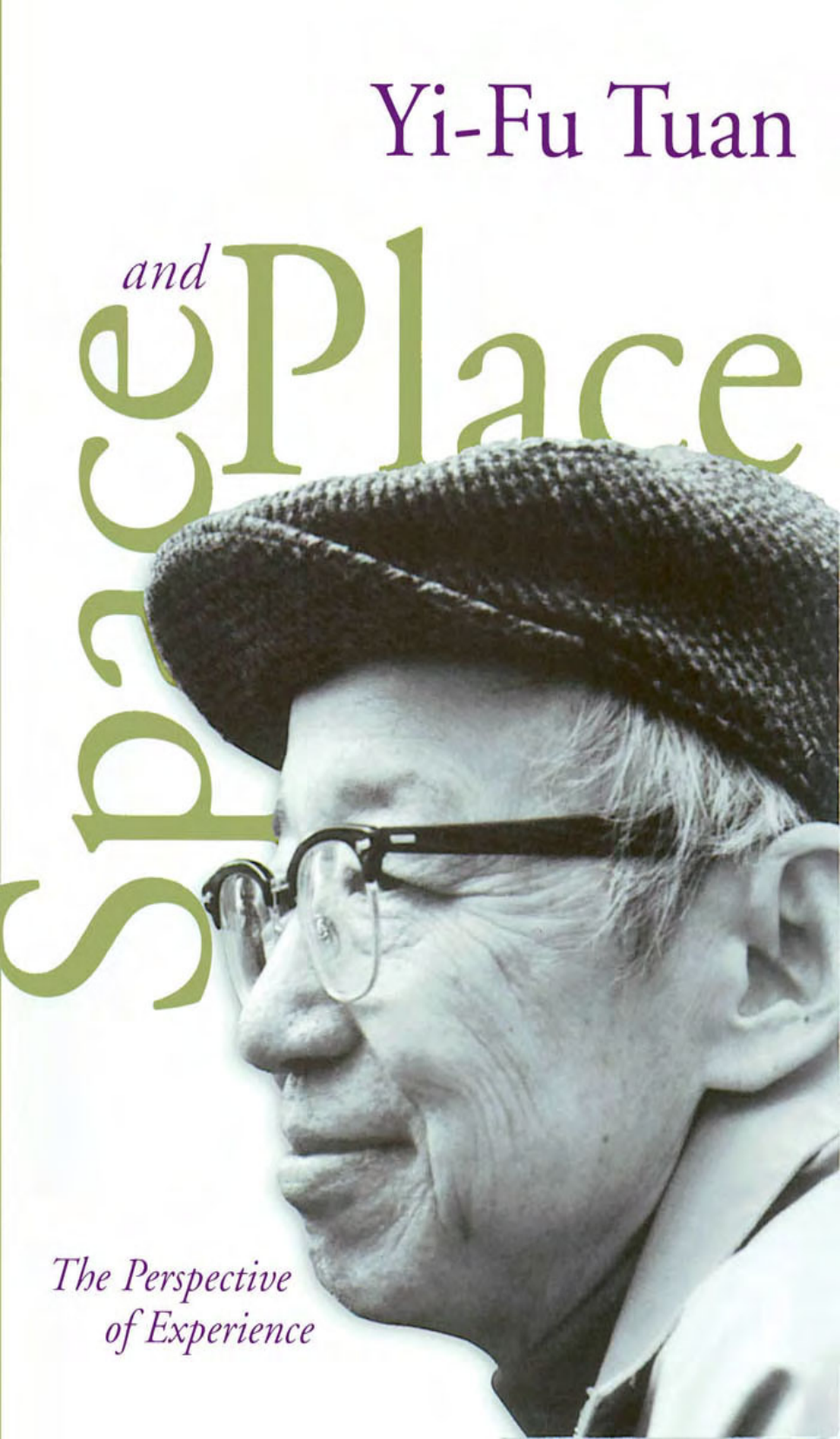
Yi-Fu Tuan

Space and Place



The Perspective of Experience

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Yi-Fu Tuan

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Preface

The life of thought is a continuous story, like life itself: one book grows out of another as in the world of political commitment one action leads to another. I wrote a book called *Topophilia* out of the need to sort and order in some way the wide variety of attitudes and values relating to man's physical environment. While I enjoyed noting the richness and range of human environmental experience, I could not at that time find an overarching theme or concept with which to structure my heterogeneous material; and in the end I often had to resort to convenient and conventional categories (like suburb, town, and city, or the separate treatment of the human senses) rather than to categories that evolved logically out of a ruling theme. The present book is an attempt to achieve a more coherent statement. To do this I narrow my focus to the closely related "space" and "place" components of environment. More importantly, I try to develop my material from a single perspective — namely, that of experience. The complex nature of human experience, which ranges from inchoate feeling to explicit conception, commands the subject matter and themes of this book.

It has often been difficult for me to acknowledge properly my intellectual debts. One reason is that I owe so much to so

many. An even greater problem is that I may well fail to acknowledge people to whom I owe the greatest debt. I have cannibalized them! Their ideas have become my own innermost thoughts. My unnamed mentors include students and colleagues at the University of Minnesota. I expect them to be indulgent toward any unconscious borrowing of their insights, for all teachers know it to be the sincerest form of compliment.

I do have specific debts, and it gives me pleasure to acknowledge them. I am deeply grateful to J. B. Jackson and P. W. Porter for their encouragement of my fumbling efforts; to Su-chang Wang, Sandra Haas, and Patricia Burwell for the diagrams which achieve a formal elegance that in the case of the text remains only an aspiration; and to Dorian Kottler of the University Press for the meticulous job of copyediting. I also want to thank the following institutions, which provided me with the resources to work on *Space and Place* with little interruption in the last two years: the University of Minnesota for granting me a sabbatical leave followed by a year's leave of absence; the University of Hawaii, where I first explored the themes of this book with a small group of sympathetic graduate students; the Australian-American Educational Foundation (Fulbright-Hays program) for an award to visit Australia; the Department of Human Geography at the Australian National University for providing a congenial and stimulating environment in which to think and write; and the University of California at Davis for a year of sunshine and warmth, human and climatic.

Yi-Fu Tuan

Chinese New Year, 1977

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1

Introduction

"Space" and "place" are familiar words denoting common experiences. We live in space. There is no space for another building on the lot. The Great Plains look spacious. Place is security, space is freedom: we are attached to the one and long for the other. There is no place like home. What is home? It is the old homestead, the old neighborhood, hometown, or motherland. Geographers study places. Planners would like to evoke "a sense of place." These are unexceptional ways of speaking. Space and place are basic components of the lived world; we take them for granted. When we think about them, however, they may assume unexpected meanings and raise questions we have not thought to ask.

What is space? Let an episode in the life of the theologian Paul Tillich focus the question so that it bears on the meaning of space in experience. Tillich was born and brought up in a small town in eastern Germany before the turn of the century. The town was medieval in character. Surrounded by a wall and administered from a medieval town hall, it gave the impression of a small, protected, and self-contained world. To an imaginative child it felt narrow and restrictive. Every year, however young Tillich was able to escape with his family to the Baltic Sea. The flight to the limitless horizon and unrestricted space

of the seashore was a great event. Much later Tillich chose a place on the Atlantic Ocean for his days of retirement, a decision that undoubtedly owed much to those early experiences. As a boy Tillich was also able to escape from the narrowness of small-town life by making trips to Berlin. Visits to the big city curiously reminded him of the sea. Berlin, too, gave Tillich a feeling of openness, infinity, unrestricted space.[1] Experiences of this kind make us ponder anew the meaning of a word like "space" or "spaciousness" that we think we know well.

What is a place? What gives a place its identity, its aura? These questions occurred to the physicists Niels Bohr and Werner Heisenberg when they visited Kronberg Castle in Denmark. Bohr said to Heisenberg:

> Isn't it strange how this castle changes as soon as one imagines that Hamlet lived here? As scientists we believe that a castle consists only of stones, and admire the way the architect put them together. The stones, the green roof with its patina, the wood carvings in the church, constitute the whole castle. None of this should be changed by the fact that Hamlet lived here, and yet it is changed completely. Suddenly the walls and the ramparts speak a quite different language. The courtyard becomes an entire world, a dark corner reminds us of the darkness in the human soul, we hear Hamlet's "To be or not to be." Yet all we really know about Hamlet is that his name appears in a thirteenth-century chronicle. No one can prove that he really lived, let alone that he lived here. But everyone knows the questions Shakespeare had him ask, the human depth he was made to reveal, and so he, too, had to be found a place on earth, here in Kronberg. And once we know that, Kronberg becomes quite a different castle for us.[2]

Recent ethological studies show that nonhuman animals also have a sense of territory and of place. Spaces are marked off and defended against intruders. Places are centers of felt value where biological needs, such as those for food, water, rest, and procreation, are satisfied. Humans share with other animals certain behavioral patterns, but as the reflections of Tillich and Bohr indicate, people also respond to space and place in complicated ways that are inconceivable in the animal world. How can the Baltic Sea and Berlin both evoke a sense of openness and infinitude? How can a mere legend haunt Kronberg Castle and impart a mood that infiltrates the minds of two

famous scientists? If our concern with the nature and quality of the human environment is serious, these are surely basic questions. Yet they have seldom been raised. Instead we study animals such as rats and wolves and say that human behavior and values are much like theirs. Or we measure and map space and place, and acquire spatial laws and resource inventories for our efforts. These are important approaches, but they need to be complemented by experiential data that we can collect and interpret in measured confidence because we are human ourselves. We have privileged access to states of mind, thoughts and feelings. We have an insider's view of human facts, a claim we cannot make with regard to other kinds of facts.

People sometimes behave like cornered and wary animals. On occasion they may also act like cool scientists dedicated to the task of formulating laws and mapping resources. Neither posture holds sway for long. People are complex beings. The human endowment includes sensory organs similar to those of other primates, but it is capped by an exceptionally refined capacity for symbolization. How the human person, who is animal, fantasist, and computer combined, experiences and understands the world is the central theme of this book.

Given the human endowment, in what ways do people attach meaning to and organize space and place? When this question is asked, the social scientist is tempted to rush to culture as an explanatory factor. Culture is uniquely developed in human beings. It strongly influences human behavior and values. The Eskimos' sense of space and place is very different from that of Americans. This approach is valid, but it overlooks the problem of shared traits that transcend cultural particularities and may therefore reflect the general human condition. When note is taken of "universals," the behavioral scientist is likely to turn to the analogue of primate behavior. In this book our animal heritage is assumed. The importance of culture is taken for granted; culture is inescapable, and it is explored in every chapter. But the purpose of the essay is not to produce a handbook of how cultures affect human attitudes to space and place. The essay is, rather, a prologue to culture in its countless variety; it focuses on general questions of human dispositions,

capacities, and needs, and on how culture emphasizes or distorts them. Three themes weave through the essay. They are:

(1) The biological facts. Human infants have only very crude notions of space and place. In time they acquire sophistication. What are the stages of learning? The human body lies prone, or it is upright. Upright it has top and bottom, front and back, right and left. How are these bodily postures, divisions, and values extrapolated onto circumambient space?

(2) The relations of space and place. In experience, the meaning of space often merges with that of place. "Space" is more abstract than "place." What begins as undifferentiated space becomes place as we get to know it better and endow it with value. Architects talk about the spatial qualities of place; they can equally well speak of the locational (place) qualities of space. The ideas "space" and "place" require each other for definition. From the security and stability of place we are aware of the openness, freedom, and threat of space, and vice versa. Furthermore, if we think of space as that which allows movement, then place is pause; each pause in movement makes it possible for location to be transformed into place.

(3) The range of experience or knowledge. Experience can be direct and intimate, or it can be indirect and conceptual, mediated by symbols. We know our home intimately; we can only know *about* our country if it is very large. A longtime resident of Minneapolis knows the city, a cabdriver learns to find his way in it, a geographer studies Minneapolis and knows the city conceptually. These are three kinds of experiencing. One person may know a place intimately as well as conceptually. He can articulate ideas but he has difficulty expressing what he knows through his senses of touch, taste, smell, hearing, and even vision.

People tend to suppress that which they cannot express. If an experience resists ready communication, a common response among activists ("doers") is to deem it private—even idiosyncratic—and hence unimportant. In the large literature on environmental quality, relatively few works attempt to understand how people feel about space and place, to take into account the different modes of experience (sensorimotor, tac-

tile, visual, conceptual), and to interpret space and place as images of complex—often ambivalent—feelings. Professional planners, with their urgent need to act, move too quickly to models and inventories. The layman accepts too readily from charismatic planners and propagandists the environmental slogans he may have picked up through the media; the rich experiential data on which these abstractions depend are easily forgotten. Yet it is possible to articulate subtle human experiences. Artists have tried—often with success. In works of literature as well as in humanistic psychology, philosophy, anthropology and geography, intricate worlds of human experience are recorded.

This book draws attention to questions that humanists have posed with regard to space and place.[3] It attempts to systematize humanistic insights, to display them in conceptual frames (here organized as chapters) so that their importance is evident to us not only as thoughtful people curious to know more about our own nature—our potential for experiencing—but also as tenants of the earth practically concerned with the design of a more human habitat. The approach is descriptive, aiming more often to suggest than to conclude. In an area of study where so much is tentative, perhaps each statement should end with a question mark or be accompanied by qualifying clauses. The reader is asked to supply them. An exploratory work such as this should have the virtue of clarity even if this calls for the sacrifice of scholarly detail and qualification.

A key term in the book is "experience." What is the nature of experience and of the experiential perspective?

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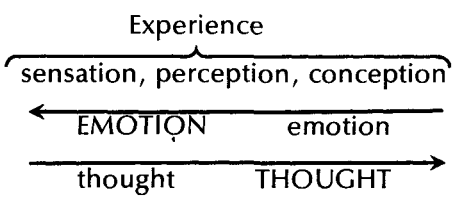
Experiential Perspective

Experience is a cover-all term for the various modes through which a person knows and constructs a reality. These modes range from the more direct and passive senses of smell, taste, and touch, to active visual perception and the indirect mode of symbolization.[1]



Emotion tints all human experience, including the high flights of thought. Mathematicians, for example, claim that the design of their theorems is guided by aesthetic criteria—notions of elegance and simplicity that answer a human need. Thought tints all human experience, including the basic sensations of heat and cold, pleasure and pain. Sensation is quickly qualified by thought as one of a special kind. Heat is suffocating or prickly; pain is sharp or dull, an irritating tease or a brutal force.

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Experiential Perspective

Experience is directed to the external world. Seeing and thinking clearly reach out beyond the self. Feeling is more ambiguous. As Paul Ricoeur put it, "Feeling is . . . without doubt intentional: it is a feeling of 'something'—the lovable, the hateful, [for instance]. But it is a very strange intentionality which on the one hand designates qualities felt *on* things, *on* persons, *on* the world, and on the other hand manifests and reveals the way in which the self is inwardly affected." In feeling "an intention and an affection coincide in the same experience."[2]

Experience has a connotation of passivity; the word suggests what a person has undergone or suffered. An experienced man or woman is one to whom much has happened. Yet we do not speak of the plant's experiences, and even of the lower animals the word "experience" seems inappropriate. The young pup, however, is contrasted with the experienced mastiff; and human beings are mature or immature depending on whether they have benefited from events. Experience thus implies the ability to learn from what one has undergone.[3] To experience is to learn; it means acting on the given and creating out of the given. The given cannot be known in itself. What can be known is a reality that is a construct of experience, a creation of feeling and thought. As Susanne Langer put it: "The world of physics is essentially the real world construed by mathematical abstractions, and the world of sense is the real world construed by the abstractions which the sense organs immediately furnish."[4]

Experience is the overcoming of perils. The word "experience" shares a common root (*per*) with "experiment," "expert," and "perilous."[5] To experience in the active sense requires that one venture forth into the unfamiliar and experiment with the elusive and the uncertain. To become an expert one must dare to confront the perils of the new. Why should one so dare? A human individual is driven. He is passionate, and passion is a token of mental force. The emotional repertoire of a clam is very restricted compared with that of a puppy; and the affective life of the chimpanzee seems almost as varied and intense as that of a human being. A human infant is distin-

guished from other mammalian young both by his helplessness and by his fearsome tantrums. The infant's emotional range, from smile to tantrum, hints at his potential intellectual reach.

Experience is compounded of feeling and thought. Human feeling is not a succession of discrete sensations; rather memory and anticipation are able to wield sensory impacts into a shifting stream of experience so that we may speak of a life of feeling as we do of a life of thought. It is a common tendency to regard feeling and thought as opposed, the one registering subjective states, the other reporting on objective reality. In fact, they lie near the two ends of an experiential continuum, and both are ways of knowing.

To see and to think are closely related processes. In English, "I see" means "I understand." Seeing, it has long been recognized, is not the simple recording of light stimuli; it is a selective and creative process in which environmental stimuli are organized into flowing structures that provide signs meaningful to the purposive organism. Are the senses of smell and touch informed by mentality? We tend to slight the cognitive power of these senses. Yet the French verb "savoir" (to know) is closely related to the English "savour." Taste, smell, and touch are capable of exquisite refinement. They discriminate among the wealth of sensations and articulate gustatory, olfactory, and textural worlds.

The structuring of worlds calls for intelligence. Like the intellectual acts of seeing and hearing, the senses of smell and touch can be improved with practice so as to discern significant worlds. Human adults can develop extraordinary sensitivity to a wide range of flower fragrances.[6] Although the human nose is far less acute than the canine nose in detecting certain odors of low intensity, people may be responsive to a broader range of odors than dogs are. Dogs and young children do not appreciate flower fragrances in the way human adults do. Young children's favorite odors are those of fruits rather than flowers.[7] Fruits are good to eat, so preference for them is understandable. But what is the survival value of sensitivity to the chemical oils wafted by flowers? No clear biological purpose is served by this sensitivity. It would seem that our nose, no less

than our eyes, seeks to enlarge and comprehend the world. Some odors do have potent biological meaning. Body scents, for example, may stimulate sexual activity. Why, on the other hand, do many human adults find the smell of decay repulsive? Mammals with noses far keener than the human tolerate and even appreciate carrion odors that would disgust men. Young children also appear to be indifferent to fetid smells. Langer suggests that the odors of decay are *memento mori* to grown people but carry no such meaning to animals and small children.[8] Touch articulates another kind of complex world. The human hand is peerless in its strength, agility, and sensitivity. Primates, including man, use their hands to know and comfort members of their own species, but man also uses hands to explore the physical environment, carefully differentiating it by the feel of bark and stone.[9] Human adults dislike having sticky matter on their skin, perhaps because it destroys the skin's power for discernment. Such a substance, like dirty spectacles, dulls a faculty of exploration.

The modern architectural environment may cater to the eye, but it often lacks the pungent personality that varied and pleasant odors can give. Odors lend character to objects and places, making them distinctive, easier to identify and remember. Odors are important to human beings. We have even spoken of an olfactory world, but can fragrances and scents constitute a world? "World" suggests spatial structure; an olfactory world would be one where odors are spatially disposed, not simply one in which they appear in random succession or as inchoate mixtures. Can senses other than sight and touch provide a spatially organized world? It is possible to argue that taste, odor, and even hearing cannot in themselves give us a sense of space.[10] The question is largely academic, for most people function with the five senses, and these constantly reinforce each other to provide the intricately ordered and emotion-charged world in which we live. Taste, for example, almost invariably involves touch and smell: the tongue rolls around the hard candy, exploring its shape as the olfactory sense registers the caramel flavor. If we can hear and smell something we can often also see it.

What sensory organs and experiences enable human beings to have their strong feeling for space and for spatial qualities? Answer: kinesthesia, sight, and touch.[11] Movements such as the simple ability to kick one's legs and stretch one's arms are basic to the awareness of space. Space is experienced directly as having room in which to move. Moreover, by shifting from one place to another, a person acquires a sense of direction. Forward, backward, and sideways are experientially differentiated, that is, known subconsciously in the act of motion. Space assumes a rough coordinate frame centered on the mobile and purposive self. Human eyes, which have bifocal overlap and stereoscopic capacity, provide people with a vivid space in three dimensions. Experience, however, is necessary. It takes time and practice for the infant or the person born blind but with sight recently restored to perceive the world as made up of stable three-dimensional objects arranged in space rather than as shifting patterns and colors. Touching and manipulating things with the hand yields a world of objects—objects that retain their constancy of shape and size. Reaching for things and playing with them disclose their separateness and relative spacing. Purposive movement and perception, both visual and haptic, give human beings their familiar world of disparate objects in space. Place is a special kind of object. It is a concretion of value, though not a valued thing that can be handled or carried about easily; it is an object in which one can dwell. Space, we have noted, is given by the ability to move. Movements are often directed toward, or repulsed by, objects and places. Hence space can be variously experienced as the relative location of objects or places, as the distances and expanses that separate or link places, and—more abstractly—as the area defined by a network of places (Fig. 1).

Taste, smell, skin sensitivity, and hearing cannot individually (nor perhaps even together) make us aware of a spacious external world inhabited by objects. In combination with the "spatializing" faculties of sight and touch, however, these essentially nondistancing senses greatly enrich our apprehension of the world's spatial and geometrical character. Taste labels some flavors "sharp," others "flat." The meaning of these

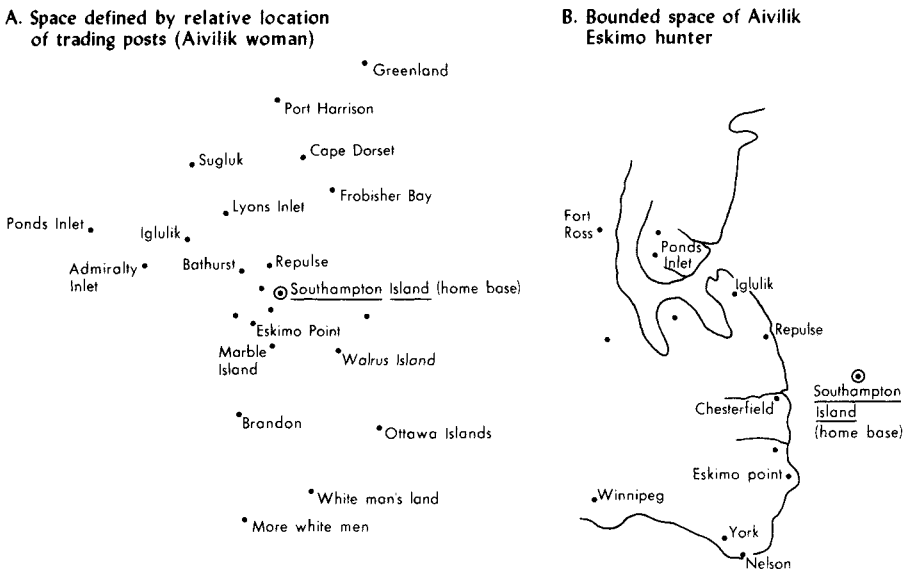


Figure 1. Space as relative location and bounded space. The Eskimo (Aivilik) woman's space is essentially defined by the location and distance of significant points, mostly trading posts (A), as perceived from the home base on Southampton Island, whereas the idea of boundary (the coastline) is important to the male Eskimo's sense of space (B). Edmund Carpenter, Frederick Varley, and Robert Flaherty, *Eskimo* (Toronto: University of Toronto Press, 1959), page 6. Reprinted with permission from the University of Toronto Press.

geometrical terms is enhanced by their metaphorical use in the realm of taste. Odor is capable of suggesting mass and volume. Some odors, like musk or tuberosa, are "heavy," whereas others are "delicate," "thin," or "light." Carnivores depend on their acute sense of smell to track down prey, and it may be that their nose is capable of articulating a spatially structured world—at least one that is differentiated by direction and distance. The human nose is a much atrophied organ. We depend on the eye to locate sources of danger and appeal, but with the support of a prior visual world the human nose too can discern direction and estimate relative distance through the strength of an odor.

A person who handles an object feels not only its texture but its geometric properties of size and shape. Apart from manipulation, does skin sensitivity itself contribute to the human spatial experience? It does, though in limited ways. The skin registers sensations. It reports on its own state and at the same time that of the object pressing against it. The skin is not, however, a distance sensor. In this respect tactile perception is at the opposite extreme of visual perception. The skin is able to convey certain spatial ideas and can do so without the support of the other senses, depending only on the structure of the body and the ability to move. Relative length, for example, is registered when different parts of the body are touched at the same time. The skin can convey a sense of volume and mass. No one doubts that "entrance into a warm bath gives our skin a more massive feeling than the prick of a pin."[12] The skin, when it comes in contact with flattish objects, can judge approximately their shape and size. At the micro level, roughness and smoothness are geometric properties that the skin easily recognizes. Objects are also hard or soft. Tactile perception differentiates these characteristics on spatio-geometric evidence. Thus a hard object retains its shape under pressure whereas a soft object does not.[13]

Is a sense of distance and of space created out of the ability to hear? The world of sound would appear to be spatially structured, though not with the sharpness of the visual world. It is possible that the blind man who can hear but has no hands and can barely move lacks all sense of space; perhaps to such a person all sounds are bodily sensations and not cues to the character of an environment. Few people are so severely handicapped. Given sight and the power to move and handle things, sounds greatly enrich the human feeling for space. Human ears are not flexible, so they are less equipped to discern direction than, say, the ears of a wolf. But by turning the head a person can roughly tell the direction of sounds. People are subconsciously aware of the sources of noise, and from such awareness they construe auditory space.

Sounds, though vaguely located, can convey a strong sense of size (volume) and of distance. For example, in an empty

cathedral the sound of footsteps tapping sharply on the stone floor creates an impression of cavernous vastness. As for the power of sound to evoke distance, Albert Camus wrote: "In Algeria dogs can be heard barking at night over distances ten times greater than in Europe. The noise thus takes on a nostalgia unknown in our cramped countries."[14] Blind people develop an acute sensitivity to sounds; they are able to use them and their reverberations to evaluate an environment's spatial character. People who can see are less sensitive to auditory cues because they are not so dependent on them. All human beings learn, however, to relate sound to distance in the act of speaking. We alter our tone of voice from soft to loud, from intimate to public, in accordance with the perceived physical and social distances between ourselves and others. The volume and phrasing of our voice as well as what we try to say are constant reminders of proximity and distance.

Sound itself can evoke spatial impressions. The reverberations of thunder are voluminous; the squeaking of chalk on slate is "pinched" and thin. Low musical tones are voluminous whereas those of high pitch seem thin and penetrating. Musicologists speak of "musical space." Spatial illusions are created in music quite apart from the phenomenon of volume and the fact that movement logically involves space.[15] Music is often said to have form. Musical form may generate a reassuring sense of orientation. To the musicologist Roberto Gerhard, "form in music means knowing at every moment exactly where one is. Consciousness of form is really a sense of orientation."[16]

The various sensory spaces bear little likeness to each other. Visual space, with its vividness and size, differs strikingly from diffuse auditory and tactile-sensorimotor spaces. A blind man whose knowledge of space derives from auditory and tactile cues cannot, for some time, appreciate the visual world when he gains sight. The vaulted interior of a cathedral and the sensation of slipping into a warm bath both signify volume or spaciousness, although the experiences are hardly comparable. Likewise the meaning of distance is as varied as its experiential modes: we acquire the feel of distance by the effort of

moving from one place to another, by the need to project our voice, by hearing the dogs bark at night, and by recognizing the environmental cues for visual perspective.

The organization of human space is uniquely dependent on sight. Other senses expand and enrich visual space. Thus sound enlarges one's spatial awareness to include areas behind the head that cannot be seen. More important, sound dramatizes spatial experience. Soundless space feels calm and lifeless despite the visible flow of activity in it, as in watching events through binoculars or on the television screen with the sound turned off, or being in a city muffled in a fresh blanket of snow.[17]

Human spaces reflect the quality of the human senses and mentality. The mind frequently extrapolates beyond sensory evidence. Consider the notion of vastness. The vastness of an ocean is not directly perceived. "We think the ocean as a whole," says William James, "by multiplying mentally the impression we get at any moment when at sea."[18] A continent separates New York from San Francisco. A distance of this order is apprehended through numerical or verbal symbols computed, for example, in days' journeys. "But the symbol will often give us the emotional effect of the perception. Such expressions as the abysmal vault of heaven, the endless expanse of ocean, etc., summarize many computations of the imagination, and give the sense of enormous horizon." Someone with the mathematical imagination of Blaise Pascal will look at the sky and be appalled by its infinite expanse. Blind men are able to know the meaning of a distant horizon. They can extrapolate from their experience of auditory space and of freedom in movement to envisage in their minds' eyes panoramic views and boundless space. A blind man told William James that "he thought few seeing people could enjoy the view from a mountain top more than he."[19]

The mind discerns geometric designs and principles of spatial organization in the environment. For example, Dakota Indians find evidence of circular forms in nature nearly everywhere, from the shape of birds' nests to the course of the stars. In contrast, the Pueblo Indians of the American South-

west tend to see spaces of rectangular geometry. These are examples of the construed space, which depends on the power of the mind to extrapolate far beyond the sense data. Such spaces lie at the conceptual end of the experiential continuum. Three principal types, with large areas of overlap, exist—the mythical, the pragmatic, and the abstract or theoretical. Mythical space is a conceptual schema, but it is also pragmatic space in the sense that within the schema a large number of practical activities, such as the planting and harvesting of crops, are ordered. A difference between mythical and pragmatic space is that the latter is defined by a more limited set of economic activities. The recognition of pragmatic space, such as belts of poor and rich soil, is of course an intellectual achievement. When an ingenious person tries to describe the soil pattern cartographically, by means of symbols, a further move toward the conceptual mode occurs. In the Western world systems of geometry—that is, highly abstract spaces—have been created out of primal spatial experiences. Thus sensorimotor and tactile experiences would seem to lie at the root of Euclid's theorems concerning shape congruence and the parallelism of distant lines; and visual perception is the basis for projective geometry.

Human beings not only discern geometric patterns in nature and create abstract spaces in the mind, they also try to embody their feelings, images, and thoughts in tangible material. The result is sculptural and architectural space, and on a large scale, the planned city. Progress here is from inchoate feelings for space and fleeting discernments of it in nature to their public and material reification.

Place is a type of object. Places and objects define space, giving it a geometric personality. Neither the newborn infant nor the man who gains sight after a lifetime of blindness can immediately recognize a geometric shape such as a triangle. The triangle is at first "space," a blurred image. Recognizing the triangle requires the prior identification of corners—that is, places. A neighborhood is at first a confusion of images to the new resident; it is blurred space "out there." Learning to know the neighborhood requires the identification of significant

localities, such as street corners and architectural landmarks, within the neighborhood space. Objects and places are centers of value. They attract or repel in finely shaded degrees. To attend to them even momentarily is to acknowledge their reality and value. The infant's world lacks permanent objects, being dominated by fleeting impressions. How do impressions, given to us through the senses, acquire the stability of objects and places?

Intelligence is manifest in different types of achievement. One is the ability to recognize and feel deeply about the particular. In distinction to the schematic worlds in which animals live, the schematic worlds of human beings are also richly populated with particular and enduring things. The particular things we value may be given names: a tea set is Wedgewood and a chair is Chippendale. People have proper names. They are particular things and they may well be the first permanent objects in the infant's world of unstable impressions. An object such as a valued crystal glass is recognized by its unique shape, decorative design, and ring when lightly tapped. A city such as San Francisco is recognized by its unique setting, topography, skyline, odors, and street noises.[20] An object or place achieves concrete reality when our experience of it is total, that is, through all the senses as well as with the active and reflective mind. Long residence enables us to know a place intimately, yet its image may lack sharpness unless we can also see it from the outside and reflect upon our experience. Another place may lack the weight of reality because we know it only from the outside—through the eyes as tourists, and from reading about it in a guidebook. It is a characteristic of the symbol-making human species that its members can become passionately attached to places of enormous size, such as a nation-state, of which they can have only limited direct experience.

6

Spatial Ability, Knowledge, and Place

Animals can move. Agility, speed, and range of motion vary greatly among different species and are largely innate. A newborn ewe, after a few tottering steps, is able to follow its mother about the pasture, managing its four legs so that they do not get in each other's way. Newborn mammals quickly learn to walk. The human young is the well-known exception. A human infant cannot stand or crawl. Even his small bodily movements are rather clumsy. An infant does not quite know where his mouth is, and his first efforts to put his finger in it are a trial-and-error experiment. At a later stage he learns to crawl more or less on his own, but standing and walking—these characteristically human activities—require encouragement and coaching from adults. Spatial ability develops slowly in the human young; spatial knowledge lags further behind. The mind learns to grapple with spatial relations long after the body has mastered them in performance. But the mind, once on its exploratory path, creates large and complex spatial schemata that exceed by far what an individual can encompass through direct experience. With the help of the mind, human spatial ability (though not agility) rises above that of all other species.

Spatial ability becomes spatial knowledge when movements

and changes of location can be envisaged. Walking is a skill, but if I can "see" myself walking and if I can hold that picture in mind so that I can analyze how I move and what path I am following, then I also have knowledge. That knowledge is transferable to another person through explicit instruction in words, with diagrams, and in general by showing how complex motion consists of parts that can be analyzed or imitated.

Since spatial skill lies in performing ordinary daily tasks, spatial knowledge, while it enhances such skill, is not necessary to it. People who are good at finding their way in the city may be poor at giving street directions to the lost, and hopeless in their attempts to draw maps. They have difficulty envisaging their course of action and the spatial characteristics of the environment in which it takes place. There are many occasions on which we perform complex acts without the help of mental or material plans. Human fingers are exceptionally dexterous. A professional typist's fingers fly over the machine; all we see is a blur of movement. Such speed and accuracy suggest that the typist really knows the keyboard in the sense that he can envisage clearly where all the letters are. But he cannot; he has difficulty recalling the positions of the letters that his fingers know so well. Again, riding a bicycle requires muscular coordination and a fine sense of balance, that is to say, a feeling for the distribution of mass and of forces. A physicist may be able to diagram the balance of forces necessary to the mastery of a bicycle, but such knowledge is certainly not required. Self-conscious knowledge can even stand in the way of perfecting a skill.[1]

When we see an animal moving through a long and devious path to reach food or home, it is tempting to ascribe to the animal an experience similar to what our own would be if we were to make the trip. In particular, it is tempting to postulate that the animal envisages a specific goal (a wedge of cheese or a hole in the dining room wall) and that it can picture the path along which it is to travel. This is highly improbable. Even human beings, who are visually and mentally equipped for such acts, rarely find it necessary to exercise their image-making powers.[2]

Spatial Ability, Knowledge, and Place

We do many things efficiently but unthinkingly out of habit. It is uncanny to watch people acting with skill and apparent purpose and yet know they perform unconsciously, much as our physiological processes adjust to changes in the environment without our conscious control. An extreme example is somnambulism. Perhaps several million Americans sleepwalk or have walked in their sleep when they were children. Lore about somnambulism is abundant. Some of the stories are hard to believe, yet the phenomenon is richly documented and has been studied under laboratory conditions. Here is a striking case. A Berkeley housewife rose one night at 2 A.M., threw a coat over her pajamas, and gathered the family dachshunds into the car for a long drive to Oakland, awakening at the wheel twenty-three miles away.[3] An entire family may be afflicted by somnambulism. When a group of human beings act in consort, with apparent deliberation and purpose, it is hard to accept the fact that they can be quite unaware of what they are doing. Yet several cases of group somnambulism have been reported. One night an entire family of six (husband, his cousin-wife, and their four children) arose at about three in the morning and gathered around the tea table in the servants' hall. One of the children in moving about upset a chair. Only then did they wake up.[4] If a person is afflicted with somnambulism he is likely to start his act as he enters deep sleep. Measurements with electrodes show that sensory information continues to enter the brain of the sleepwalker, whose body then makes appropriate responses, but the brain does not consciously register this information as it does when the person is awake.

With long-distance commuting and driving a commonplace experience in several sectors of American society, many people have known what it is like to display spatial skill and geographical competence in the absence of conscious awareness. The driver "blanks out" while he is on a familiar stretch of the road. He no longer attends to the task; his mind is elsewhere, and yet for long minutes his body maintains control over the vehicle, showing an ability to adapt to minor changes in the environment, as in negotiating broad curves with the

wheel or pressing down the gas pedal in response to a long upward incline in the road. Griffith Williams has documented several cases of what he calls "highway hypnosis." One driver reported:

> I discovered this fact (amnesia) while driving at night from Portland, Oregon to San Francisco, California. The lights of a town approached and I realized that I had been in an almost asleep condition for about 25 miles. Inasmuch as I knew the road I had traveled was not straight, it was apparent that I had negotiated the road, making all the turns, etc. I did not remember the stretch of road at all. I purposely tried it several times after that and found that I could drive miles and miles without memory of it, and while resting. In each case, the moment any driving emergency appeared, I became fully awake.[5]

Acquiring spatial ability, whether it is to ride a bicycle or to find one's way through a maze, does not depend on the possession of a developed cerebral cortex. Pechstein's experiment is convincing. In his experiment rats and human beings are trained to find their way through mazes of identical pattern. Although the training situation is far more familiar to the human than to the rodent subjects, rats learn as quickly and perform almost as well as human beings.[6] Man's large brain is redundant to learning the kinds of skills in path-finding that are essential to the survival of animals.

How do human beings acquire the ability to thread their way through a strange environment, such as unfamiliar city streets? Visual cues are of primary importance, but people are less dependent on imagery and on consciously held mental maps than they perhaps realize. Warner Brown's experimental work suggests that human subjects can learn to negotiate a maze by integrating a succession of tactual kinesthetic patterns. They learn a succession of movements rather than a spatial configuration or map.[7]

Major steps in Brown's experiment are as follows. The subject wears a gadget over his eyes so that he cannot see the maze but can see the upper portions of the larger environment (the room) and also perceive light and noises from outside the room. In the first attempt, the subject stands at the entrance and is aware of its locality. Once he steps into the maze he will

FROM SPACE TO PLACE: LEARNING A MAZE

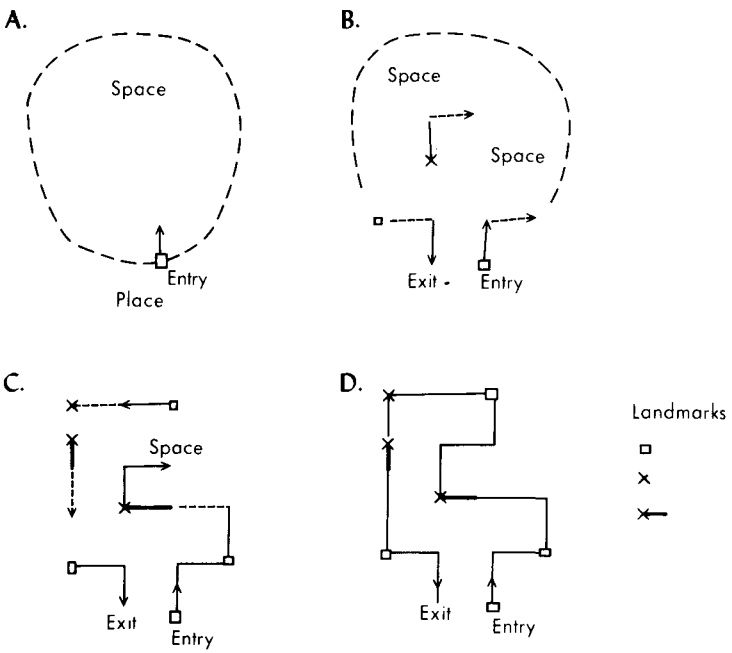


Figure 5. From space to place: learning a maze. At first only the point of entry is clearly recognized; beyond lies space (A). In time more and more landmarks are identified and the subject gains confidence in movement (B, C). Finally space consists of familiar landmarks and paths—in other words, place (D).

move in a certain manner; exit is his goal but its location is not yet known (Fig. 5). By the second or third trial he will have acquired a sense of the location of the exit, and his behavior changes as he approaches it. After a few trials, then, the subject recognizes and expresses confidence about two localities in the laboratory maze, the entrance and the exit. With further trials he learns to identify more and more "landmarks." He refers to them as "a rough spot," "a tilting board," "a long straight stretch," and "double turns." They represent for him stages of a journey. Even past errors can serve this purpose.

The subject may say, "I made the same mistake last time," indicating that he has recognized a locality. Encountering a familiar landmark in the maze is almost an emotional experience. The subject will often express satisfaction, for the landmark suggests to him that he is on the right track. Moreover each encounter is a signal for what he is to do next. The primary localities remain the entrance and the exit. The integration of space is an incremental process during which the appropriate movements for the entrance and the exit, and for the intermediate localities, continue to expand until they are contiguous. "When the subject is able to tread the maze without error (or with only rare errors) the whole maze becomes *one locality* with appropriate movements."[8] What begins as undifferentiated space ends as a single object-situation or place.

When the person who has learned a maze is asked to walk the same pattern on the open floor, the track he leaves bears only a slight resemblance to the original maze pattern. Elements of the track clearly resemble the correct course, but departures are conspicuous. Most blindfolded subjects, after having learned to tread the maze correctly, fail to apprehend that the plan is rectangular. Few subjects can recount the turns in order as "right" or "left." A subject will attempt to recall the turns and then give up, saying, "I don't know what comes next. I *have to be there* before I can tell you." Drawings of the maze, like the tracks made on the open floor, generally show correct representations of parts of the course, but they are badly executed as to angle and length (Fig. 6). The drawn pattern departs so far from the actual course that it cannot be used as a map.[9]

Brown's experimental work suggests that when people come to know a street grid they know a succession of movements appropriate to recognized landmarks. They do not acquire any precise mental map of the neighborhood. Of course, a rough image of spatial relations can be learned without deliberate effort; people do pick up a sense of the starting point here, the goal out there, and a scattering of intermediate landmarks, but the mental image is sketchy. Precision is not required in the practical business of moving about. A person needs only to have a general sense of direction to the goal, and to know what

DISTORTION IN DRAWN MAZES

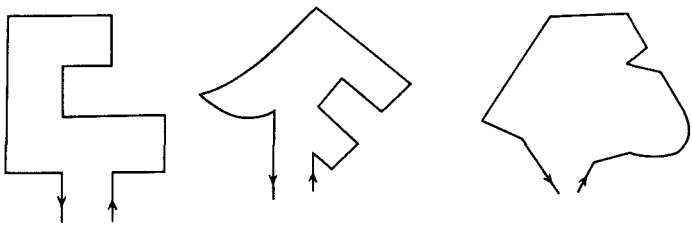


Figure 6. Distortion in drawn mazes. Subjects who have learned how to walk through the maze nonetheless have difficulty reproducing it in drawings. Adapted from Warner Brown, "Spatial integration in a human maze," *University of California Publications in Psychology*, vol. 5, no. 6, 1932, p. 125, 126, figures 2 and 3.

to do next on each segment of the journey. Think what it is like for the man who drives his car from city home to summer cottage. He has made the trip before. At the start he knows the approximate direction of the cottage, so he knows which way to turn the wheel as the car emerges from the driveway. And this knowing what to do next is repeated at each successive landmark; that is, each special configuration in the landscape—which may not always be easy to specify in recapitulation—triggers his next set of movements. D. O. Hebb observes that if the highway curves are gentle the driver has the feeling that, no matter which way he has just swerved his car, he is still heading straight to his destination. A person seems psychologically disposed to discount the angular departures and to accept all forward movements as movements toward his goal.[10] Hence when he tries to reproduce his route in a drawing he is likely to simplify the route and omit or minimize the angularity of the turns—unless he happens to remember a particular bend, in which case he may well exaggerate its angularity.

When space feels thoroughly familiar to us, it has become place. Kinesthetic and perceptual experience as well as the ability to form concepts are required for the change if the space is large. Small children and mentally retarded people are

likely to have difficulty integrating large space into familiar place. They have no trouble identifying specific landmarks and localities. They recognize particular shops and residences, but they understand the spatial relations among them poorly; hence they easily feel disoriented outside the small areas of habitual contact. We have already considered the world of young children. What problems in orientation confront people who have difficulty forming spatial concepts?

Robert Edgerton gives an example of how confusion can overtake a person (IQ range 55–69) outside the familiar neighborhood. A patient, Mary, is released from a hospital for the mentally retarded so that she can lead as normal a life as possible with the help of a dedicated counselor, Kitty. One day, Mary, Kitty, and Edgerton are on their way to visit Mary's mother. Edgerton reports the following episode:

> Kitty was driving and Mary was giving directions. Mary became hopelessly lost. She had no means whatever for finding the house or for explaining her own confusion. The researcher [Edgerton] finally determined the address of the house from a phone book and located the street. They first drove in the wrong direction, as numbers were difficult to see. Mary pointed out a large restaurant as they passed it. The researcher finally noted that they were traveling in the wrong direction, and the car was turned around. Mary quickly pointed out that they must be going in the wrong direction "because there is that restaurant again and we were going wrong when we saw it before." That she was passing the restaurant while traveling in two different directions never occurred to her and she could not be made to understand this fact.[11]

Spatial ability is essential to livelihood, but spatial knowledge at the level of symbolic articulation in words and images is not. Many animals have spatial skills far exceeding those of man; birds that make transcontinental migrations are an outstanding example. For human beings, what is the relationship between spatial ability and knowledge? How does one affect the other? Spatial ability precedes spatial knowledge. Mental worlds are refined out of sensory and kinesthetic experiences. Spatial knowledge enhances spatial ability. This ability is of different kinds, ranging from athletic prowess to such cultural achievements as ocean and space navigation.

A step in the training of an athlete is to help him envisage the motions necessary for high achievement. Before a man broad-jumps, it helps him to pause and rehearse mentally what he must do. The football coach uses words and diagrams to teach his team the idealized patterns of spatial behavior.[12] Blind people, especially those born without vision, are severely handicapped in movement. To compensate for the lack of vision their auditory and tactile senses are highly developed. Using their minds to formulate spatial concepts further enhances their spatial ability. Tactual maps, for example, help blind children to envisage the relative locations of significant landmarks. From a tactually presented map, boys blind from birth learn to follow a route and even solve a detour problem.[13] Some blind people appear able to use the sun to help them find their way. Verbalizing a course of action is another device that the blind employ when they try to figure out spatial dilemmas.[14]

Human beings are not endowed with an instinctive sense of direction, but under training the ability to stay oriented—even in unfamiliar country—can be acutely developed. De Silva reports the case of a twelve-year-old boy who appears to possess "automatic directional orientation." He does not make deliberate efforts to orient himself and yet is never lost in a strange city. The explanation would seem to lie in early training. His mother at one time gave him orders in cardinal directions rather than in the more usual left and right. She would say, "Get me the brush on the north side of the dresser," or "go and sit in the chair on the east side of the porch." Eventually the boy developed an unusual ability to move in a complicated path for relatively long periods of time and to retain his orientation without paying attention to it.[15]

In a narrow sense, spatial skill is what we can accomplish with our body. Its meaning approximates that of agility. In a broad sense, spatial skill is manifest in our degree of freedom from the tie to place, in the range and speed of our mobility. A trained explorer, equipped with map and compass, can move across a strange country with minimal reliance on his personal experience of the terrain. Technical knowledge has made it

possible for human beings to cross continents like birds and indeed, for brief periods, to leave the earth's gravitational field. In people skill and knowledge are inextricably intertwined.

Human groups vary widely in spatial skill and knowledge. Small primitive groups such as the Tasaday of Mindanao occupy a small ecological niche in the forest and hesitate to move beyond their home base. They have no word for sea or lake in their language although these features are less than forty miles away.[16] At the other extreme, the ability to traverse great distances and develop elaborate astronomical and geographical lores are characteristic achievements of people in high civilizations. Indeed such knowledge and capacity are another sign of their overall mastery of the physical environment. It is not, however, a rule that large integrated societies will have greater spatial knowledge than small, loosely organized groups. There are many exceptions. Peasants and subsistence farmers, for example, may have evolved complex social relationships, and they may live in large villages and command ample food supply. Their material culture is more sophisticated than that of primitive hunters and fishers. Yet the spatial skills and knowledge of primitive hunters can far exceed those of sedentary agriculturalists bound to locality. The hunter's skill is not simply one of identifying trails, water holes, and feeding grounds in a broad tract of land, although these capacities are very much in evidence; spatial knowledge extends beyond details of terrain to reference points in heaven, and it may be expressed in the abstract notation of maps.

In Siberia several primitive hunting groups show knowledge of astronomy. The Yakuts, for example, can distinguish with the naked eye stars in the Pleiades not usually seen without a telescope. They show an interest in the number of stars; they say there are many stars in the Pleiades group but only seven large ones. The Buriats, and likewise the natives of northeastern Siberia, make use of the polar star at night and of the sun by day on their hunting trips.[17]

Drawing maps is indubitable evidence of the power to conceptualize spatial relations. It is possible to find one's way by

dead reckoning and through long experience with little attempt to picture the overall spatial relations of localities. If an attempt is made to conceptualize, the result may remain mental rather than being transcribed into a material medium. What occasions would call for a map? Perhaps the most common occasion is the need to transmit efficiently geographical knowledge to another person. When someone wants to know how to go to a camp or water hole, the most time-consuming help is to take him there. One can, instead, try to describe the route and the nature of the terrain verbally, but this is always difficult, for language is better suited to the narration of events than to the depiction of simultaneous spatial relations. A sketch map, done quickly on sand, clay, or snow, is by far the simplest and clearest way to show the nature of the country. Cartographic ability presupposes not only a talent for abstraction and symbolization on the part of the primitive cartographer but also a comparable talent in the person who looks on, for he must know how to translate wriggly lines and dots back into real terrain. Sketch maps of this kind will probably depict human habitations and footpaths (to indicate the direction of movement), and such natural features as streams and lakes. They are short-lived. Some, however, have been etched on bark, leather, or wood, and have become part of a people's store of material culture. These maps can be quite elaborate, showing more information than is needed for any particular occasion. They intimate a desire to enshrine communal geographical knowledge in cartographic form. Take the Chukchi maps of the Aradyr delta in northeastern Siberia. They are drawn exceptionally skillfully with reindeer blood on wooden boards. The winding course of the river, the vegetation on the shores, fords, and hunting places are easily seen. "The complicated delta with its numerous islands is faithfully reproduced. Two parallel lines show the shores [of the river]. . . . Many splashes of red on the shores no doubt indicate hills. The map picture is enlivened by hunting and fishing scenes. At one corner is a group of three huts, fishing nets are spread in the middle of the river and a herd of swimming reindeer is shown."[18] The Chukchi maps, in general features, compare

favorably with a map of the same region made, circa 1900, by the Russian Ministry of the Marine.

Primitive hunters in Siberia learn to conceptualize space and translate their detailed knowledge into the symbolic language of maps. Illiterate Russian peasants, on the other hand, have a poor grasp of spatial relations outside their small world; they have no reason to draw maps, and when asked to do so their efforts are inferior to the works of hunters. What elements in culture, society, and the physical environment affect a people's spatial skills and knowledge? What conditions encourage a people to experience their environment and be aware of it to the degree of trying to capture its essence in words and maps?

John Berry has attempted to find answers by studying two preliterate societies, the Temne of Sierra Leone and the Eskimo of Arctic Canada.[19] The spatial skills of the Eskimo are far superior to those of the Temne. Eskimos possess a large spatial-geometric vocabulary, comparable in richness to that of Western technical man, with which to articulate their world. The Temne, in comparison, have a meager stock of spatial-geometric terms. Eskimos are famed for their soapstone carvings and, more recently, for their work in stencil and block-printing. The Temne produce almost no graphics, sculpture, or decoration. Eskimos are good mechanics. Edmund Carpenter reports that they delight in stripping down and reassembling engines, watches, all machinery. "I have watched them repair instruments which American mechanics, flown into the Arctic for this purpose, have abandoned in despair."[20] The Temne show no special mechanical aptitude. Eskimos are superbly versatile travelers; they use and make maps. Temne farmers lack such skills.

Why the contrast? The physical environments of the two peoples are strikingly different. Temne land is covered with bush and other vegetation, offering a wealth of visual stimuli. Color is vivid: trees and grass vary from light to dark green, and against this green backdrop fruits, berries, and flowers provide flashes of red and yellow. The Eskimo environment is bleak. Moss and lichen in summer give the land a uniform gray-brown cast; snow and ice in winter paint the scene in monotone.

When fog or blizzard appears, land, water, and sky lose all differentiation. It is in this poor and poorly articulated environment that the Eskimos, to survive, have refined their perceptual and spatial skills. When all landmarks disappear in mist and driven snow, Eskimos can nevertheless find their way by observing relationships between the lay of the land, types of snow and ice crack, the quality of the air (fresh or salt), and wind direction. In heavy fog the Arctic navigator establishes his position at sea by the sound of waves beating on land and by checking on the wind.[21] Nature may be hostile and enigmatic, yet man learns to make sense of it—to extract meaning from it—when such is necessary to his survival.

Society has a strong impact on the development of spatial skills. Most Temne are rice farmers and live in villages. Their society is rigid and authoritarian. The men have control over the women, and infractions of marital laws are heavily punished. Discipline of children after weaning is harsh. Formal education is in the hands of the secret societies: the young are taught traditional skills and roles during the months in the bush, after which initiation takes place. Security lies in conforming to the ways of the group, for it is this cohesive unit that confronts nature and extracts from it a livelihood. Since nature is fairly benign, a modest effort suffices to earn a living. The Temne individual is rarely alone. Occasions seldom arise when a farmer faces the task of orienting himself in unfamiliar and inhospitable space. He has no need to make a conscious effort to structure space, since the space he moves in is so much a part of his routine life that it is in fact his "place."

The Temne has his place, knows his place, and is rarely challenged by unstructured space. Far different is Eskimo society in Arctic Canada. Eskimos are hunters and live in family-size hunting camps. Their women enjoy freedom and their children are treated with consistent kindness. Eskimos work alone or with close relatives over a broad territory. Their challenges come from a harsh and fickle environment. The individual does not lean on the power of organized society to overcome nature. He relies on his own ingenuity and fortitude. Compared with Temne farmers, Eskimos are individualistic and venturesome.

They encourage these traits in their children, who will need self-reliance to survive. Eskimos have adapted to their inhospitable environment and feel more or less at home in it. That environment, however, is not yet consistently place. They still need to cope with unstructured space and they have developed the necessary skills and knowledge to do so successfully.[22]

Consider another type of spatial competence—navigation. Crossing an ocean with the help of magnetic compass and charts is a highly technical achievement of the European and Chinese civilizations. The navigational skills and geographical knowledge of the Pacific Islanders are, in their way, equally impressive. Geographical knowledge may mean a barely conceptualized familiarity with one's local environment. People know their own neighborhood well. Geographical knowledge also means a conscious and theoretical grasp of spatial relations among places that one seldom visits. Pacific Islanders excel in this more abstract kind of geographical understanding. An exemplar of such excellence is Captain James Cook's informant, Tupaia, of the Society Islands. He was acquainted with a world reaching from the Marquesas in the east to Fiji in the west, a span that is the width of the Atlantic Ocean or nearly the width of the United States. Tupaia accompanied Cook to Batavia in the *Endeavour*. At more than "2000 leagues" from his home and despite the ship's circuitous route, "he was never at a loss to point to Taheitee," as John Reinhold Forster (1778) admiringly put it.[23] This expansiveness of geographical horizon, superbly displayed in Tupaia, is seldom matched by any other people in the world. It is a fact to counterbalance the image of primitive peoples as being bound to place, their geographical knowledge deteriorating rapidly into mythology away from their home grounds.

What conditions favor the exceptional development of spatial skills among the Pacific Islanders? They are similar to those that foster spatial skills among the Eskimos. To survive, Eskimos must know well large tracts of land and water, since food obtainable within any small area is insufficient. Pacific Islanders

also need to explore a much larger world than their tiny insular base, but not necessarily because food is inadequate on the island and in the adjoining seas. The reasons for distant travel are subtle enough so that the Islanders themselves are not fully aware of them. The natives of Puluwat, for example, claim that they make trips of 130 and 150 miles to get a special kind of tobacco; yet they need only wait a while for the ships to bring the commodity to them. Visits to distant islands expand the food-supply base, but they also allow people to cement old ties, establish new ones, and exchange ideas. A small community the size of Puluwat cannot achieve its present level of culture without the support of a much larger world. The forging of larger socio-political nets broadens the intellectual horizon, extends the range of choice in goods and in marriage partners, and permits the tiny communities to cope more effectively with natural disasters, notably typhoons.[24]

Puluwatans, like Eskimos, see nature as the arena in which their quintessential virtues and skills are displayed. Eskimos master the arts of hunting in snow and ice fields, Islanders the arts of navigation in unmarked seas. With both groups security and success depend on personal skills and knowledge. Initiative has survival value in a watery world where changes of weather and current have an immediate impact on the small craft. Young Islanders are encouraged to develop curiosity. Like Eskimo children, Puluwatan children are pampered and given much freedom. Boys six or seven years old are taken on long canoe trips. At an impressionable age they imbibe navigational lores and experience the sea and sky in all their moods.[25]

Island navigation combines intimate personal ways of knowing with formal conceptual knowledge. Much that the Islander knows about the sea and navigation is picked up without conscious effort. Not everyone becomes a recognized navigator in Island society, but almost everyone has gone on ocean-crossing trips. He is bound to know how a craft feels as it rides over waves and as it alters course with shifts in current and weather. He learns to detect reefs from the subtle changes in the color of the water, and he learns to read the sky. A recog-

nized navigator's knowledge is more detailed and more consciously acquired than that of the ordinary Islander; nevertheless integral experience rather than deliberative calculation informs the many decisions he has to make in the course of a long voyage. A navigator needs keen eyes, but he must train the other senses to a high degree of acuity as well. Sometimes he will deliberately exclude visual cues in order to concentrate on other kinds of evidence. This is necessary because the stars may not be visible, and the wave patterns that provide clues to direction can be difficult to interpret visually from the level of the boat. Steering by waves then depends on the motion of the boat rather than on sighting. A navigator from the Society Islands, Tewake, claimed that "he would sometimes retire to the hut on his canoe's outrigger platform, where he could lie down and without distraction more readily direct the helmsman onto the proper course by analysing the roll and pitch of the vessel as it corkscrewed over the waves."[26]

Island navigation is also a body of detailed knowledge that can be taught and learned formally. On Puluwat Atoll instruction begins on land. A senior navigator dispenses a massive dose of specific information to his students, who sit together in the canoe house and make little diagrams with pebbles on the mats that cover the sandy floor. "The pebbles usually represent stars, but they are also used to illustrate islands and how the islands 'move' as they pass the canoe on one side or the other."[27] Here, then, is an example of the use of schematic diagrams to teach spatial relationships. Learning is not complete until the student "at his instructor's request can start with any island in the known ocean and rattle off the stars both going and returning between that island and all the others which might conceivably be reached directly from there."[28] What the student eventually acquires is not a long litany of names but the detailed patterns of stars, islands, and reefs (Fig. 7). "The Puluwatans," says Thomas Gladwin, "pictures himself and his island in his part of the ocean much as we might locate ourselves upon a road map." The ocean is a network of seaways linking up numerous islands, not a fearsome expanse of

ETAK: A SYSTEM FOR ORGANIZING SPATIAL DATA

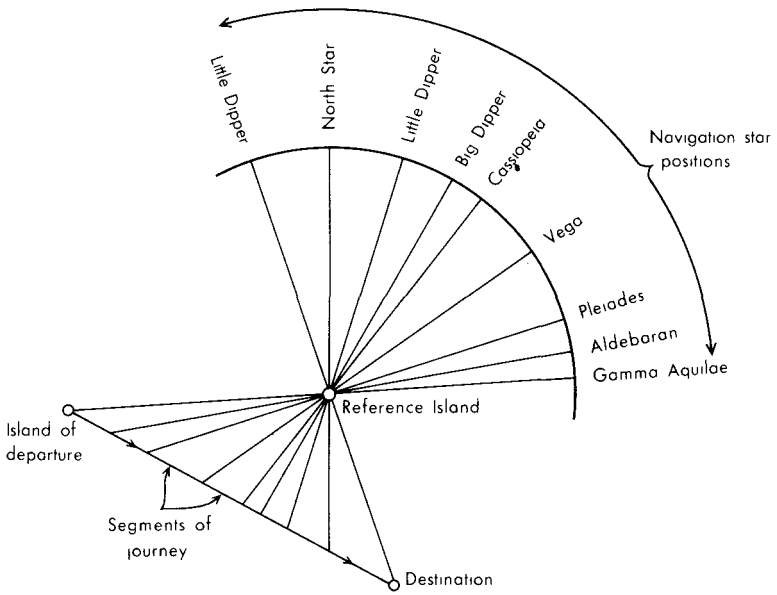


Figure 7. Etak: a system for organizing spatial data. The diagram illustrates the Puluwatan's sophistication in conceptualizing space. "The contribution of etak is not to generate new primary information, but to provide a framework into which the navigator's knowledge of rate, time, geography, and astronomy can be integrated to provide a conveniently expressed and comprehended statement of distance traveled. It also helps keep his attention focused on these key variables which are central to the entire navigation process" (T. Gladwin). Thomas Gladwin, *East is a Big Bird* (Cambridge: Harvard University Press, 1970), opposite page 184. Reprinted with permission from Harvard University Press.

unmarked water (Fig. 8).[29] Polynesian and Micronesian navigators have conquered space by transforming it into a familiar world of routes and places. All people undertake to change amorphous space into articulated geography. Pacific Islanders have reason to take pride in the breadth of their geographical horizon.

TUPAIA'S IMAGE OF THE PACIFIC OCEAN

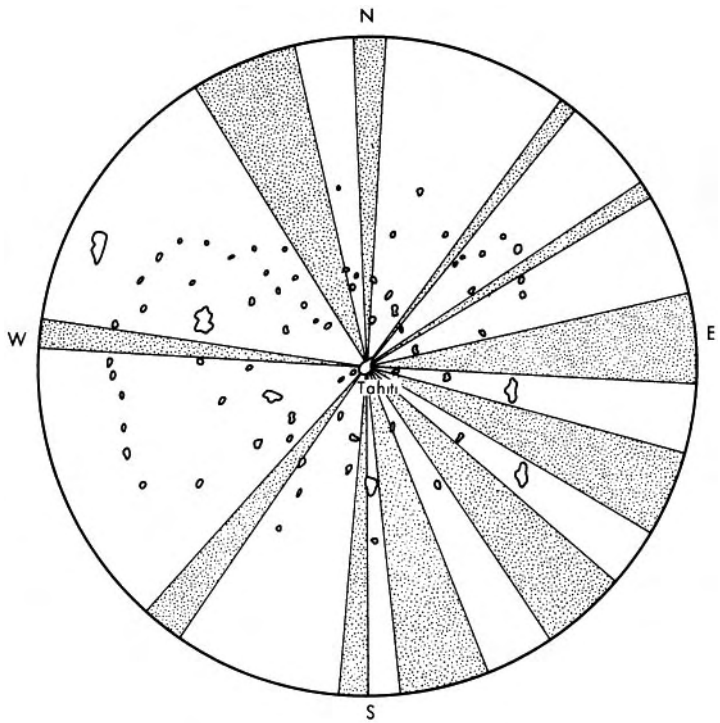


Figure 8. Tupaia's image of the Pacific Ocean. To the Polynesian navigator the ocean is dotted with landmarks. Looking outward from the home base only a small portion of the ocean surface, represented by the shaded sectors, is empty—without islands. Michael Levison, R. Gerard Ward, and John W. Webb, *The Settlement of Polynesia* (Minneapolis: University of Minnesota, 1973), page 63. Figure 37 "Tuapia's map and island screens." Reprinted with permission from the University of Minnesota Press.

8

Architectural Space and Awareness

Many animals, like human beings, live in environments of their own construction rather than simply in nature. And evolutionarily advanced animals such as birds and mammals are not the only species that can build. Even single-celled organisms construct shells for themselves out of things like sand grains. We say, however, that animals build instinctively, that each species of weaverbird has an inherited instinct to make a nest of a particular shape, some round, others pear-shaped. Yet we know that some weaverbirds build better nests in their second year than they did in the first. Weaverbirds are capable of learning from experience, which means that not all the details of their performance are controlled by heredity. As another illustration of architectural prowess, consider the termites. They live in a built environment that is vast in proportion to their own size. They make nests that soar like skyscrapers. Termites' nests contain not only elaborate ventilated living quarters for themselves but also fungus gardens for their form of food production. Moreover there appear to be local traditions in architecture that determine how, for instance, the ventilation should be arranged; termites of the same species adopt different systems in Uganda and on the west coast of Africa.[1]

Compared with the termite's skyscraper, the lean-tos and

thatched mud shelters of the human being look crude. If humans nonetheless claim a certain superiority, the claim must rest on grounds other than architectural achievement. It must rest on awareness. The assumption is that the Bushman, when he makes his lean-to shelter, is more aware of what he does than the weaverbird and the termite as they make their fancier homes.

What is the quality of this awareness? What is the human builder conscious of as he first creates a space and then lives in it? The answer is complex because several kinds of experience and awareness are involved. At the start, the builder needs to know where to build, with what materials, and in what form. Next comes physical effort. Muscles and the senses of sight and touch are activated in the process of raising structures against the pull of gravity. A worker modifies his own body as well as external nature when he creates a world. Completed, the building or architectural complex now stands as an environment capable of affecting the people who live in it. Man-made space can refine human feeling and perception. It is true that even without architectural form, people are able to sense the difference between interior and exterior, closed and open, darkness and light, private and public. But this kind of knowing is inchoate. Architectural space—even a simple hut surrounded by cleared ground—can define such sensations and render them vivid. Another influence is this: the built environment clarifies social roles and relations. People know better who they are and how they ought to behave when the arena is humanly designed rather than nature's raw stage. Finally, architecture "teaches." A planned city, a monument, or even a simple dwelling can be a symbol of the cosmos. In the absence of books and formal instruction, architecture is a key to comprehending reality. Let us look at these kinds of experience and awareness in greater detail.

Where shall one build, with what materials, and in what form? Such questions, it has been said, do not worry builders in preliterate and traditional societies. They work from ingrained habit, following the procedure of unchanging tradi-

tion. They have, in any case, little choice since both the skill and the materials at hand are limited. Some types of dwelling, such as the beehive houses of Apulia, the black houses of the Outer Hebrides, and the Navajo hogans, have not changed since prehistoric times. Habit dulls the mind so that a man builds with little more awareness of choice than does an animal that constructs instinctively. At the opposite pole from the primitive builder is the modern master architect. He feels the call to be original. He can, if he likes, select and combine from the numerous styles offered by the world's cultures, past and present. He has almost unlimited technical means at his disposal to achieve his final vision. Given a project, the master architect is obligated to conceive in his mind and on paper a range of architectural forms, all of which serve the project's purpose but only one of which will be selected because it is deemed the best, for reasons that may not be clear to the architect himself.[2] In the preliminary steps of design the architect's consciousness is almost painfully stretched to accommodate all the possible forms that occur to him.

This contrast between primitive builder and modern architect is, of course, an exaggeration: the one is not wholly chained to custom and the other does not have unlimited choice. What sorts of decisions does the primitive builder make? What are his options? These are pertinent questions because a person is most aware when he has to pause and decide. Unfortunately we lack the evidence for clear answers. Few ethnographic surveys report on building activity as a process of making up minds, of communication and learning. Rather huts and villages are described as though they simply appeared, like natural growths, without the aid of cogitating mind. Such portraitures are, to say the least, misleading. In any human life choices arise and decisions must be made, even if they are not especially demanding. Nomads, for example, need to decide where to stop for the night, where to establish their camps. Shifting agriculturalists must know where to make a clearing and build a village. These are locational choices. Material and form also require selection. The natural environ-

ment is never static or uniform. Materials available to the human builder vary, however slightly, in time and place, forcing him to think, adjust, innovate.

Nonliterate and peasant societies are conservative. Their shelters show little change in the course of time, and yet—paradoxically—there may be greater awareness of built forms and space in a traditional than in a modern community. One cause of such greater awareness is active participation. Since nonliterate and peasant societies do not have architects, everyone makes his own house and helps to build public places. Another cause is that this effort, with the awareness it stimulates, is likely to be repeated many times in the course of a man's life. Primitive shelters combine persistence of form with ephemerality of substance. Construction and repair are almost a constant activity. A house is not achieved once to be enjoyed thereafter. The Eskimo, on winter hunts, makes a new igloo every night. The Indian's tepee rarely lasts more than one season. Every few years the shifting cultivators must clear another patch of forest and build another village.

A third cause of heightened awareness is the fact that with many primitive and traditional peoples the act of construction is a serious business that calls for ceremonial rites and perhaps sacrifice.[3] To build is a religious act, the establishment of a world in the midst of primeval disorder. Religion, since it is concerned with stable truths, contributes to the conservatism of architectural form. The same shaped house and city are made again and again as though they come out of the mold of some unthinking process of mass production; yet each is probably built with a sense of solemnity. The builder, far from feeling that he is doing routine work, is obliged by the ceremony to see himself as participating in a momentous and primordial act. The occasion elevates feeling and sharpens awareness, even though the actual steps to be followed in construction fall into a more or less prescribed pattern.

A type of spatial consciousness that people of a simple economy do not experience is systematic and formal design, the envisagement of the final result by drawing up plans. Any large enterprise calls for conscious organization. This can be

done verbally and by example on the work site. However, an order of complexity develops, at which point instruction has to be more formally presented if it is to be effective. A technique in formal learning and teaching is the plan or diagram. By making sketches the architect clarifies his own ideas and eventually arrives at a detailed plan. With the same means he helps others to understand what is to be done. The plan is necessary to any architectural enterprise that is sustained over a period of time and executed by a large team of more or less specialized workers. Conceptualizing architectural space with the help of plans is not, of course, a modern device. According to John Harvey, from Egypt in the middle of the second millennium B.C. there is a continuous chain of evidence for architectural scale drawing, throughout all the higher cultures of the Near and Middle East and in classical and medieval Europe.[4]

Indeed by late medieval times the prototype of the modern architect appeared in Europe. He was the master builder, a man of vision and temperament who did not hesitate to impose his own personality on design. The master builder had a certain freedom of choice; he could, for example, select the fashionable Gothic arch as against the outmoded Romanesque. Size was another area that allowed a certain latitude. A building might serve a traditional purpose and yet permit the architect to exercise initiative, for to construct a monument at all revealed hubris, that is, a yearning to excel, to depart from precedence if only in size and in decorative conceits. Wealthy patrons might share the megalomania of their architects. Instructions tended to be general rather than specific. Abbot Gaucelin (A.D. 1005–1029) at Fleury decided to build a tower at the west end of the minster with the square stones he had brought by boat from the Nivernais. His simple instruction to his architect was, "Build it to be a model for the whole of France."[5]

The late medieval period had known cultural innovation, conspicuously so in monumental architecture. At the same time Christian values remained intact and formed a bond for people in different walks of life. The construction of a cathedral aroused the enthusiasm of a broad community of believ-

ers. When Chartres was being built, Robert of Torigni reported glowingly that 1,145 men and women, noble and common people, together dedicated all their physical resources and spiritual strength to the task of transporting in hand-drawn carts material for the building of the towers.[6] Such accounts suggest that raising an edifice was an act of worship in which the feelings and senses of a people were deeply engaged. The vertical structure of the medieval cosmos was not then an abstract and dry doctrine that had to be accepted on faith but rather a world that could be seen and felt as the arches and towers heaved heavenward. In the sixteenth century an architectural enterprise dedicated to God could still inspire a fervor among workers and populace that we in our secular age may find incomprehensible. Here is the historian Leopold von Ranke's description of the raising of the obelisk in front of St. Peter's on April 30, 1586.

> [Raising the obelisk] was a work of the utmost difficulty. All who were engaged in it seemed inspired with the feeling that they were undertaking a work which would be renowned through all the ages. The workmen, nine hundred in number, began by hearing Mass, confessing, and receiving the Communion. They then entered the space which had been marked out for the scene of their labors. The master placed himself on an elevated seat. The obelisk was bound with strong iron hoops. Thirty-five windlasses were to set in motion the monstrous machine which was to raise it with strong ropes. At length a trumpet gave the signal. At the very first turn, the obelisk was heaved from the base on which it had rested for fifteen hundred years. At the twelfth, it was raised two palms and a quarter, and remained steady. The master saw the huge mass in his power. A signal was fired from Fort St. Angelo, all the bells in the city rang, and the workmen carried their master in triumph around the inclosure, with incessant shouts and acclamations.[6]

Building is a complex activity. It makes people aware and take heed at different levels: at the level of having to make pragmatic decisions; of envisioning architectural spaces in the mind and on paper; and of committing one's whole being, mind and body, to the creation of a material form that captures an ideal. Once achieved, architectural form is an environment for man. How does it then influence human feeling and con-

sciousness? The analogy of language throws light on the question. Words contain and intensify feeling. Without words feeling reaches a momentary peak and quickly dissipates. Perhaps one reason why animal emotions do not reach the intensity and duration of human ones is that animals have no language to hold emotions so that they can either grow or fester. The built environment, like language, has the power to define and refine sensibility. It can sharpen and enlarge consciousness. Without architecture feelings about space must remain diffuse and fleeting.

Consider the sense of an "inside" and an "outside," of intimacy and exposure, of private life and public space. People everywhere recognize these distinctions, but the awareness may be quite vague. Constructed form has the power to heighten the awareness and accentuate, as it were, the difference in emotional temperature between "inside" and "outside." In Neolithic times the basic shelter was a round semisubterranean hut, a womblike enclosure that contrasted vividly with the space beyond. Later the hut emerged above ground, moving away from the earth matrix but retaining and even accentuating the contrast between interior and outside by the aggressive rectilinearity of its walls. At a still later stage, corresponding to the beginning of urban life, the rectangular courtyard domicile appeared. It is noteworthy that these steps in the evolution of the house were followed in all the areas where Neolithic culture made the transition to urban life.[8]

The courtyard house is, of course, still with us—it has not become obsolete. Its basic feature is that the rooms open out to the privacy of interior space and present their blank backs to the outside world. Within and without are clearly defined; people can be certain of where they are. Inside the enclosure, undisturbed by distractions from the outside, human relations and feelings can rise to a high and even uncomfortable level of warmth. The notion of inside and outside is familiar to all, but imagine how sensibly real these categories become when a guest—after a convivial party—leaves the lantern-lit courtyard and steps through the moon gate to the dark wind-swept lane outside. Experiences of this kind were commonplace in tradi-

tional Chinese society, but they are surely known to all people who use architectural means to demarcate and intensify forms of social life (Fig. 11). Even contemporary America, with its ideal of openness symbolized by large windows and glass walls, has created the enclosed suburban shopping center. How will the shopper experience such a place? As he approaches it in his car across the vast expanse of the parking lot, he can see only the center's unperforated outer sheath which, except for a large trade sign, makes no attempt to lure people in. The image is bleak. He parks the car, steps inside the center's portal, and at once enters a charmed world of light and color, potted plants, bubbling fountains, soft music, and leisurely shoppers.[9]

Spatial dimensions such as vertical and horizontal, mass and volume are experiences known intimately to the body; they are also felt whenever one sticks a pole in the ground, builds a hut, smoothes a surface for threshing grain, or watches a mound of dirt pile up as one digs a deep well. But the meaning of these spatial dimensions gains immeasurably in power and clarity when they can be seen in monumental architecture and when people live in its shadow. Ancient Egypt and Mesopotamia have enlarged mankind's consciousness of space, heightened people's awareness of the vertical and the horizontal, of mass and volume, by constructing their exemplars in the towering shapes of pyramids, ziggurats, and temples.[10] We have inherited this knowledge. Modern architects design with these dimensions in mind. The layman, sensitized to the dramatic play of thrust and repose, learns to appreciate it wherever it appears, in nature as well as in man-made objects that have no aesthetic pretension. We see drama and meaning in the volcanic neck standing above the flat plateau and in the silos of Nebraska. Here is Wright Morris's description of the symbols in a prairie town. The grain elevators are, for him, the monuments of the plains. He observes:

> There's a simple reason for the grain elevators, as there is for everything, but the forces behind the reason, the reason for the reason, is the land and the sky. There is too much sky out there, for one thing, too much horizontal, too many lines without stops, so that the excla-

INTERIOR SPACE AND THE COURTYARD HOUSE

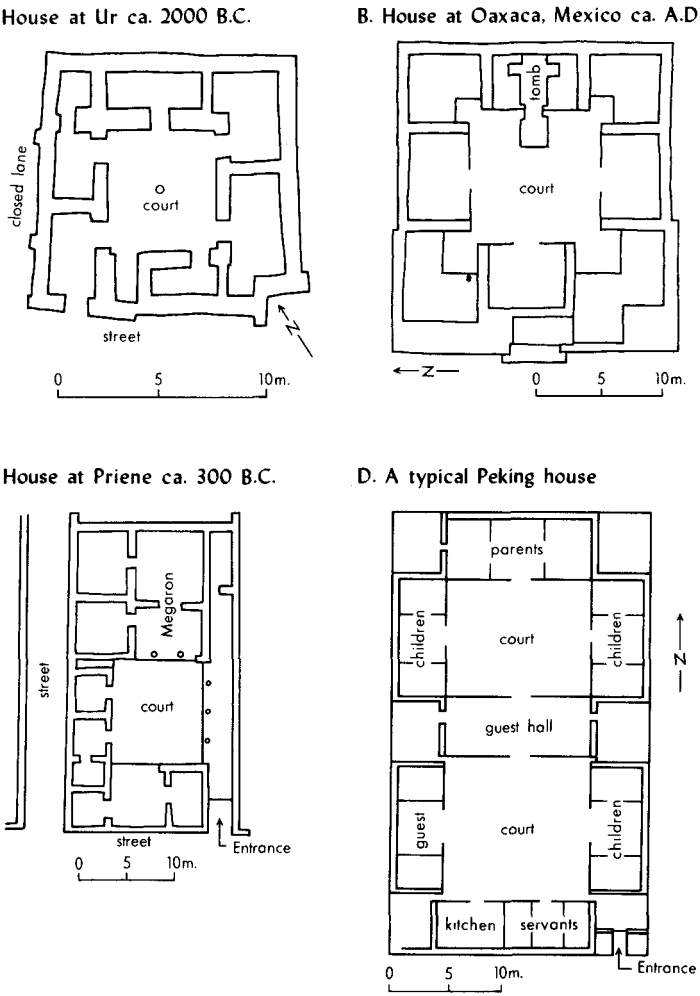


Figure 11. Interior space and the courtyard house. Here is a type of domestic environment that transcends time and culture. The courtyard house dramatizes the contrast between "inside" and "outside." Source for B: Marcus C. Winter, "Residential patterns at Monte Alban, Oaxaca, Mexico," *Science*, vol. 186, 1974, page 985, figure 5. Reprinted with permission from Marcus C. Winter and the American Association for the Advancement of Science. Copyright 1974 by the American Association for the Advancement of Science. Figure 11D is adapted from Andrew Boyd, *Chinese Architecture and Town Planning* (Chicago: University of Chicago Press, 1962), page 80, figure 29.

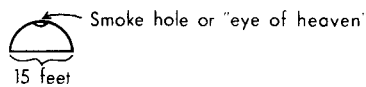
mation, the perpendicular had come. Anyone who was born and raised on the plains knows that the high false front on the Feed Store, and the white water tower, are not a question of vanity. It's a problem of being. Of knowing you are there.[11]

A third example of how architecture can educate people's awareness and conception of reality is from the domain of the illuminated interior. Interior space as such is a commonplace experience. We have already noted the enduring and universal antithesis between "inside" and "outside." Historically, interior space was dark and narrow. This was true not only of humble dwellings but also of monumental edifices. Egyptian and Greek temples commanded external space with their polish and imposing proportions; their interiors, however, were gloomy, cluttered, and crudely finished. European architectural history has seen many changes of style but, according to the art historian Giedion, among ambitious builders the development of an illuminated and spacious interior was a common ideal from the Roman to the Baroque period. An early success was Hadrian's Pantheon. Its interior attained a sublime simplicity. The Pantheon consisted essentially of a cylindrical drum topped by a large hemispherical dome; sunlight streaming through the central oculus swept the building's stark hollow space (Fig. 12). Architectural drawings and relics show that interior space was elaborated together with the fenestration of light. From Roman times the role of light in defining interior space continued to expand. With the Gothic cathedral light and space combined to produce effects of mystical beauty. The light-flooded interiors of Baroque churches and halls were further efforts to explore the possibilities of a major and enduring concept of space.[12]

In sketches of architectural development like these, we trace the growth of the human capacity to feel, see, and think. Woolly feelings and ideas are clarified in the presence of objective images. Perhaps people do not fully apprehend the meaning of "calm" unless they have seen the proportion of a Greek temple against the blue sky, or of "robust, vital energy" without baroque façades, or even of vastness without a huge edifice.[13] But, we may well ask, doesn't nature provide even

THE DOME: EXPERIENCE AND SYMBOL

A. *Mongolian yurt*



B. **Hadrian's Pantheon**

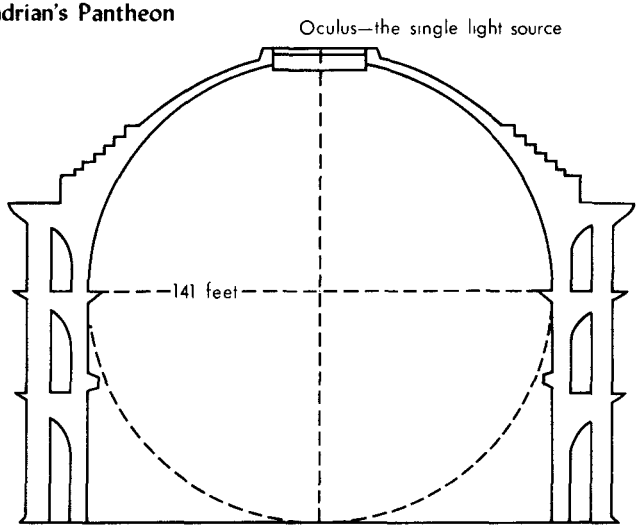


Figure 12. The dome: experience and symbol. The symbolism of the modest Mongolian yurt resembles that of one of the world's architectural masterpieces—Hadrian's Pantheon: the dome is the vault of heaven and the central opening is the "eye of heaven." Yet how vastly different is the experience: entering the smoke-stained yurt can hardly evoke the same feeling as entering the vaulting interior of the Pantheon. Adapted from Sigfried Giedion, *Architecture and the Phenomena of Transition* (Cambridge: Harvard University Press, 1971), page 148, figure 116.

more powerful images? What gives a better sense of calm than the sea at rest, or of exuberant energy than the primeval forest, or of vastness than the endless sweep of the plains? True, but it is doubtful whether human beings can naïvely apprehend these qualities in nature without prior experience in the sensible forms and scale created by man. Nature is too diffuse, its stimuli too powerful and conflicting, to be directly accessible

to the human mind and sensibility. First man creates the circle, whether this be the plan of the tepee or the ring of the war dance, and then he can discern circles and cyclical processes everywhere in nature, in the shape of the bird's nest, the whirl of the wind, and the movement of the stars.[14]

The designed environment serves an educational purpose. In some societies the building is the primary text for handing down a tradition, for presenting a view of reality. To a nonliterate people the house may be not only a shelter but also a ritual place and the locus of economic activity. Such a house can communicate ideas even more effectively than can ritual. Its symbols form a system and are vividly real to the family members as they pass through the different stages of life (Fig. 13).[15] On a larger scale the settlement itself may be a potent symbol. Consider villages on the island of Nias in Indonesia. A South Nias village is a diagram of cosmic and social order. Its characteristic location is the hilltop. The word for village also means "sky" or "world." The chieftain is called "that which is up river." His large house, located at the upper end of the central street, dominates the settlement. The street's upper end signifies river source, east or south, the sun, aerial creatures, chieftainship, and life. The lower end signifies downstream, west or north, aquatic animals, commoners, and death. A man's status is clearly indicated by the size and location of his house. Slaves live either in the field, beyond the cosmic village, or under the village dwellings and share space with pigs. Such a world would constantly remind man of where he stands both in society and in the cosmic scheme of things.[16]

In nonliterate and traditional communities the social, economic, and religious forms of life are often well integrated. Space and location that rank high socially are also likely to have religious significance. An economic activity may be deemed profane, but "profane" is itself a religious concept. In contrast, modern life tends to be compartmentalized. Space in our contemporary world may be designed and ordered so as to draw one's attention to the social hierarchy, but the order has no religious significance and may not even correspond closely to wealth. One effect is the dilution of spatial meaning. In mod-

COSMIC AND SOCIAL ORDER IN ATONI HOUSE

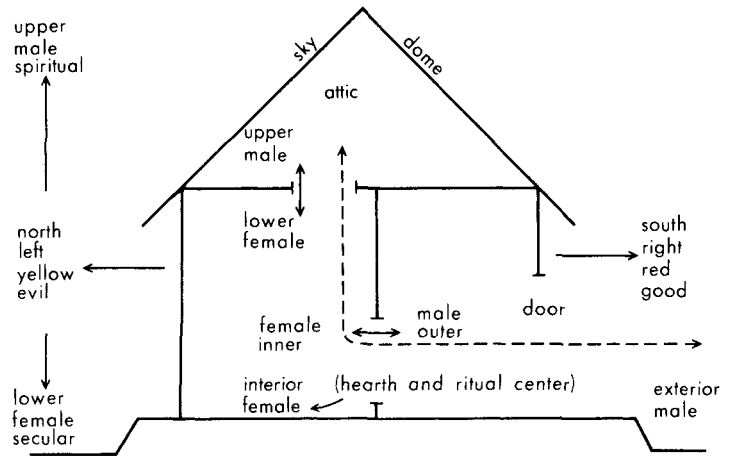


Figure 13. Cosmic and social order in the Atoni house of Indonesian Timor. "Order in building expresses ideas symbolically, and the house depicts them vividly for every individual from birth to death. Furthermore, order concerns not just discrete ideas or symbols, but a system; and the system expresses both principles of classification and a value for classification per se, the definition of unity and difference" (C. Cunningham). Clark E. Cunningham, "Order in the Atoni House," in Rodney Needham, ed., *Right and Left: Essays in Dual Symbolic Classification* (Chicago: The University of Chicago Press, 1973), page 219, figure 7. Reprinted with permission from the University of Chicago Press. *Copyright 1973 by the University of Chicago.*

ern society spatial organization is not able, nor was it ever intended, to exemplify a total world view.

All settlement patterns reveal at least social order and functional convenience. Other types of order may or may not be superposed. Space of restricted meaning is characteristic of, but not limited to, Western technological society. It appears also among people with the simplest economy and social structure. An example is provided by the Pygmies of the Congo forest. Their created space is the camp, a forest clearing with conical huts arranged in a scalloped ring. Friends build their huts so that the openings face each other. A man speaks as an individual when he talks from his own doorway, but he speaks

for the group when he stands in mid-camp.[17] The center is public, the periphery is for interaction among friends and kin. Man-made space thus expresses the Pygmies' informal social order. It is not, however, their religious space. Religious sentiments are identified with the surrounding forest. Social and religious spaces are thus separate (Fig. 14). The Pygmies are perhaps aware that what they make and build is trifling compared with the circumambient and life-supporting forest: man-made things cannot, as it were, carry the weight of religious meaning. What distinguishes Western technological society is that its built environment, which is pervasive and dominant, nonetheless has only minimal cosmic or transcendental significance.

Architectural space reveals and instructs. How does it instruct? In the Middle Ages a great cathedral instructs on several levels. There is the direct appeal to the senses, to feeling and the subconscious mind. The building's centrality and commanding presence are immediately registered. Here is mass—the weight of stone and of authority—and yet the towers soar. These are not self-conscious and retrospective interpretations; they are the response of the body. Inside the cathedral there is the level of explicit teaching.[18] Pictures in the stained-glass windows are texts expounding the lessons of the Bible to illiterate worshipers. There are the countless signs pointing to Christian doctrine, practice, and mystery: holy water, flickering candle light, statues of saints, confessional, pulpit, altar, and cross are examples. To some of the signs the worshipers respond with a more or less automatic act, such as kneeling. Other signs elicit specific ideas. The cross suggests suffering, atonement, and salvation. Finally the cathedral as a whole and in its details is a symbol of paradise. The symbol, to the medieval mind, is more than a code for feelings and ideas that can readily be put into words. The symbol is direct and does not require linguistic mediation. An object becomes a symbol when its own nature is so clear and so profoundly exposed that while being fully itself it gives knowledge of something greater beyond. Imagine a man of the Middle Ages who goes into a cathedral to worship and meditate. He is reverent and has

PYGMY CAMP: SOCIAL AND SACRED SPACE

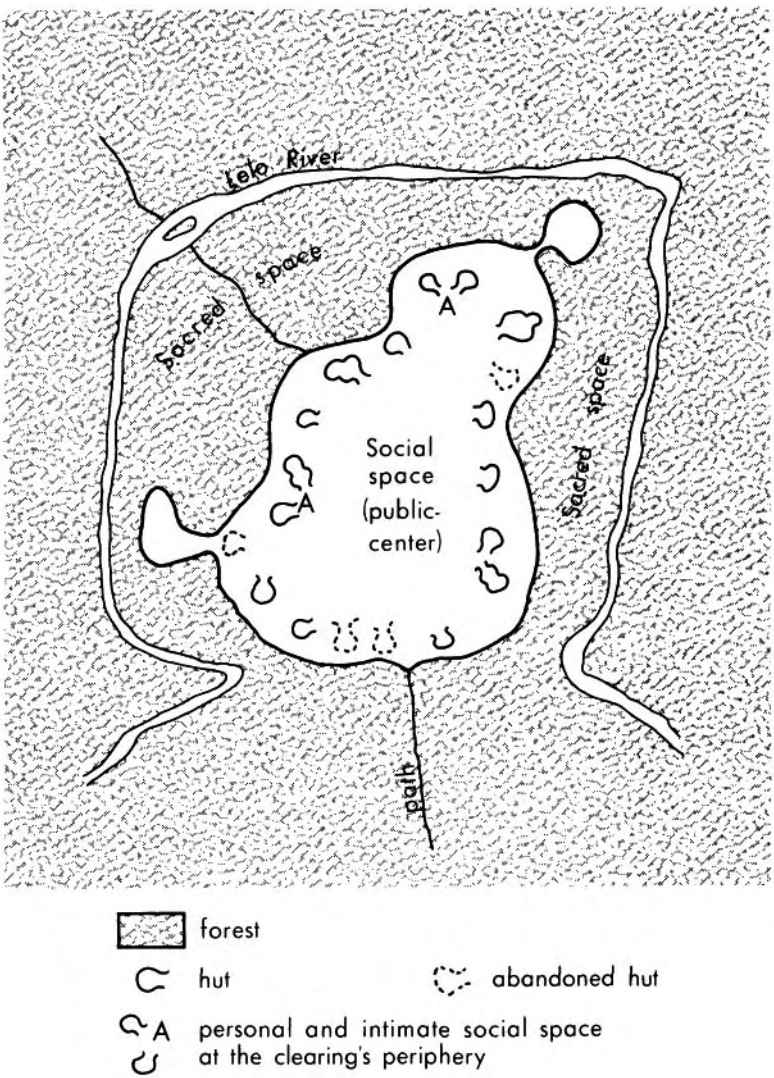


Figure 14. Pygmy camp in the Ituri (Congo) rainforest, showing personal, social, and sacred space. Adapted from Colin M. Turnbull, "The lesson of the Pygmies," *Scientific American*, vol. 208, 1963, p. 8.

some learning; he knows about God and heaven. Heaven is that which towers over him, has great splendor, and is suffused in divine light. These are, however, only words. In an ordinary setting, when he tries to envisage paradise by the power of his own imagination his success is likely to be modest. But in the cathedral his imagination need not soar unaided. The beauty of space and light that he can perceive enables him to apprehend effortlessly another and far greater glory.[19]

Turn now to earth and the modern world. How does modern architectural space affect awareness? In important respects, the principal ways by which it influences people and society have not changed. Architectural space continues to articulate the social order, though perhaps with less blatancy and rigidity than it did in the past. The modern built environment even maintains a teaching function: its signs and posters inform and expostulate. Architecture continues to exert a direct impact on the senses and feeling. The body responds, as it has always done, to such basic features of design as enclosure and exposure, verticality and horizontality, mass, volume, interior spaciousness, and light. Architects, with the help of technology, continue to enlarge the range of human spatial consciousness by creating new forms or by remaking old ones at a scale hitherto untried.

These are the continuities. What are some of the changes? Active participation is much reduced. In the modern world people do not, as in nonliterate and peasant societies, build their own houses, nor do they participate even in a token manner in the construction of public monuments. Rites and ceremonies that focus on the building activity, which used to be thought of as the creation of a world, have greatly declined so that even in the erection of a large public edifice there remain only the rather wan gestures of laying the foundation stone and topping. The house is no longer a text encoding the rules of behavior and even a whole world view that can be transmitted down the generations. In place of a cosmos modern society has splintered beliefs and conflicting ideologies. Modern society is also increasingly literate, which means that it depends less and less on material objects and the physical environment

to embody the value and meaning of a culture: verbal symbols have progressively displaced material symbols, and books rather than buildings instruct.

Symbols themselves have lost much of their power to reverberate in the mind and feeling since this power depends on the existence of a coherent world. Without such a world symbols tend to become indistinguishable from signs. Gas stations, motels, and eateries along the highway have their special signs which are intended to suggest that these are not only convenient but good places for the motorists to pause. Holiday Inn's trademark promises room, food, and service of a certain quality.[20] What else does it say? We can of course think of other values, but a characteristic of the live symbol is that it does not require explication. Consider the modern skyscraper. People who take note of it are likely to offer a broad range of opinions concerning its worth and meaning. To some it is aggressive, arrogant, and monolithic; to others, on the contrary, it is daring, elegant, and lithe. Such divergent—even opposing—views exist despite the fact that the high-rise is the product of an age to which we all belong. A *consensus gentium* is notably lacking with regard to the artifacts of modern culture. Turn again to the Gothic cathedral. As with the modern skyscraper it is capable of provoking divergent opinions. It has been called "an expression of ignorant and monkish barbarians," "the finest utterance of a noble faith," "the architectural image of primeval forests," and "the lucid embodiment of constructive mathematics."[21] But what is sampled here are the literary views of critics who lived in later times. To those who built the cathedral and to the faithful who worshiped in it, the edifice probably did not require further literary exposition. In that age of concrete symbols people could accept it as the forecourt to paradise, an artifact handsome in itself and yet revelatory of a far more exalted realm.