only with the simplest of the problems in the cartography of reality; the representation of the distance between two points as a changing or indeterminate function. There are as many others as there are attributes of reality. The last one to be treated here, however, simply takes one further step in the abolition of the metric. Take the reality of intransitive distance. A transitive relation is one such that if *A* has this relation to *B*, and *B* to *C*, then *A* has this relation to *C*. If distance *A*, for example, is longer than distance *B* and distance *B* is longer than distance *C*, then distance *A* is also longer than distance *C*. In an intransitive relation this does not follow, and distance *A* would not be longer than distance *C*. Intransitive relations in general are quite common. I like you, for instance, and you like her; but *I* do not like her or *she* does not like me. Or take another case: Harry, the chessplayer,

always beats Joe, and Joe always beats William; but Harry never beats William. The mathematician Stanley Ulam recounts his discovery of intransitive relations:

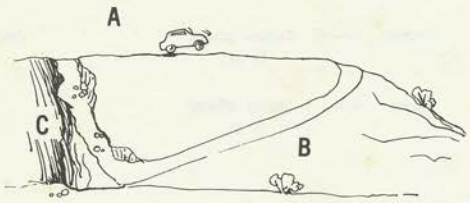
> I remember that at the age of eight or nine I tried to rate the fruits I liked in order of "goodness." I tried to say that a pear was better than an apple, which was better than an orange, until I discovered to my consternation that the relation was not transitive—namely, plums could be better than nuts which were better than apples, but apples were better than plums.[17]

The "to my consternation" is appropriate, for intransitive relations, as Ulam recognized, are generally messy and confuse simplistic attempts at ordering things. The merest thought of intransitive distance is enough to curl the edges of all the conventional maps in existence.



An Intransitive Relationship

Figure 13-10



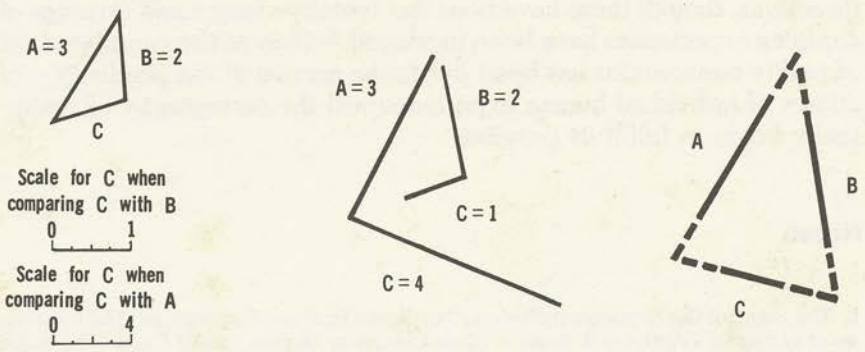
Another Intransitive Relationship

Figure 13-11

To visualize the spatial problem of intransitivity consider that it means that, given a scalene triangle, side one is longer than side two, which is longer than side three, which is longer than side one. To argue that this is not a triangle *is* preposterous: three sides intersect in pairs in three points resulting in three angles. But how can this intransitive triangle be represented? For those who would raise the specter of subjectivity I can say with Russell only that "it would puzzle those who use this glib word to say what they mean by it."[18] But in any case, since each of these expedients violates the first principle of the cartography of reality—to trust your experience over all else—each must be dismissed. The real world *can* be represented.

Actually, as soon as the problem has been admitted as genuine, solutions begin to appear. Each line representing the three distances,

Figure 13-12



for instance, could be provided with individual pairs of scales: one of the pair to be used when comparing its line to one of the other lines, the other of the pair to be used when comparing its line to the remaining line. More radically, the third line could be represented by two different lines, one longer than the first line, the other shorter than the second, each to be used in the appropriate context. All three lines could be allowed to fade out as they approach what would have been their termini, which could be represented by eloquent blanks, thus rendering any measurement possible and so freeing the lines to be any length at all. The possibilities are endless. The immediate sensation that each of these conventions is counter-intuitive soon enough wears off, especially when it is realized that all cartographic conventions are just that, conventions, and in most cases not counter-intuitive themselves simply because habit has inured us to their presence. Nothing, for instance, in the real world could be more counter-intuitive than the shape Australia assumes in a north polar equidistant projection of the conventional world; nothing, that is, except the way, on the same projection, the South Pole miraculously transforms itself into a circle circumscribing the whole of the earth. If enough naive attention can be summoned to an examination of the maps of conventional cartography, the whole ensemble of conventions suddenly acquires an entirely unreal quality.[19] But just as habit tramples this into a mundane and acceptable semblance of "reality," so habit will all too soon rob the conventions of the cartography of reality of any hint of counter-intuitiveness.

A completed cartography of reality will consist of a full set of reality conventions capable of transforming the reality of individual human experience in its spatial entirety to two-dimensional graphic form, though these conventions will develop over time, as have those of the conventional cartography. Three earlier papers have explored a num-

ber of conventions for the representation of real distances and real directions, though these have been but tentative forays and no maps of complex experiences have been produced.[20] Only as the completed set of reality conventions has been put to the service of the production of atlases of individual human experience will the cartography of reality really begin to fulfill its promise.

Notes

1. The range of this literature is illustrated by Roger Hart and Gary Moore, *The Development of Spatial Cognition: A Review,* Clark University Department of Geography Place Perception Research Report no. 7 (Worcester, Mass., 1971); Roger Downs and David Stea, *Maps in Minds* (New York: Harper & Row, 1977).
2. This is, of course, not unknown to cartographers. See Arthur Robinson and R. D. Sale, *Elements of Cartography,* 3d ed. (New York: John Wiley & Sons, 1969), ch. 1; J. K. Wright, "Map Makers Are Human," in *Human Nature in Geography* (Cambridge: Harvard University Press, 1966). For further discussion, see Arthur Robinson and B. Petchenik, *The Nature of Maps* (Chicago: University of Chicago Press, 1976); Waldo Tobler, "The Geometry of Mental Maps," in Reginald Golledge and Gerard Rushton, eds., *Spatial Choice and Spatial Behavior* (Columbus: Ohio University Press, 1976), especially p. 69; David Stea, "The Measurement of Mental Maps," in Kevin Cox and Reginald Golledge, eds., *Behavioral Problems in Geography,* Northwestern University Studies in Geography no. 17 (Evanston, Ill.: Northwestern University Press, 1969), pp. 228–53.
3. In an attempt to avoid a sectarian strife, the definitions of *humane, humanist, phenomenological,* and *phenomenalist* were derived from those in *The American Heritage Dictionary* (Boston: American Heritage and Houghton Mifflin, 1970).
4. Bertrand Russell, *Mysticism and Logic* (New York: Doubleday Anchor, 1957), p. 133.
5. Ibid., p. 135. In Alexander Durrell's *Balthazar* (New York: E. P. Dutton, 1958), p. 14, a character puts it like this: " 'We live' writes Pursewarden somewhere, 'lives based on selected fictions. Our view of reality is conditioned by our position in space and time—not by our personalities as we like to think. Thus every interpretation of reality is based on a unique position. Two paces east or west and the whole picture is changed.' " I have no doubt that Durrell was strongly influenced by this essay of Russell's.
6. Russell, *Mysticism and Logic,* p. 138.
7. A. S. Eddington, "What Is Geometry?" in J. J. C. Smart, ed., *Problems of Space and Time* (New York: Macmillan, 1964), p. 170.
8. This particular solution to the problem was suggested by Gordon Hinzmann, a geographer residing in Bogota, Colombia, in a personal communication dated March 16, 1973.
9. This modification of Hinzmann's solution is the present author's.
10. This solution is due to John DeLisle of Leominster, Massachusetts.
11. That is, the whole trip is commutative, while its parts are not.
12. H. Minkowski, "Space and Time," in Smart, *Problems of Space and Time,* p. 298.
13. It is, of course, only custom that stops us from blinking significantly at the blank space appearing on most maps. I have yet to see any part of the earth's surface that is blank, and yet since I am so inured to the convention I do not rebel. The case in hand is at once merely unconventional and yet at the same time more radical in its significance than the merely unfamiliar would be.
14. This solution is due to Thomas Oram of Marlboro, Massachusetts.
15. This solution is due to Stuart Howe of Worcester, Massachusetts.
16. This solution is due to Norman Carpenter, who is also responsible for figures 13-1 through 13-9.
17. Stanley Ulam, *Adventures of a Mathematician* (New York: Charles Scribner's Sons, 1976), p. 91.

18. Russell, *Mysticism and Logic*, p. 138. Once a description has been labeled (castigated) as subjective it can be dismissed, at least as something important. This holds for all experiences modified by "seemed to be," for if something only *seemed* to be, then it really *was not*; and if it was not, why bother with it? Father Brown makes the same point when he says:

> What's the good of words? . . . If you try to talk about a truth that's merely moral, people always think it's merely metaphorical. A real live man with two legs once said to me: "I only believe in the Holy Ghost in a spiritual sense." Naturally I said, "In what other sense could you believe it?" And *then* he thought I meant he needn't believe in anything except evolution, or ethical fellowship, or some bilge.

He makes the remark in an extended and brilliant passage in G. K. Chesterton, *The Father Brown Omnibus* (New York: Dodd, Mead, 1951), p. 638.

19. This is to say that no matter how unlikely the conventions of the cartography of reality seem to be on first acquaintance, they are rarely as bizarre as the conventions of conventional cartography; and of these, few are more bizarre than those that transform points—such as the poles—into lines and, in the case of the Mercator projection, into lines of infinite length. That some other feature of the world is thrown into brilliant highlight by the insanity of this convention is too subtle a point for most teachers: they label the whole map "real" and thus render it entirely imaginary.

20. The three earlier papers, listed in the order in which they should be read, are "What Color Is the Sky?" (Paper distributed at the 1978 meetings of the Association of American Geographers); "The Cartography of Reality" (Paper presented at the 1973 meetings of the National Council on Geographic Education); and "The Geometry of Ecstasy" (Paper distributed at the 1977 meetings of the Association of American Geographers). In terms of the conventions developed, the first deals with the issue of transitivity; the second, with commutativity; and the third, with real directions. All three are available from the present author upon request. Bob Klute drew figures 13-10, 13-11, and 13-12.