

times are equally critical: the outlook in 1964 is neither better nor worse than was the outlook in 1864, or, for that matter, in 64 A.D. He is in favor of the Great Tradition of Western Civilization but is an inadequate defender of it, being insufficiently aware that the tradition is endangered by both internal decay and external attack. Highet's platitudes reflect the former, and the vehement attack on the center by Marx and Nietzsche reflects the latter. Highet has very little to say about either of these men; he seems oblivious not only to the profundity of their respective critiques of Western civilization but to their threat to what he considers the eternal verities.

It is sad to have to report on the shortcomings and ultimate failures of this book because Gilbert Highet is, in his middlebrow way, a distinguished man. The reader of his latest effort can scarcely help feeling that the author is a soldier on the right side. It is easy to see that his heart is in the right place, but it is difficult to say the same thing about his mind.

## Knowing One's Place

THE NATURE OF MAPS: ESSAYS TOWARD UNDERSTANDING MAPS AND MAPPING. *By Arthur H. Robinson and Barbara Bartz Petchenik. University of Chicago Press. \$8.95.*

Reviewed by BRIAN HAYES

Lost in the woods: you unfold a map, a representation of the wilderness, and strike for home. But how do you discover the correspondence between representation and reality? How do you find your own position on the map? Having found it, how do you establish some mutual orientation between the map, yourself, and the territory, so that home has a known direction? These are cognitive tasks of surprising complexity; if they cannot be accomplished, the map is useless, a mere paper wilderness. The problem is somewhat like that of using a dictionary to find the spelling of a word. Where do you start, and when you've found the word how can you be certain it's the right one? A dictionary, how-

ever, is a one-dimensional map; a real map has at least two dimensions and hence is far more complicated.

In spite of the difficulties, the apparent circularities, most of us can find the spelling of a word in a dictionary, and most of us can find our way through unfamiliar terrain with the help of a map. Arthur H. Robinson and Barbara Bartz Petchenik argue that this competence is deceptive; just because we know how to use maps, they say, this doesn't mean we understand maps. They are at pains to demonstrate the special properties of a map as an instrument of communication.

When considered merely as an object, a map seems fairly straightforward. Definitions usually begin by postulating a one-to-one correspondence between the points on the paper and the points of the territory mapped. In more abstract terms, the map defines coordinates that express formally the particularity of space; each point is named, uniquely identified. Even at this level of description, there are inadequacies; for example, the contributions of map symbols and of projective geometry have not been considered. What is more important, however, is that even a comprehensive description in these terms could define only the relation between the map and the territory. Robinson and Petchenik ask that we also consider the relations between the map and the viewer and between the viewer and the territory. Finally, we might give some thought to the possible effects of errors on the map, and to the inevitable discrepancies between the perceptions of the cartographer and those of the map reader.

A map for someone who is lost in the woods is presumably a topographic map, a species closely related to (but usually more beautiful than) the gas-station road map. The road map itself is probably the most familiar kind, although it is also one of the more abstract and highly stylized maps. (No one believes the state of New Jersey actually looks like that tangled fishnet of red and blue and black!) There are many other map types. Thematic maps represent the variation of some measured quantity—population, income, the incidence of plague—with respect to location. Maps can be constructed so that distance corresponds not to distance in the real world but to some other variable, such as travel time.

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On certain military maps an entire landscape is reduced to an array of numbers. Further afield, there are maps of the moon, maps of the brain, maps of the living cell. The blueprints for the chip of etched silicon that runs an electronic calculator could be regarded as a particularly elaborate map, and so could the silicon chip itself.

The most conspicuous property common to all these graphic devices is multidimensionality. They are all spatial arrays, and their format seems somehow to facilitate access to the information embedded in them. Suppose you are given a list of ten cities, together with all the distances between them, taken two cities at a time. Such a list of distances (for ten cities there are forty-five of them) uniquely specifies the arrangement of the cities on a plane; it supplies enough information to draw a map. Without the map, working from the list of numbers alone, it would be all but impossible to visualize the cities' relative positions. A glance at the map gives all the distances between pairs, and gives much more—an image. Robinson and Petchenik observe that people make and use maps in order "to discover (by seeing) meaningful physical or intellectual shape organizations in the milieu, *structures that are likely to remain hidden until they have been mapped*" (their italics). It's the seeing that is the tricky part.

In attempting to understand how it is that maps yield up their information, Robinson and Petchenik set out in several directions at once. They consider the contributions of information theory, as formulated by Claude Shannon and Warren Weaver, and conclude—too hastily, I think—that it has little to offer. They discuss the epistemological ideas of Susanne K. Langer and Michael Polanyi and find them illuminating but less than explanatory. What they find most useful is the work of Jean Piaget and his colleagues on how children acquire the concept of spatial relation. It comes as no surprise, of course, that the psychology of perception should be a central discipline in the study of maps and how we read them. Unfortunately, the strongest conclusion that can be supported by this work is something of a disappointment: it seems that we understand maps because maps reflect in some way the organization of

information in the brain. That's good to know, but one longs for a more detailed map of that maplike organization.

Robinson and Petchenik suggest that their thin book (138 pages) be regarded only as a preliminary foray into the theory of mapping. One of their objectives is simply to point out that maps, considered as a system of communication, deserve more scholarly attention than they have received. What Robinson and Petchenik have supplied is an outline of work yet to be done.

They have also provided a reminder of the importance of knowing one's place. It is quite extraordinary, and not widely appreciated, that each of us goes through a lifetime with an almost continuous sense of location. "Lost" long ago ceased to be a mere metaphor for desperation; the several meanings of the word together suggest that to be misplaced is to be absent entirely, dead. The need to ask "Where am I?" is a classical, definitive sign of terror or insanity. Ordinarily we pay little attention, but we are always aware of position and prepared to revise coordinates, to consult a mental map or a whole atlas of mental maps. We are constant navigators.

## They Walked a Long Mile

THE U.S. CAMEL CORPS: AN ARMY EXPERIMENT. By *Odie B. Faulk*. Oxford University Press. \$9.75.

Reviewed by PAUL A. ZAHL

Camels first evolved in North America, where forty million years ago they were grazers on the central plains. Then, for reasons obscure to present-day ecologists, the family *Camelidae* vanished from the continent, but not before some of its members had wandered across the northern land bridge into Asia and thence to Africa, where they adapted to desert life. Others sought the high

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