CHAPTER

1 INTRODUCTION

INTRODUCTION

This book presents basic information about the major environmental issues that impact on architectural design and attempts to do so in a manner that can guide and support the design process. These presentations are not intended merely to cover "required" information before they must be addressed, which for too many design projects done in school is during preparation of the presentation drawings. Unfortunately, the inclusion of environmental considerations often tends to be merely applied "window dressing" intended to make a project appear more "architectural." While there are legitimate reasons why an expansion of items addressed occurs at presentation time, an understanding of environmental issues, particularly in terms of concepts and principles, must be present at the beginning of the design process so that it can inform the initial schematic explorations. A response to the critical environmental issues must be at the core of any effective design, not merely an applied accommodation added later.

With an increased understanding of the basic concepts and principles of the different environmental topics, we should be better able to grasp the connection between these critical issues and effective architectural design. Although the presentation of these issues might at times be mathematical, these issues are definitely not external to effective design, nor should they be considered only as corrective measures that allow one to do something illogical in terms of design. In fact, an understanding of these principles is fundamental to design.

Unfortunately, the obvious significance to design of some of the material covered in this book might not become fully apparent until later in your studies or perhaps not until later in your design careers. But as with most of what we study, if we understand the underlying principles, these explorations of environmental issues will continue to be of value as we progress in our studies and throughout our professional careers.

ENVIRONMENTAL AESTHETICS

Nature can only be mastered by obeying its laws.

Roger Bacon (Thirteenth-century English philosopher and scientist)

Esthetic judgment constitutes the quintessential level of human consciousness.

James M. Fitch (Architectural historian and theorist)

The commitment of environmental designers (interior designers, architects, landscape architects, and urban designers) to the enhancement of the human experience can best be realized through designs that are both aesthetically pleasing and socially meaningful. In this effort, perhaps the most confusing task is to assign the proper significance to each concern so that the resulting design responds

appropriately to the imposed conditions. To accomplish this effectively, designers must have an understanding of science and technology in addition to sensitivity for composition and form.

Science is much more than a body of knowledge. It is a way of thinking. This is central to its success. Science invites us to let the facts in, even when they don't conform to our preconceptions. It counsels us to carry alternative hypotheses in our heads and see which best match the facts. It urges on us a fine balance between no-holds-barred openness to new ideas, however heretical, and the most rigorous skeptical scrutiny of everything—new ideas and established wisdom.[1]

Carl Sagan (Renowned American scientist)

Many erroneously believe that science is based primarily on complex mathematical computations, and because of this, there is often a tendency to assume that science is imbued with a notion of certainty. On the other hand, art is generally considered to be nonspecific and nonscientific. As a result, designers often tend to avoid specific limitations, especially if they are expressed through the use of numbers, as if the acceptance of specificity might imply that they are not really concerned with the poetry of design or, even worse, that they are not really creative.

Calculations, the use of mathematical formulas, are merely a way to model certain aspects of the physical world. Math is a language that provides a simple way of expressing ideas, but many designers are uncomfortable with the mathematical language and cannot appropriately appreciate or effectively use a mathematical model. While rejection of mathematics is unfortunate, since it deprives designers of an effective means of modeling certain conditions, it is untenable if it encourages designers to concomitantly reject science or to go as far, as some do, as to exclaim, "Don't confuse me with the facts!"

Science is the ever-unfinished task of searching for facts, establishing relationships between things, and deciphering laws according to which things appear to occur. The main intention of science is to extract from the chaos and flux of phenomena a consistent, regular structure—that is, to find order. Similarly, effective environmental design should be committed to the discovery of pattern, structure, and order and to giving them viable expression in physical form.

Today there is some confusion over what is or should be the basic intentions of environmental design. This confusion is probably the result of various changes that began developing as long as 150 years ago with the general industrialization of the construction field. This industrialization has tended to separate the design process from what James Marston Fitch called "the healthy democratic base of popular participation."[2] As a result, the designer is now typically isolated from the consumer, increasing the "prevalence of the abstract, the formal, and the platitudinous in architectural design."[3] It is becoming increasingly clear that an attitude within many segments of the various design professions is "one of complacent laissez faire whose esthetic expression is a genial eclecticism. The result is a body of work as antipopular and aristocratic in its general impact as anything ordered by Frederick the Great or Louis XV."[4]

While many of the prominent voices in the design field seem to be consumed by a theoretical dialogue on stylistic intentions and priorities, the traditional leadership role that environmental designers have traditionally contributed has been significantly reduced. In fact, in many situations, oblivious to their fundamental responsibility to ensure that environmental development is nurturing and sustainable, the work of many designers continues to degrade rather than enhance the natural environment. At a time when the design professions should be actively involved in supporting rational, sustainable development, continued infatuation with a narrow set of design parameters might reasonably be interpreted as equivalent to rearranging the deck chairs on the *Titanic*.

Rather than narrowing our options, design professionals should be pursuing ways both to maintain traditional involvement in environmental design and to increase the level of participation through an expansion of professional services. We should take the opportunity to build upon the problem-solving methodology of the design field and substantially extend its realm of engagement. We should reinterpret the basic notion of what constitutes environmental design practice, and sustainable development provides a means to accomplish this.

The ultimate and quintessential role of environmental design is the interpretation of ideas through physical form for human habitation, and designing is the actual act of interpretation. The idea of the designer as a creative individual operating intuitively and independently in this effort of interpretation, although romantic, is unsubstantiated by fact and is a notion that inhibits realization of the architectural potential. While designing is obviously a critical responsibility of professional practice, there are numerous activities with which designers have regularly been involved and upon which designing relies. Just in

[1] Carl Sagan, *The Demon-Haunted World: Science as a Candle in the Dark* (Ballantine Books, New York, 1966), p. 27.

[2] James Marston Fitch, *American Building: The Environmental Forces That Shape It* (Houghton Mifflin Company, Boston, 1972), p. 316.

[3] Ibid., p. 317.

[4] Ibid., p. 318.

terms of traditional architectural practice, these usually include promoting and selling architectural services; educating the public, clients, and future professionals; preparing a project brief; developing contract documents; selecting contractors and determining costs; and inspecting construction progress. In addition to these activities, there are a number of allied services that are frequently associated with architectural practice.

Although these various activities collectively constitute the overwhelming portion of architectural practice, a presumption remains, even among many practicing architects, that designing is the most dominant aspect of professional architectural services. In reality, designing accounts for only around 10% of the actual effort expended in fulfilling the demands of most architectural practices! While the actual act of interpretation is critical, all efforts necessary to accomplish this interpretation are essential and crucial to the architectural endeavor, not merely the interpretation itself.

Regrettably, a distinction is sometimes made between the value and importance of "designing" and the "nondesign" efforts of contemporary environmental practice. This establishes an unfortunate hierarchy within the design professions that is extremely divisive and can undermine collaboration, which is essential for effective design that is responsive to the multiplicity of concerns in our complex world. While distinctions in the areas of involvement will remain, any assumed hierarchy will continue to be extremely disruptive to the environmental design professions. To remain effective, we can no longer indulge ourselves with a biased, myopic view of what is actually an extremely diverse responsibility that demands multiple skills and abilities.

Too many recent "prestigious" buildings have been designed in response to a rather narrow value system. While some of these buildings are clearly attractive, too often they are void of functional meaning or any significant social connotation. Only with an understanding of the technological propriety, tempered by a process of socialization, can the environmental design professions move from their recent role of "agent and spokesman for the elite"[5] to achieve more meaningful contact with and support for the popular community.

An understanding of technological propriety can only come from a sound theoretical scientific foundation. As Gary Stevens stated in *The Reasoning Architect*:

> *. . . although architecture is usually thought to be the product of acts of inspired creation, it is also the product of acts of inspired reason; to demonstrate that science and mathematics are portions of our intellectual culture that cannot be set apart from architecture and left to the engineers to worry about, but are the concern of all of us.*[6]

> *A distinction is often made also between art and craft. These dichotomies are in fact quite recent, about 200 years old, but as long as we do not take the boundary as hard-and-fast, and admit into each parts of the other, they are useful distinctions if only because scientists and artists do see themselves as carrying out quite different sorts of activities.*
>
> *Though they may be different, it does not necessarily lead to the conclusion that they are opposed. The two can be unified in the one individual or pursuit.*[7]

It is unfortunate, and perhaps even harmful, that in our society, art and science have come to be seen as opposites and antagonistic to one another. Perhaps this tension between the two cultures of art and science is most evident in the environmental design disciplines—that is, in architecture, broadly defined to include physical design extending from consideration of interior space to the urban environment. This confrontation between art and science is especially disturbing since effective environmental design depends on a collaboration of the two.

The wide-ranging criticism of science in architecture is based on the notion that science demands that design be predicated on the application of a set of operational rules that are devoid of any concern for humanistic values. But this criticism is founded on a fundamental confusion about the meaning of humanism and the nature of science. As expressed by Jacob Bronowski:

> *The scholar who dismisses science may speak in fun, but his fun is not quite a laughing matter. To think of science as a set of special tricks, to see the scientist as the manipulator of outlandish skills— this is the root of the poison that flourishes in the comic strip. There is no more threatening and no more degrading doctrine than the fancy that somehow we may shelve the responsibility for making the decisions of our society by passing it to a few scientists armoured with a special magic. [This is a] picture of a slave society, and should make us shiver whenever we hear a [person] of*

[5] Ibid., p. 319.

[6] Gary Stevens, *The Reasoning Architect: Mathematics and Science in Design* (McGraw-Hill Companies, New York, 1990), p. 3.

[7] Ibid., p. 11.

sensibility dismiss science as someone else's concern. The world today is made, it is powered by science; and for any [individual] to abdicate an interest in science is to walk with open eyes towards slavery.[8]

Gary Stevens said:

[T]he fundamental fallacy . . . is in regarding creativity and reasoning as two watertight compartments of the human intellectual makeup. Since architecture is clearly a creative activity, it [is assumed to follow] that architecture cannot be about reasoning, and from this it is a straightforward step to conclude that it must not be about reasoning. The critique perpetuates the wholly wrong idea that creativity in architecture is the domain of design and design alone and that all the other components of architectural knowledge are just so many dry facts that are sometimes handy to the architect but preferably left to the consultant. The result of such attitudes, among other consequences, is that architects are doing less and less in the construction process, as the masters of all these dry facts chip away slowly but steadily at the architect's role.[9]

Only with an appreciation for human values and a committed sensitivity for nature, including both an understanding of its technological potential and an awareness of its ecological fragility, can we hope to achieve environmental design of significance and quality. But confusing any attempt of designers to address environmental concerns appropriately is their apparent failure to grasp the proper meaning of certain common terms: *visual, aesthetic*, and *taste*.

To address environmental concerns appropriately as we fulfill our commitment to design, we must grasp the proper meaning of *aesthetics* and *taste,* recognizing that they are based on more than personal choice and opinion.

Aesthetic Judgment

Aesthetic judgment deals with the issue of "beauty" as distinct from "moral" or "useful" issues, but "beauty" is not limited merely to visual concerns. Unfortunately, James Fitch's claim that "esthetic judgment constitutes the quintessential level of human consciousness"[10] is confusing since it seems to be directly opposed to his stand against the obsession that many in the environmental design professions had, and still have, with visual aesthetics. However, any confusion that comes from this pithy comment derives from a narrow interpretation of aesthetic judgment and beauty. Since beauty entails a combination of qualities that pleases the aesthetic senses, "esthetic" judgment, as expressed by Fitch, is based on an interrelationship between all the physical senses, not just the visual. Aesthetic judgment also depends on personal interpretation of these sensations.

Assuming that aesthetic judgment is based only on visual phenomena leads to a serious misconception of the multidimensional aspect of aesthetic theory. "Far from being narrowly based upon any single sense of perception like vision, our response to a building derives from our body's total response to and perception of the environmental conditions which that building affords."[11] There are many examples of building types where the aesthetic judgment is clearly based on nonvisual concerns as well, and sometime perhaps instead of visual concerns. Even in the most beautiful symphonic hall, a building type that is primarily intended for the appreciation of auditory sensations, one cannot be truly aesthetically pleased if the acoustics are inadequate. In a ballet theater, one cannot be satisfied if one is unable to see the performance properly. There are also situations in which external issues impose on aesthetic judgment. For example, while an owner might recognize that a building incorporates certain positive physical qualities, if the costs far exceed expectations and/or the capacity to pay, it is questionable if there would be substantial appreciation, aesthetic or otherwise, of the structure.

It is inappropriate to attempt to qualify environmental design merely from visual phenomena. While we can, of course, analyze a building in terms of its compositional aspects, we should not confuse this with a comprehensive investigation of its overall aesthetic quality. Although we can derive information on certain nonvisual aspects of a structure from visual observation, we should not confuse issues.

An exploration of the broad issue of aesthetic judgment begins to clarify that there is an important distinction between architecture as object and architecture as experience. As object, architecture tends to exist external to us, and can be observed and interpreted dispassionately and objectively. It is beyond us. It exists for itself. However, as experience, the architectural object has significance only in that it provides the basis for a perceptual experience. It becomes part of us, and the actual physical substance of the object is not of paramount importance. Rather, it is only the effects of the object that are truly significant.

[8] Jacob Bronowski, *Science and Human Values* (Harper & Row, New York, 1965), p. 16.

[9] Stevens, *The Reasoning Architect*, p. 17.

[10] Fitch, *American Building*, p. 309.

[11] Stevens, *The Reasoning Architect*, p. 5.

Of course, the physical reality is important, but this importance is derived primarily from what it implies rather than what it might be physically. Its value and strength exist in its expressed ideas and in its meaning.

The distinction between architecture as object and architecture as experience is similar to the distinction between what can be referred to as "design from outside" and "design from within." While it would be desirable to further explore and clarify these differences, this is beyond the scope of this book; however, hopefully we can agree that the human-caused modification of the physical environment that we call architecture must be considered in terms of a complex composite structure formed of numerous distinct, yet interacting, elements including, but not limited to, its visual characteristics.

Aesthetic Taste

Taste deals with the value system on which we establish our aesthetic judgments. These judgments are based on established values that are developed by and representative of a culture. Since they are statements of cultural consciousness, aesthetic criteria are relative and are dependent on a particular culture. So, while there are specific individual responses that must be considered, aesthetic judgment is greatly affected by its particular social and cultural background. "Esthetic standards are expressions of social agreement, of a common outlook or attitude towards [a] particular aspect of human experience."[12] These standards may, and probably will, vary not only according to the society, but even within a society, according to the particular group or class, establishing a differentiation between what is called *popular taste* and *high style*.

While there is a sharp distinction between popular taste and high style, there is also an extremely important relationship between the two and a joint subordination of them to the exigencies of society as a whole. In certain situations, the connection between the two is complete. As Fitch mentioned, with handicraft methods of production, the aesthetic standards were constantly disciplined by the production method itself. Initially, the designer, producer, and consumer were one and the same, and there was no such thing as bad taste. With early societies basically isolated from other communities, there were no comparative values applied externally to an object, and it was on this basis that the unique aspects of primitive art evolved.

As society progressed from the primitive stage, a distinction between popular taste and high style started to emerge. It became more apparent and ultimately, following the Industrial Revolution, with an increase in automation, popular taste and high style tended to become totally separated and, at times, even in direct opposition to one another. Today, such opposition is often a conscious positioning by those choosing to suggest that their value set, which is obviously assumed to be high style, is different from and superior to that which is generally accepted.

Perception of the Physical Environment

In his book *American Building: The Environmental Forces That Shape It,* James Marston Fitch wrote about our perceptual experience. He suggested that while there might be a dominance of visual sensations or significance for our thermal experiences, our spatial perceptions are strongly influenced by all of our senses. Fitch listed six senses upon which our environmental perceptions are based: visual, auditory, olfactory, tactile, gustatory (taste), and proprioceptive (interactive). While the first five are reasonably understood, the proprioceptive or interactive sense is not commonly recognized. According to Fitch, this sense is activated by stimuli produced within the organism by movement of its own tissues. As intriguing and provocative as this sixth sense might be, another interpretation of the phenomena of perception was provided by Pierre von Meiss:

Be warned: for a person who has the use of all his senses, the experience of architecture is primarily visual and kinaesthetic [using the sense of movement of the parts of the body]. . . .That does not mean that you are allowed to be deaf and insensitive to smell and touch. *That would be to deny oneself the fullness of sensations. Isn't it sometimes a failure on a single one of these points which are deemed to be of secondary importance which destroys all visual qualities? Aesthetic experiencing of the environment is a matter of all our senses and there are even some situations where hearing, smell, and tactility are more important than vision; they are experienced with extraordinary intensity. As designers we must never forget that! Let us try to imagine the echo in the spaces that we are designing, the smells that will be given off by the materials or the activities that will take place there, the tactile experience that they will arouse.*[13]

While Fitch considered perception to be based on the five senses augmented by the proprioceptive or interactive sense, von Meiss reduced the number of basic senses by dropping the sense of taste and added the kinaesthetic

[12]Fitch, *American Building*, p. 31.

[13]Pierre von Meiss, *Elements of Architecture* [Van Nostrand Reinhold (International), London, 1990], p. 15.

sense as his special augmentation. More likely, our perceptions of the physical world are the result of the five physical senses of sight, sound, touch, smell, and taste, modified by our prior experiences, our expectations, and our intellectual capacity. Further, in agreement with both Fitch and von Meiss, our perceptions of the physical environment are established by the interaction of *all* of our senses. As Fitch said: "Far from being narrowly based upon any single sense of perception such as vision, our response to a building derives from our body's *total* response to and perception of the environmental conditions the building affords."[14]

As an extension of his classification of the senses, Fitch distinguished seven factors or areas upon which our environmental perceptions of the physical environment are based. He identified these as the thermal, atmospheric, aqueous, luminous, sonic, world of objects, and spatio-gravitational. (For a further explanation of this, refer to the first chapter in Fitch's book.) While Fitch's division is helpful, especially since he used these to organize his book, assigning a chapter to each, in the discussion of environmental issues, the presentation is not generally organized on the basis of our perceptual experience. Rather, we usually organize the issues by the standard engineering subdivisions. These include HVAC (heating, ventilating, and air conditioning) or ECS (environmental control systems), lighting, and acoustics, plus the additional areas of plumbing, fire safety, electrical service, communications, movement systems, and others. This book uses these classifications, although the order in which they are arranged is somewhat different. Rather than begin with thermal issues and ECS, the discussion starts with lighting and then acoustics, and then addresses thermal issues, although there is no need to read the chapters in this order. The other issues are addressed afterward.

This arrangement aligns more closely with how we utilize our various sensations in developing spatial perception and, because of this, how we generally begin to develop an architectural design. In our discussion of the various environmental issues, we will explore basic physical phenomena and address how architectural design can be a means of addressing these, and since early design explorations tend to be more spatial than fully experiential, it makes sense to begin with lighting and acoustics since these issues most closely relate to how we predominantly develop our sense of space.

However the discussions of the various environmental issues are arranged, we should realize that our perceptual experiences are the result of all of our senses, although we tend to rely on each in different ways. Obviously, spatial perception is highly dependent on vision, followed perhaps by hearing, but it is also affected by thermal and atmospheric conditions. Olfactory senses also can have an effect that can be quite powerful, but generally this is because odors tend to trigger recollection of previous experiences, and often these do have spatial connotations. The tangible experience of touch can also influence how we experience space since it provides information on both the texture and substance of the materials, and these attributes are connected with issues of quality. However, it is usually sufficient to observe a texture or surface that we have touched previously to reconstruct the experience and then incorporate this in forming our perception. As for taste, although it is involved in assessing atmospheric conditions, we usually do not lick the space. However, as with touch, we might have actually had a taste. As infants, we probably did rely on taste as we initially explored our world, and these memories still have an impact on our interpretations.

THE INTENTIONS FOR ENVIRONMENTAL DESIGN

[The] ultimate task of architecture is to act in favor of human beings—to interpose itself between people and the natural environment in which they find themselves. . . . The successful interposition between people and their natural environment furnishes the material basis of all great architecture. To wrest the objective conditions for our optimal development and well-being from a Nature that only seldom provides them, to satisfy our physiological and psychological requirements at optimal levels— this, beyond question is the objective basis of any architecture that is both beautiful and good.[15]

James Marston Fitch

The main intention of environmental design, which includes urban design, architecture, interior design, and those other fields that deal with design of the physical environment, is the ordering of the physical environment to serve humankind. In order to serve humankind effectively, environmental design must be fundamentally scientific. Going beyond a dictionary definition,[16] science can

[14] Fitch, *American Building: The Environmental Forces That Shape It* (Oxford University Press, 1999), p. 4.

[15] Ibid., p. 3.

[16] *Webster* defines "science" as "1.) a branch of knowledge or study dealing with a body of facts or truths systematically arranged and showing the operation of general laws, 2.) systematic knowledge of the physical or

be explained as the ever-unfinished task of searching to discover facts, establishing relationships between things, and deciphering the laws according to which things occur.

The ultimate intention of environmental design is to achieve an environment that can support the fullest measure of human endeavor without the imposition of excessive external stress or, at the other extreme, the deprivation of necessary minimal sensory stimuli. To achieve this goal, designers must rely on science, although unfortunately, some design professions are unprepared to do this. Many designers do not adequately understand certain critical factors that significantly impact on the environment and, therefore, are unable to respond to them properly.

According to Fitch, this isolation from critical information is partially the consequence of the spread of industrialization and the resulting isolation of "design from the healthy democratic base of popular participation."[17] With increasing industrialization, the traditional connection between users and designers was set aside. The result of this division was the "increasing prevalence of the abstract, the formal, and the platitudinous in architectural and urban design."[18] It is probably fair to say that the aesthetic concern that has been the motivating force in the design of most of the recent prestigious buildings is an aesthetic void of any significant "functional-democratic connotations."[19] This has resulted in "a body of work as antipopular and aristocratic in its general impact as anything ordered by Frederick the Great or Louis XIV."[20] The environmental design professions must go beyond their current role as agents for the elite to provide meaningful professional service to the popular community. This demands that designers go through a process of socialization evolved from a broad theoretical foundation gained from a scientific education.

Some time ago, Dr. Jacob Bronowski presented an address to the Royal Institute of British Architects entitled "Architecture as a Science and Architecture as an Art." In this talk, Bronowski stated that "the architect bears the same responsibility for making science as well as art visible and familiar, and for having each influence and enter into the other. Architecture remains the cross-roads of new science and new art. If the architect is willing to make them one, by learning to live naturally in both, there will at last be fine modern buildings, and citizens wise enough to see that they survive."[21] Or as Fitch stated: "Modern architectural problems can no more be solved by carpentry than can spacecraft be built by village blacksmiths."[22]

To be effective, environmental design must maintain or establish a symbiotic relationship between the physical structure and its occupancy. In this sense, occupancy includes both a human component and an operational component. As environmental designers, we can expect to achieve an appropriate and effective design expression only if we have a proper understanding of the technical issues that relate to environmental issues.

In *An Outline of Philosophy*, while commenting on mathematical modeling of the physical world, Bertrand Russell wrote, "Physics is mathematical not because we know so much about the physical world, but because we know so little; it is only its mathematical properties that we can discover."[23] Paraphrasing this comment to address the problems that face architecture today, we might suggest that architecture is evaluated on the basis of visual aesthetics, not because we know so much about design, but because we know so little. It is only the composition of form that we can readily observe and, therefore, attempt to control.

Another interpretation derived from Bertrand Russell's quotation is that, in general, we tend to be more attentive to those issues that are initially most apparent to us, not necessarily those issues that are most significant. Since we tend to deal first with obvious issues, we frequently avoid or miss those that are more difficult and may be more significant. As designers, we should recognize this and attempt to avoid the trap. We must be able to consider objectively all issues that impact on our task, not just the ones that we think of first or those in which we are interested. If we are to establish our design standards on a relatively firm factual base, we need to develop a more systematic and detailed investigation of the actual relationship between humankind and the physical environment.[24]

We should also recognize that we bring to the design task a great deal of valid understanding based on our prior experience. We should use this understanding or preconditioning, which some might choose to refer to as *common sense*, and build upon it. While our prior conceptions can guide us when we undertake the study of a new issue, they should not interfere with our expanding into new areas of understanding. We must be careful to keep our preconditioning from limiting our willingness to acquire new,

material world gained through observation and experimentation, . . . 4.) systematic knowledge in general, 5.) knowledge, as of facts or principles; knowledge gained by systematic study, . . . 7.) skill, esp. reflecting a precise application of facts or principles; proficiency" (*Webster's Encyclopedic Unabridged Dictionary*, Gramercy Books, New York, 1996).

[17] Fitch, *American Building*, p. 354.

[18] Ibid., p. 355.

[19] Ibid., p. 356.

[20] Ibid., p. 356.

[21] Jacob Bronowski, "Architecture as a Science and Architecture as an Art," *R.I.B.A. Journal* (March 1955), pp. 183–189.

[22] Fitch, *American Building*, p. 357.

[23] Bertrand Russell, *An Outline of Philosophy* (Blackwell, Oxford, 1993), p. 125.

[24] Ibid., p. 24.

sometimes conflicting, information and formulating new concepts and ideas. In fact, they might give some relevance to these new concepts and ideas.

As designers, our ultimate concern should be the experiential reality of the physical environment that results from all of our senses.

Other Thoughts

The term *primitive* refers to being at the beginning, being original. According to Amos Rapoport, "Primitive building . . . refers to that produced by societies [which are] defined as primitive by anthropologists."[25] While these buildings might appear to us as rather elementary, "they are, in fact, built by people using their intelligence, ability . . . and resources to their fullest extent. The term primitive, therefore, does not refer to the builders' intentions or abilities, but rather to the society in which they build."[26] That is, a primitive building can be very sophisticated, especially from the vantage point of the builder!

According to the anthropologist Robert Redfield, *primitive* refers to a culture that is isolated and self-contained, if not in terms of other primitive cultures, then in terms of some higher culture. Primitive cultures have no knowledge of an outside higher culture. They are limited to their own devices. In the primitive society, there is a diffused knowledge of everything by everybody. In a primitive culture, there are prescribed ways of doing or not doing everything.

The term *vernacular* is distinct from primitive. Vernacular refers to a culture that coexists in association with a higher culture. Therefore, vernacular is related to *folk* and *peasant*, terms that clearly imply a distinction of cultural levels. In a sense, vernacular carries the connotation of *popular taste*.

In vernacular design, models are used as the basis of design, but these models are individually modified. They are not copied directly, as is done in primitive design. As mentioned before, in primitive design, individual adjustments of the prototype are not available. But while there is an important distinction between primitive design and vernacular design, this distinction is not as significant as that between vernacular design and high-style design. In vernacular design there is a "lack of theoretical or aesthetic pretensions; [and] working with the site and micro-climate; respect for other people and . . . the total environment, [human] made as well as natural; and working within an idiom and allowing variations only within a given order"[27] is the acceptable standard. In high-style design, aesthetic pretensions tend to dominate, and concern for the environment is subjugated to the more ethereal concerns of the designer. Another distinction between vernacular and high-style design is that vernacular design has an additive and open-ended nature, whereas high-style design is basically closed and complete. Vernacular buildings can readily accept change and adapt to variations. This tends to contribute to the particular charm of such buildings. High-style buildings, on the other hand, cannot change or adapt without being conceptually modified.

With vernacular design, tradition is a regulator that helps establish the aesthetic norm. But today, the regulatory nature of tradition has basically disappeared, especially in the United States. It has been supplanted by stylistic pretensions that are not, unfortunately, generally concerned with adaptation to the natural environment. Even with all of the rhetoric concerning the need to change our ways and become better stewards of the environment, our actions tend to continue to impose on nature rather than work with it. While there are obviously many who are dedicated and committed, the majority seem unwilling to take even modest steps that could help in the near term, so it is our responsibility to lead as best we can.

Needs and Means

In vernacular design, the major intention is to achieve an honest solution to the fundamental requirements expected of the building. The designer, who is also usually the builder and the user, does not impose contradictory and extraneous considerations on the design. Rather, the designer attempts to accomplish a natural symbiosis with nature. In simpler times this natural symbiosis of vernacular design was easily achieved, generally through an intuitive process that resulted in a positive response to imposed requirements. This process should not be thought of in terms of blind trial and error. It was a logical process that depended on an understanding of the demands expected of the proposed building and the means available to meet these demands, as well as on a wealth of prior experience.

With the unbelievable expansion of knowledge that has occurred since the beginning of the twentieth century, an expansion considered to double every 15 years,[28] and with the increase in expectations and demands of our contemporary society, the intuitive design process cannot sustain effective architectural development. Today the architectural design process must be consciously rational

[25] Amos Rapoport, *House Form and Culture* (Prentice-Hall, Englewood Cliffs, NJ, 1969), p. 3.
[26] Ibid., p. 3.
[27] Ibid., p. 5.
[28] This would mean a more than 60-fold increase in knowledge since 1900.

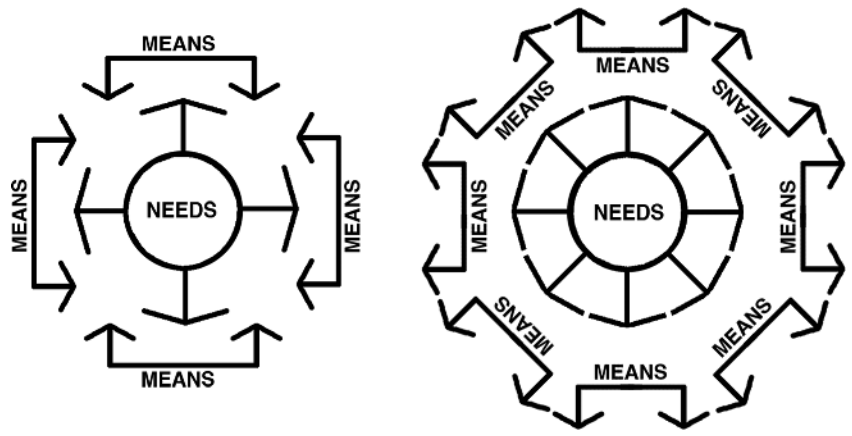

Figure 1.1 DIAGRAM OF NEEDS AND MEANS
James Marston Fitch stated that design should be the process of balancing the outward-pressing needs with the inward-pressing means that are available. While this balance was readily achieved in simpler times with limited needs and means, the increased complexity of needs and the expansion of the various means that are now possible have led to an explosion of possibilities and design chaos.

and scientific. In *American Building,* Fitch presented this thesis—the requirement for a rational and scientific design method. He suggested that prior to the general proliferation of design requirements and potentials that resulted from the industrial/technological revolution of the last 150-plus years, the building profession was disciplined and ordered by what Fitch called a "clear and comprehensible reference frame of needs and means."

As shown in the left-hand diagram in Figure 1.1, the needs that a building was to address, which were outward-pressing requirements, were relatively simple and basic, and they were readily defined. Also the means by which it was possible to respond to these needs, which were inward-pressing limitations, were easily identified and offered minimal opportunities for choice. Today, however, as indicated in the right-hand diagram, the balanced interface of needs and means has been exploded with the increase in both technological capability and programmatic demands. Without a balanced interface, chaos reigns supreme and the adaptation of the physical environment in humankind's favor, the primary objective of environmental design, cannot be achieved effectively.

Things have become more complex, and the challenge for environmental design is to embrace this complexity. We must develop a clear understanding of both sides of the needs–means interface and use this to reestablish a sustainable future where needs and means are again brought into balance, as indicated in Figure 1.2.

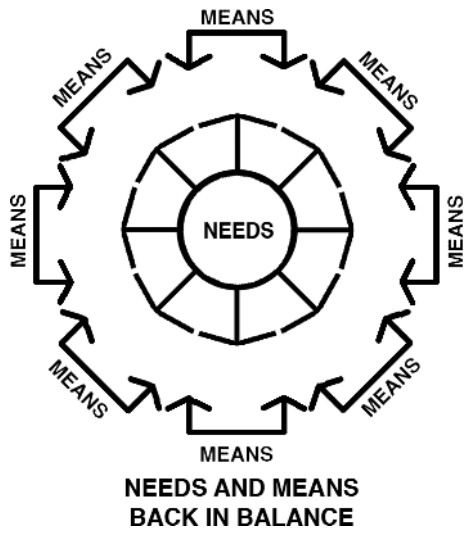

Figure 1.2 DIAGRAM OF NEEDS AND MEANS BACK IN BALANCE
With a clear understanding of the needs that environmental design must address and a solid grasp of not just what is possible but, more importantly, what is appropriate to address these complex needs, a balance between the two can be reestablished.

CONCLUSION

The aim of environmental design is to achieve a nurturing environment that can support the fullest measure of human endeavor without imposing excessive external stress. The aim is to establish what Fitch called the *third environment*, in which there is a symbiotic relationship between the physical environment and the occupancy. If a designer's standards for judgment are to be firmly based, with more substantiation than is currently provided, the designer needs to understand the fields of physiology, psychology, anthropology, history, economics, and others. Architecture needs to have a broad knowledge base and a well-developed understanding of humankind's actual physical and emotional relationship with the environment.

Let us begin by learning more about the environmental issues that impact on architecture.

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