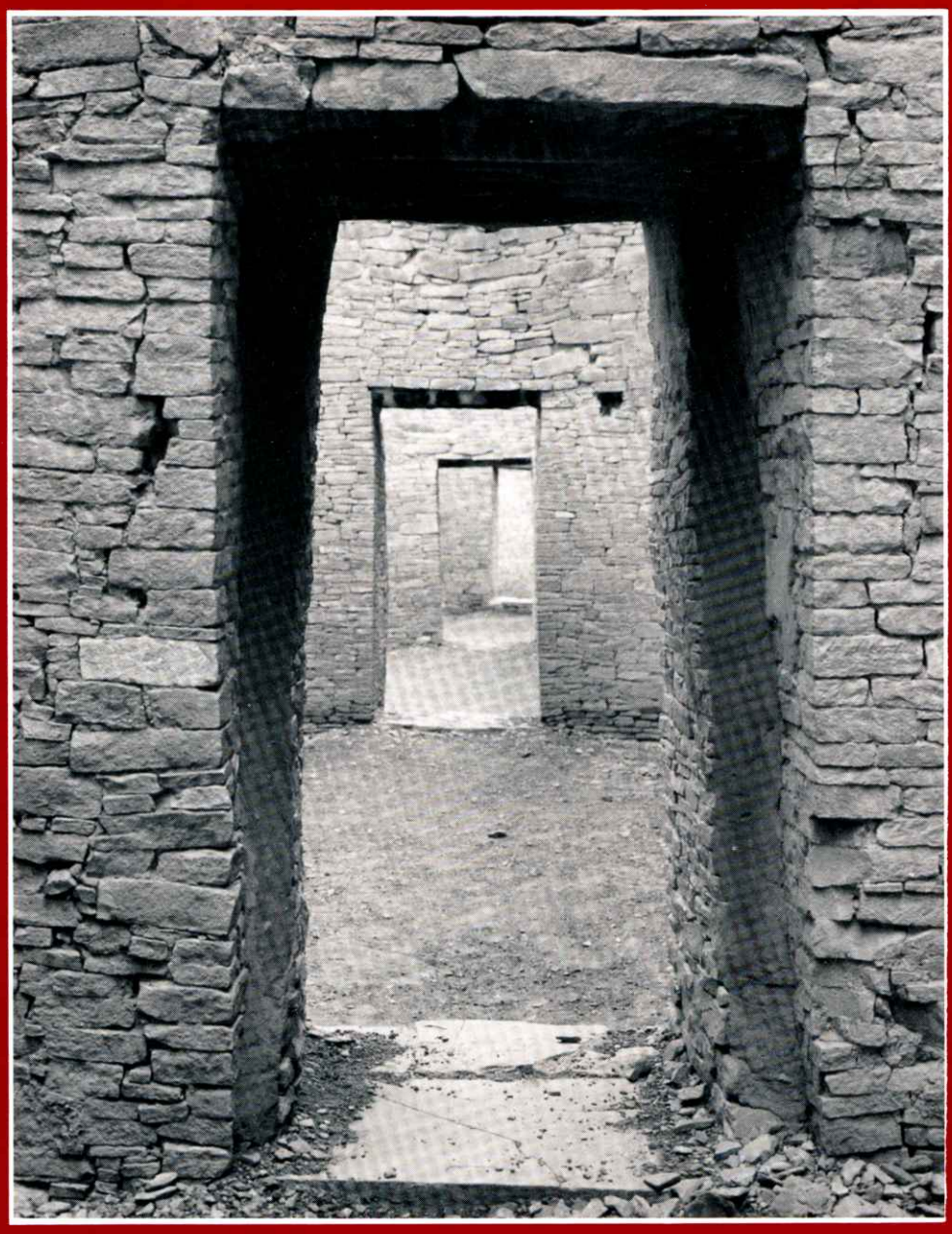
ARID LANDS NEWSLETTER
Spring/Summer 1989
Volume 28



DESERT ARCHITECTURE

Office of Arid Lands Studies
The University of Arizona
Tucson Arizona

From the Editor

This issue of the *Arid Lands Newsletter* explores one of the most basic human concerns—housing. Those of us living in deserts know that our dwellings must fit our special surroundings. Our environment is one of extreme temperatures, scarce water, and sparse vegetation. Yet even as the desert sometimes requires us to shield ourselves from its harsh conditions, it invites us to "bring in the outdoors" during much of the year. As a result, ours must be a special architecture.

The articles presented in this issue take us from the streets of an old Yemeni city to the rural M'zab Valley in north Africa; from centuries-old design forms such as the courtyard house in Latin America to the latest in water-saving and energy-efficient devices in an experimental house in Phoenix, Arizona.

The common thread that unites the articles is a call for sensitivity to our environment. Architecturally, such an approach leads to preserving the old, incorporating new technologies, designing to accommodate cultural heritage, and using indigenous materials.

We hope that you will enjoy this special issue of the newsletter. Let us know what you think.

On the cover: Doorways, Pueblo Bonito, Chaco Canyon, New Mexico.

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CONTENTS

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The *Arid Lands Newsletter* is published semiannually by the Office of Arid Lands Studies, The University of Arizona, and is distributed worldwide without charge. The purpose of the Newsletter is to inform readers of current activities of interest to arid lands researchers throughout the world.

We'd like to hear from you. Address letters of comment, requests for future mailing, and items about projects that may be of interest to our readers to:

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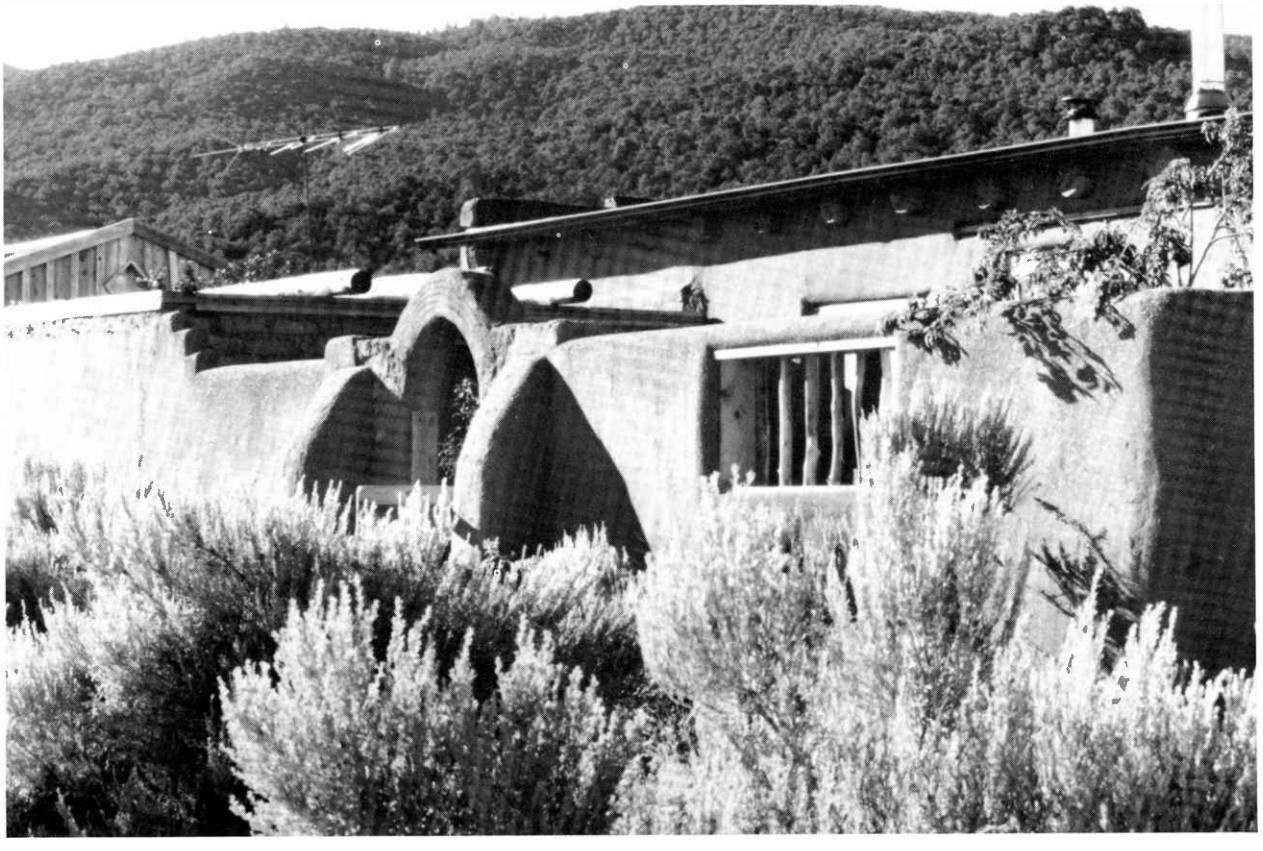


Critical Regionalism from a Desert Dweller's Perspective

Fred S. Matter

Historical and Literary Debate

Broadly defined, *critical regionalism* is an attempt to synthesize the rooted aspects of a region, including physical and cultural characteristics, with appropriate current technology. It is the search for an architecture that is meaningful within its context and at the same time participates in the more universal aspects of a contemporary mobile society.

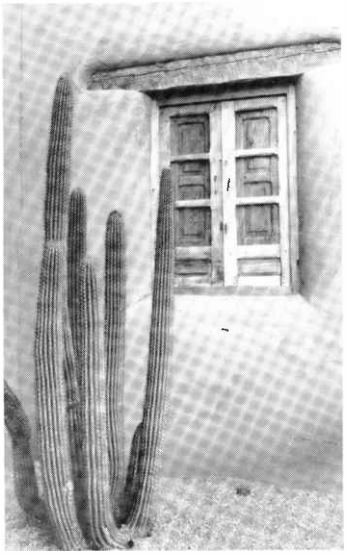
The articulation of these frequently conflicting needs is responsible for a dialogue that goes well back into the history of architecture. It is a dialogue that frequently has been influenced by attaching strong political and social implications to the concept of a regionalist architecture. It is also one that can be traced into the twentieth century as both a counterpart to the humanistic tendencies of the early modern movement in architecture and as a reaction to the International Style that symbolized its later phases.[1]

Its role in contemporary architecture has been discussed frequently in the architectural journals of the 1980s. Of particular interest is an article by the French geographer Paul Ricoeur titled "Universal Civilization and National Cultures," written in 1965. In this article, taken from the book *History and Truth*, a frequently quoted paradoxical basis for critical regionalism was first articulated, namely, "...How to become modern and return to sources; how to revive an old, dormant civilization and take part in universal civilization."[2] A continuation of this dialogue is found in the writing of Kenneth Frampton, "Towards a Critical Regionalism: Six Points for an Architecture of Resistance." In this article the author proclaims the metropolitan centers of the developed world as illustrations of "...the victory of universal civilization over locally inflected culture."[3] He goes on to say that "architecture can only be sustained today as a critical practice if it assumes an "arriere-garde position, that is to say, one which distances itself equally from the Enlightenment myth of progress and from a reactionary, unrealistic impulse to return to the architectonic forms of the preindustrial past."[4] He concludes a discussion of critical regionalism in an article written for the Yale University architectural journal *Perspecta* by saying, "Its salient cultural precept is 'place' creation; the general model to be employed in all future development is the 'enclave'—that is to say the bounded fragment against which the ceaseless inundation of a placeless, alienating consumerism will find itself momentarily checked."[5]

In a recent article titled "Towards an Architecture of Place," and published in *Arcade*, Douglas Kelbaugh gives us a set of criteria through which we can distinguish a critical regionalist way of looking at things. Kelbaugh describes five essential attitudes which he labels: "Love of Place, Love of Nature, Love of History, Love of Craft, and Love of Limits."[6] Each individual love he elaborates as follows. For Place, he writes: "What makes a place unique is worth celebrating and protecting with architecture: finding and keeping the difference that makes a difference." For Nature: "By working together, architects, landscape architects and urban planners can fulfill an ecological role, namely to protect and preserve ecosystems, natural cycles, loops and chains and the symbiosis between organisms and their environment." For History: "A building type that has stood the test of time for many generations must be doing something right in terms of responding to building materials and practices, to climate, to social and cultural needs, to tradition, and to economy." For Craft: "The sheetrocking of America has brought a slow and subtle loss of precision and substantiality in construction—the interior design equivalent of soil erosion." "In the meantime, critical regionalists keep ripping off the fake plastic wood from their dashboards and refrigerator handles and insisting on real slate floors in their foyers." And for Limits: "...critical regionalists keep designing modest, bounded, resource-conserving buildings."

Having mentioned only briefly some of the theoretical components of critical regionalism, it is appropriate to ask why this current dialogue is particularly important to contemporary

society. There are many ways to construct an answer to this question. Starting with the most general condition one can refer to the anxiety of spatial definition that Michel Foucault describes as a problem of contemporary society. "In any case I believe that the anxiety of our era has to do fundamentally with space, no doubt a great deal more than with time."[7] "The space in which we live, which draws us out of ourselves, in which the erosion of our lives, our time and our history occurs, the space that claws and gnaws at us, is also, in itself, a heterogeneous space."[8] Spatial anxiety in these terms is the result of a cultural disorientation that stems from a highly physically mobile and heterogeneous population. This shifting population is unable to maintain commonly understood, shared concepts about the symbolic meaning of architectural space. The words most frequently associated with this condition are alienation, disillusion (when in Rome go to the Kentucky Fried Chicken stand), and in the extreme even schizophrenia. This latter condition is described by Fredric Jameson as the product of a consumer society that has lost its sense of continuity, that has witnessed "...the fragmentation of time into a series of perpetual presents."[9] These are crises terms in both a social and an architectural context and indeed they are so conceived in the minds of many contemporary critics of society and of its various forms of artistic expression. An obvious caveat is needed to clarify this concept of contemporary society. The reference is to the so-called "developed world", more specifically to those cultures that fit the definition of a post-industrial society.[10] These same conditions are, however, also of concern to the developing world. There the question becomes one of critical selectivity. How to adopt those aspects of modern technology that are of benefit and yet still can be assimilated into the contextual framework of the regional culture.



Alternative Modes of Action. If then, there exists a crisis of spatial and temporal relationships in both human and physical terms, what alternatives are available as modes of practical action for an architecture that is responsive to the needs of its time? By what guidelines does one create an architecture that is at once rooted in the characteristics of a specific region while still utilizing the technological advantages of modern building? How to create a meaningful architecture that does not impose artificial restraints on the ability of an "outsider" to adapt to a locally interpreted "sitegeist" that is functionally accessible to the frequently changing inhabitants of a mobile society?

The Character of the Site. The most obvious component of a critical regionalist approach requires a careful design response to a localized, physical sense of place. This suggests many elements for consideration including topography, lighting characteristics, orientation, vegetation and a number of other microclimatic conditions. Possibilities for natural daylighting, natural ventilation, and shading for passive solar heating and cooling are all important. The benefits are both economic and at the same time foster the creation of an architecture that can selectively be opened to its surroundings. This bounded framework also provides a good sense of orientation and suggests a sensitivity to nature through the interaction of inside and outside spaces.

Another recognizable aspect of this component is the use of a pallet of materials that is capable of withstanding local climatic extremes with low maintenance costs and high performance characteristics for proper heat transmission and storage.

The Qualities of Movement. The careful consideration of physical place also requires a similar consideration of the localized characteristics of "path."[11] The understanding of place involves movement to and from the place. The conditions of that movement, movement alone, movement with others, movement in a container, open movement, high and low speed movement, movement in all of its possibilities reveals to us the various dimensions of place. The two conditions are totally intertwined and cannot be defined or designed separately. A major failing in the twentieth century is the lack of consideration for the regional and local aspects of movement. Movement in the western world has become synonymous with standardization and universal civilization. This concept is pervasive in its impact on the definition of place.

A Framework for Interpreting the Passage of Time. Another consideration of the critical regionalist designer involves an interpretation of the passage of time in the building. For a building to be understood as an expression of the time of its creation, it must provide understandable ways of recording the passage of time. Only when a building shows evidence of the passage of time can it be understood in depth in the context of an historical evolution. The various means of this recording can also provide clues toward an understanding of the building in a future context. Attitudes toward permanence and durability or toward change as growth or decay are important expressions of a regionalist sensibility.

Clues to the Character of Human Interactions. Having discussed some of the physical aspects of an architecture of place, path and time, the critical components of human interaction in all of their manifestations become a major consideration. Here we look for a domestic architecture that speaks of the organization of the family structure, as for example in the pattern of the courtyard house, or for both a domestic and a civic architecture that suggest the dimensions of the community, the political and the economic structures of the region. Is it an architecture of defense, or is it an aggressive display of power? Is it an architecture of invitation or is it one of exclusion? Is it an expression of bureaucracy, of hierarchy, or of an open democracy? These clues to the qualitative aspects of human interaction as seen through the lens of a regional interpretation are important to a temporal understanding of the meanings of spaces and places.

The Organization of Work and Expressions of Human Dignity. In a similar vein but worthy of special consideration is the expression in architecture of an understanding of the organization of work in a region, and by extension, that of leisure time. In the twentieth century there are strong universalist tendencies in the separation of the means of production and that of consumption. These tendencies can be seen as more fundamental in their impact on society than basic differences in political ideologies.[12] Questions about the position and responsibility of the individual in the vast scale of the multinational corporation, about the location of the workplace in relation to the place of dwelling, about the compartmentalization of activities in the process of production and the intervention of the machine in the realization of the product all have an impact on the architectural interpretation of these activities. The fragmentation and the physical separations, including the removal of the producer from the consumer, have a direct bearing on the immediate evidence of human care in the built environment. This evidence, or lack of evidence can be seen at all scales and in all types of buildings.

By correlation, all of the above questions can be applied to the structuring of leisure time in today's post-industrial society. The concept of production through a multinational corporation can be compared with the idea of entertainment through a universal mass media. Again, questions of evidence of direct participation and interaction in leisure-time activities can be equated with evidence of human care and the expression of individual human dignity in the formation of the immediate surroundings.

In spite of and in reaction to the universality of these new, large-scale forms of work and of leisure organization there still exist strong variations in the regional expression of some forms of work and of play. This is particularly true in the building industry. One of the major concerns of a critical regionalist architecture, therefore, is that of a direct and tactile expression of the methods and materials chosen for construction. A natural material of the earth and of the site is easy to conceive in these terms. A synthetic, plastic material presents real problems in a regionalist vocabulary and must be seen as a floating reference within the containment of the structure of the place.

"What makes a place unique is worth celebrating and protecting with architecture: finding and keeping the difference that makes a difference."

Summarizing through the Eyes of a Desert Dweller

Few places in the United States express more clearly the vast gulf between the two worlds of architecture under discussion than the desert southwest region. Typical of urban areas in the western United States, the region's fast-growing cities are mainly products of a placeless universal expression. This "placelessness" is evident in much of the contemporary architecture, landscape architecture, and urban planning in both civic and domestic settings. Witness the products of the consumer society—the food, the clothing, and the modes of transportation—that are more universal than regional. The natural outgrowth of a population largely composed of people transplanted from all other regions of the country, this universality belies the proud cultural heritages characteristic of southwestern deserts. Different expressions of the old and the new often sit side-by-side in sometimes startling juxtapositions. The contemporary results are interesting for their shock value, but they make little sense when evaluated as environments for a steadily growing population that needs to be sustained over a long period of time. Clearly, the concept of "critical regionalism" can be usefully applied here.

The challenge is clear. The society is predominantly new and it is heterogenous. The climate is both harsh and inviting. The landscape is open and vast. Water is scarce. The sun is penetrating and pervasive. The historical elements of a regional desert architecture still may be

found and used as a guide in response to the climatic factors. However, we are missing a dialogue between these time-tested responses and the expectations of the new society for technological innovations and improvements. Few of the new inhabitants are familiar with the elements that characterize the regional responses of the past. Architectural traditions in the desert include massive enclosing walls, simple compact forms, small exterior openings with carefully filtered natural light, additive spatial compositions, and protected courtyards. The Southwest exhibits a tactile and protective architecture of the earth, occasionally splashed with accents of bright color and woven textures and generally informal in character. The architecture is not one of the open plan, the free-flowing space, the glass-enclosed box, and the separation of nonbearing skin from flexible structure that is associated with the "modern movement."

Where then is there a possibility for meaningful dialogue? Perhaps one area can be found in the nature of the structural systems employed. Available new materials with greater supporting capacities can be used in combination with traditional enclosing materials. Active mechanical systems can be balanced and bounded within the carefully designed, naturally protective layers of the building envelope. A number of other such opportunities exist to create a synthesis between innovation and tradition. The parameters for guiding such choices, however, are still to be found within the domain of the character of the specific place. At the same time, the rationality of the decision-making process, expressed clearly in the systematic ordering of the building and its use of materials, is an expression that encompasses more than a specific location in time and place. This expression tries to reconcile both the specific and the universal, the transitory and the enduring. In this, its ultimate aim, a rational critical regionalist architecture transcends any tendencies toward a frozen regionalism of the past and rejects the standardized answers of a universal civilization.

NOTES

1. Christian Norberg-Schulz, "Where is Modern Architecture Going?," GA Document #2 (Tokyo: A.D.A. EDITA, Autumn 1980), p. 6.
2. Paul Ricoeur, "Universal Civilization and National Cultures" (1961), History and Truth, trans. Charles A. Kelbley (Evanston: Northwestern University Press, 1965), p. 277.
3. Kenneth Frampton, "Towards a Critical Regionalism: Six Points for an Architecture of Resistance," The Anti-Aesthetic, ed. Hal Foster (Port Townsend, Washington: Bay Press, 1983), p. 17.
4. *Ibid.*
5. Kenneth Frampton, "Prospects for a Critical Regionalism," Perspecta 20 (New Haven: Yale Architectural Journal, 1983), p. 162.
6 All quotes in this paragraph are from Douglas Kelbaugh, "Towards an Architecture of Place," Arcade, Dec./Jan. 1986 (Seattle). {UNABLE to cite page, cannot obtain copy of periodical; photocopy has no page numbers.}
7. Michel Foucault, "Of Other Spaces," Diacritics, Spring 1986, Vol. 16, No. 1, p. 23.
8. *Ibid.*, p. 23.
9 Fredric Jameson, "Postmodernism and Consumer Society," The Anti-Aesthetic, ed. Hal Foster (Port Townsend, Washington: Bay Press, 1983), p. 125.
10. See Daniel Bell, The Coming of Post-Industrial Society (New York: Basic Books, Inc., 1973).
11. For a more complete discussion of the definitions of "Place and Path," see Christian Norberg-Schulz, Existence Space and Architecture, Chapter 2, "The Elements of Existential Space" (New York: Praeger, 1971).
12. For a more complete discussion of this concept of the split between the producer and the consumer, see Alvin Toffler, The Third Wave, Chapter 3, "The Invisible Wedge" (New York: Bantam Books, Inc., 1981).

Fred S. Matter *is a professor in the College of Architecture at The University of Arizona. He is also director of graduate programs for the College and director of the Architectural Research Laboratory with its Center for Desert Architecture. His major interests include climate-responsive architecture and urban planning.*

Three Architects' Approach to the Arizona Desert

Robert Hershberger

The American southwestern desert is a special place and calls for a unique architectural response. The University of Arizona College of Architecture has developed an international reputation for its specialized program of study emphasizing the design of appropriate built form within this arid lands context. That reputation has been created by unique individuals drawn to the desert to practice their architecture and share their knowledge and sensitivity of the desert with the students in the design studios.

Represented here are three of these architects and an individual work exemplifying their own unique philosophy and relationship to the desert in which they live, design, and build. Each is different in approach and offers a wealth of creativity in response to the insensitivity typical of much of today's current architecture.

Integrating elements of climate, landscape, and culture are objectives of architect Will Bruder.

Will Bruder (Platt Residence, Maricopa County, Arizona, 1977-82)

For me, architectural regionalism is about creating a harmony and energy between a natural environment and a man-made environment. Regionalism is about creating an architecture that celebrates and integrates the elements of climate, landscape, and culture that are unique to a place. On one level, regionalism is about something small like a neighborhood or a city, or maybe a place as big as a region like the Southwest. But for me, regionalism is about a person's responsibility not only to one's intimate sense of place but [to our] sense of . . . place in the world community in the time we are living. As an artist, I want to solve problems in ways that are timely to our cultural and technological maturity as a society, that "push the envelope" of perceived reality like breaking the sound barrier, and that are works of art that become timeless in the quality and substance of the solutions they represent.

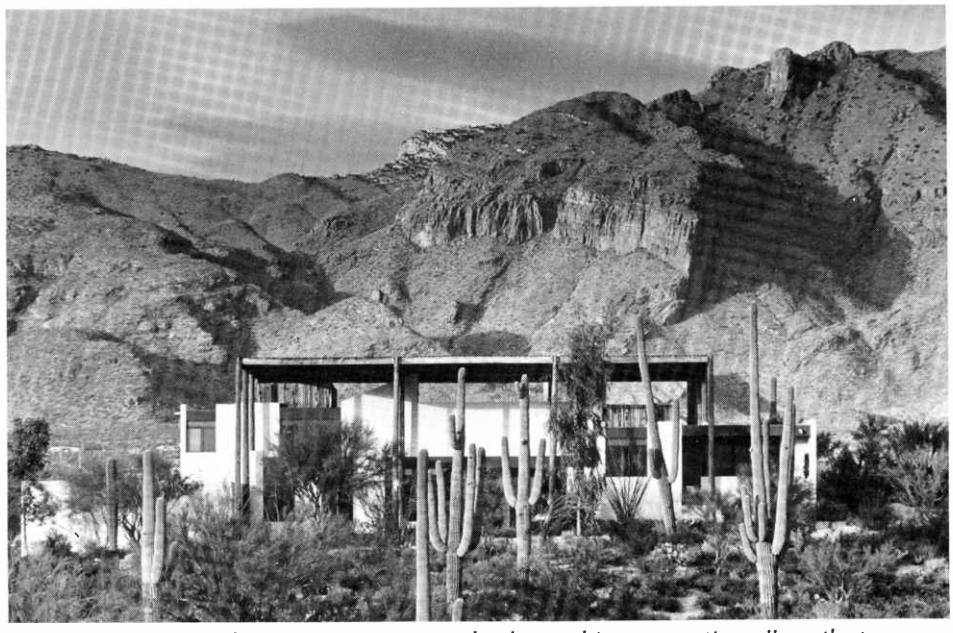
What is unique about this place that is Arizona? The climate, the light, the scale of the land, vast distances and vistas, a sense of adventure and pioneer spirit, a lifestyle that is friendly and casual. A very open client attitude, a sense of tradition, but a flexible young place willing to make a bold statement about its specialness. These are all aspects unique to Arizona—yesterday, today, and in the future.

Our built environment has its roots in the land—Indian stonework, Spanish mud adobe, the simple architecture of the historic mining industry. We have two great architectural role models, Frank Lloyd Wright and Paolo Soleri, who really understood and understand Arizona and the great region called "Earth," which they celebrated and celebrate in all their work. I am also very inspired by the often poetic simplicity and grandness of engineering feats exercised to harness this truly powerful place called "the desert." The Central Arizona Project canal under construction and an attempt at flood management on a desert river are both bold sculptures and statements of function and our time to learn from!

(Excerpt from *Local Truths: Ideals and the Modifiers of Place!* ASU Symposium, 1988)

Judith Chafee (Ramada House, Tucson, Arizona, 1980)

As the air in the valley is warmed, it rises up the hillside and under the shade of the Ramada House. The use of a ramada, which allows the passage of air through it is ancient in this region. In this case, however, the scale is relative to huge shade trees that do not exist here. The house is in two parts: the shade structure and the masonry house, scaled to relate to



The use of a ramada has ancient origins in the desert; this construction allows the passage of air through it.

its neighbors, pueblo-style houses of the thirties and forties. The column spacing of the shade structure is absolutely regular, the masonry forms are flexible and earth-hugging. Some of the now unreasonable mannerisms of the pueblo style, such as piling masonry on top of openings, have been eliminated. The intention of relating to the neighbors is born of politeness, not revivalism.

Here, then, with the ramada and the pueblo-considered masonry is a building easy to promote as new regionalism. Perhaps it is. Our regionalism, to have integrity and to do its job, which is to provide growth for those who use our buildings, has got to be NOW—everything we have learned that can contribute to the appropriateness of our solution in time and place.
(Excerpt from *Art Space Magazine*, Spring 1982)

Larry Medlin (Solar Oasis, Environmental Research Laboratory, University of Arizona, Tucson, Arizona, 1987)

Historically, an oasis is a green and fertile area surrounded by aridity and barrenness that has been joint-ventured by humans and natural forces. A limited supply of water is carefully collected and used to generate and sustain vegetation, which often includes food crops. This tempers the impact of climatic extremes and creates a benevolent microclimate within which humans place buildings and develop habitable outdoor spaces.

The unique delicacy of the desert ecology is intimately linked to evaporation. In the desert more water is lost by evaporation than falls in precipitation. This results in limited vegetation, limited cloud cover, maximum solar radiation levels, and substantial diurnal swings. These unique characteristics of the desert ecology provide the basis for a way of building and living in the desert that can interact advantageously with the substantial variations in the presence of sunlight, wind, and water.

Reapplication of this ancient concept may be especially appropriate today. In an oasis-like microclimate, buildings can be designed to interact advantageously with the daily and seasonal variations of climate. The large diurnal temperature swing can provide the basis for an environmental control strategy in which the building envelope and surrounding landscape form a "selective filter" to take favorable advantage of the energy forces of nature. For the winter the building envelope is designed to collect and store solar radiation during the day. At night the envelope is closed to form an insulated blanket and the interior space is heated by re-radiated solar energy. For the summer, the process is reversed. On hot days the insulated envelope is closed, openings are shaded and the building is evaporatively cooled. At night the envelope is opened and ventilated to exhaust heat into the cooler, outside ambient air, and on the typical evening with limited cloud cover, for re-radiation of heat to the black body night sky. These processes prime interior spaces with coolness, which tempers heat buildup the following day. The design of a building envelope as a "selective filter" will facilitate opening the building to the exterior. During the frequent spring/fall periods of moderate climate conditions, summer evenings and/or winter days, this will enable direct climate interaction between indoors and outdoors.
(Excerpt from *Arcus*, Issue 6, 1984)

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Architecture, Modernity, and Preservation: The Tower House of Sana'a, Yemen

Richard Brooks Jeffery

The Yemen Arab Republic is located on the southwestern tip of the Arabian Peninsula in an area the Romans called "Arabia Felix" because of its lush fertility amidst the surrounding desert. Yemen is a land of geographic extremes: harsh coastal plains, rugged mountains, and austere plateaus, whose history of human settlement traces back 3,000 years. The severity of the resulting geography and a recent history of xenophobia, dictated by Imamic rule, provide keys to understanding the Yemenis' remote isolation as well as their need to build in order to survive.

Within the context of regional variations, Yemeni architecture can be defined by the geographic features from which the indigenous materials are taken. In the coastal plain, reed, mud, and coral stone are used. In the mountainous regions, stone is the most predominant building material. In the high plateau areas, both local mud and nearby imported stone form a hybrid of construction materials. All Yemeni buildings exhibit superb craftsmanship in a tradition of mud and stone masonry that has been maintained for centuries.

On the central plateau lies the capital of the Yemen Arab Republic and one of the oldest cities in the world: Sana'a. This dense, walled city projects the urban character typical of traditional Arab cities and contains many building types unique to Southern Arabia. The most striking of these is the tower house, which looms above as one walks through the narrow, winding streets of the old city.

Most tower houses are at least five stories high, and some reach as many as eight or nine. Their origin lies in the remote villages where farmland was scarce and verticality was the only means of accommodating the settlement of people with efficient use of the land. Height also provided the necessary overview to protect a settlement and its crops from marauding tribes.

That tower houses existed during pre-Islamic times is proven by the historical accounts of the Ghumdan palace, built in the third century A.D. and later destroyed in the seventh century. It was described as a grand palace, as tall as 20 stories, with each wall built of different colored stone and including a top room with an alabaster ceiling and windows built of marble, teak, and ebony.

The vertical arrangement of these multistoried houses represents an upward transition from public to private space. The ground floor and its mezzanine are reserved for animals and the storage of timber, fruit, and grain, as well as a small compartment for the collection of dry excrement from the bathrooms above.

The second floor is the first habitable level and also where visitors are received in the public sitting room, or *diwan*. This room is usually rectangular in plan and furnished in a manner typical of almost all Yemeni rooms, whether they are used for eating, sitting, sleeping, or all three. The walls are fringed with a continuous seat of cushions, leaving a narrow carpeted area in the center and a space next to the door for the removal of shoes. The windows have low sills, to accommodate a seated position, and consist of two sets of openings. The lower window is for ventilation and is controlled with shutters, and the upper opening is an arched or circular transom window that allows light to enter even when the shutters are closed. The transom window is made of either a thin piece of alabaster, called *qamariya* (meaning "of the moon"), or colored glass set in a delicate tracery of gypsum, called *takhrim*. The translucency of the *qamariya* emits a soft amber light, while the colors and pattern of the *takhrim* transmit a joyful play of light on the interior walls. The walls of the room are articulated with niches and high shelves made of unreinforced gypsum plaster on which personal articles are placed.

On the third floor is the main family *diwan*, reserved for special ceremonial occasions such as weddings, births, and

Window tracery, made by special craftsmen, adorns internal surfaces of many Yemeni homes.

The tower houses of Sana'a are a hybrid construction of stone and baked brick.

funerals. Above this level are additional semiprivate rooms and the kitchen, usually located one level below the top to accommodate service to both upper and lower levels. Here the women have their primary domain. Though they are not restricted within any part of the house, it is this level that contains the kitchen and an adjacent outside terrace with high screened walls, from which the women may see without being seen from the street or other houses. The kitchen is usually smoke-blackened from the bread ovens being fueled by wood, whose smoke escapes through the vents that pierce the outside wall.

The highest level, dominated by one private sitting room called the *mufraj*, is reserved for special guests or family members. Here, the afternoon social gatherings are held, usually between men, where they smoke the water pipe and chew *qat* while exchanging conversation, reading poetry, or listening to the music of the Yemeni *'ud*. The *mufraj* is the most decorated of the rooms. It provides magnificent views as well as the play of colored shadows of the walls cast by the stained-glass *takhrim* windows above, increasing the delight during the afternoon *qat* session.

A central staircase, rising throughout the height of the house, provides the central stability around which the structural distribution of the house is supported. The thermal capacity of the stone and masonry walls produces a thermal lag, which tempers the extreme day and night temperatures. Ventilation is provided throughout the house by means of projecting masonry cooling boxes (*shubaq*) positioned within the walls of the staircase and lobbies of each floor.

The facade of the house, showing similarity to textile or jewelry designs, seems to pay little attention to the adjoining facade, either in alignment or proportion. Yet the innate aesthetic sense of the Yemenis leads to an unerring contentment of spatial relationships. Interior proportion appears to be of importance to Yemeni builders. Significant modules, such as the cross section of the *diwan*, are based on a square, with its length being two or three squares in plan. Orientation is also considered important, in that any house facing other than south is said to be less than a full house.

The tower houses of Sana'a are a hybrid construction of stone and baked brick. The foundation walls are approximately 45 cm thick, composed of facing stones inside and out and a center core of clay plaster and rubble. Crosswalls are constructed of rough rubble and connect to the outside face of the external wall. The areas created within the crosswalls are based on the module of a 3-m timber member for easy floor spans throughout the height of the house. Brickwork begins between 3 and 10 m above ground level, the weight and flexibility of bricks making them more suitable for the construction of the large openings that appear in the upper walls. Wooden bands run around many of the houses, providing a tensile girdle for the stone and brick walls.

Window tracery (*takhrim*) is made by special craftsmen, though much of the finest work in plaster window tracery was done by the Jews before the mass emigration of 1949-50. Tracery patterns are hand drawn on slabs of wet gypsum plaster, and the inner pieces are cut out, leaving spaces for the colored glass. A second slab, whose pattern is traced from the first, is laid on top. Finally, a second, glassless tracery of a different design is placed on the external wall, creating a fanciful play of patterns on the inside and leaving the exterior surface devoid of color. Gypsum plaster is also used as a decorative form on internal surfaces. Intricate plaster wall reliefs are often found in the *mufrajs* of many tower houses, some professing verses from the *Qoran* in extravagant calligraphy.

The vertical arrangement of the multistoried tower house represents an upward transition from public to private space.

Exterior ornamentation of the tower houses is quite elaborate and often resembles patterns of latticework, jewelry, or textiles. Stars, snakes, and naturalistic elements appear often, though now much of such decoration represents modern themes such as cars, planes, and weapons.

Doors are also a source of decoration, containing wood fretwork and pounded metal door knockers. Traditionally, door frames carry intricately carved inscriptions as an expression of the symbolic importance of the threshold. An interesting modern phenomenon has been the introduction of metal doors to Yemen, which have all but replaced the traditional carved and painted wooden doors. Metal doors with intricate wrought iron patterns and bright colors are externalizing the delight formerly reserved for private interior spaces.

Modernity

Since the 1962 civil war, the face of Yemen has changed drastically. The previous lack of modern development made Yemenis aware of the ever-increasing need for modernization, and they embraced it wholeheartedly when it arrived. Along with modern amenities such as public services, cars, and foreign consumer goods, change brought massive urban migration, traffic, litter, cheap foreign construction materials, and an obsession to become a modern state even at the expense of traditional culture.

People abandoned buildings in Sana'a's old city and moved into comfortable modern villas in the suburbs where new development was sprawling to meet the demands of a

population explosion. Much of the commercial activity vital to the old city has left the market area. The importation of cheaper goods has caused many of the traditional crafts, along with their shops, to disappear. Buildings of the old city have fallen into disrepair because the need for annual maintenance is often disregarded. As a result, a new generation of builders lack the necessary skills to repair traditional buildings and consequently substitute modern and often inappropriate techniques.

Preservation

In 1984, UNESCO and the Yemen government established the "Campaign for the Preservation of the Old City of Sana'a," with the goal of preserving the architectural heritage of the old city. Those who initiated the campaign recognized the need not only to preserve and repair but also to revitalize the traditional way of life, which means creating centers of training for young workers while there are a few remaining masters of old building techniques still alive. In addition to architectural concerns, the campaign also includes social, commercial, educational, and economic projects. Financing is provided by the Yemeni government with the continued help of foreign aid.

Through the efforts of this campaign, the international community has become aware of the need for a cooperative effort to preserve Sana'a's unique architectural heritage from the accelerated modernity overtaking all aspects of Yemeni life. While the international community is keen to implement its preservation ethic in Yemen, Yemen itself has yet to complete its infatuation with technology as an expression of modernity.

Reappreciation of traditional values, as defined by preservation ethics, is a cyclical phenomenon whose time has come in many parts of the world. As much of the world was once infatuated with technology as a modern savior, many developing nations were introduced to these ethics in the name of foreign development. Though the introduction of

Yemeni architecture can be defined by the geographic features from which the indigenous materials are taken.

foreign development to Yemen has greatly contributed to the destruction of its traditional architectural environment, Yemen has creatively adopted this modern vocabulary to express the symbolic language inherent in all Yemeni art forms.

Yemen is a country whose development is accelerating at an incredible rate. For it to establish a valid preservation ethic, Yemen must be allowed to follow through with its technological expression of modernity. The international community must make itself aware of the overall implications of establishing such preservation programs within the context of current Yemeni culture, so as not to suppress the Yemenis' inevitable quest to catch up with the rest of the world. The danger that exists for Yemen lies not in the importation of technologies to satisfy Yemeni goals of accelerated modernity, but in the importation of ethics that may not be consistent with the country's goals.

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The Courtyard House

Corky Poster

Human settlement patterns have always been closely intertwined with the fundamental economic activities that they support. Thus in the prehistoric period when human beings were nourished by a hunter-gatherer economic system, the form of human settlement was appropriate to that economy: an arms-length migratory pattern aimed at establishing territories large enough to support a family or tribal grouping with the naturally occurring food supply. The less plentiful the food supply, the larger the territory needed to be. The pattern was migratory, moving with the growth seasons and the animal herds, and the house form corresponded to those needs. It was mobile, light, simple, and protective.

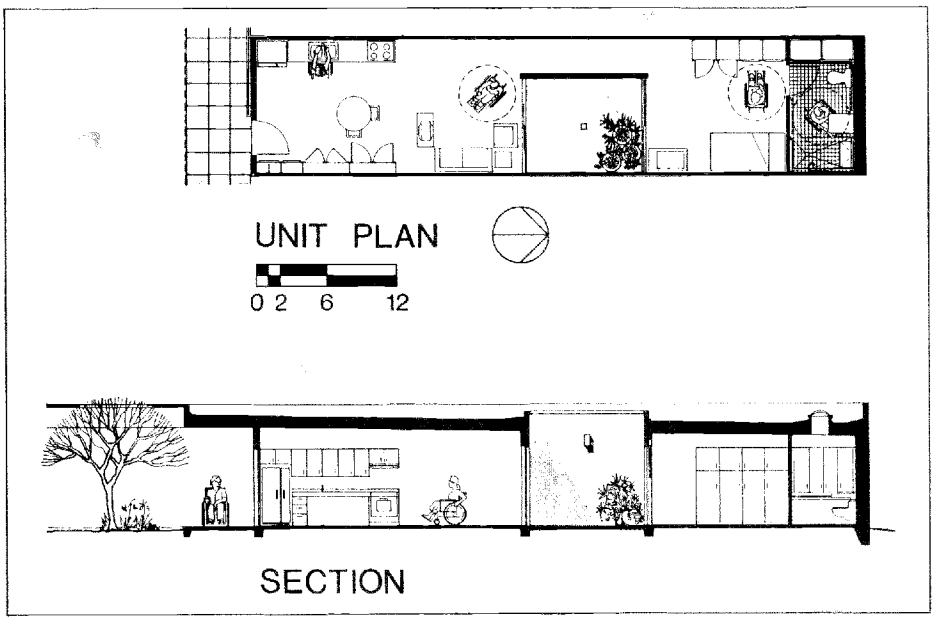
A fundamental change in the economic system—the advent of the agricultural revolution, wherein early humans discovered that they could intervene in the reproductive cycle of edible plants and thus control and manage their food supply—brought a corresponding change to the human settlement pattern. No longer was an arms-length, migratory pattern desirable. Instead, a more sedentary, more permanent form emerged. As agriculture developed further, human groupings were able to produce a surplus of food, and from this single fact grew division of labor and ultimately towns and cities.

These changes occurred most rapidly in very specialized climatological areas. The first urban agricultural centers emerged in areas blessed with benign and year-round growing seasons combined with the ready availability of rivers for irrigation purposes. Major permanent concentrated populations arose, for example, in the Tigris/Euphrates region of ancient Mesopotamia, the desert coast of Peru at Chan-Chan, the Thar Desert crossed by the Indus River in what is now India, and Egypt of the Nile. In all these arid-region urbanized agricultural centers, the *courtyard house* emerged as the basic house form. Today, throughout the arid regions of the world, the courtyard house remains a sensible, satisfactory, and preferred solution.

Schoenauer, in his informative book *6,000 Years of Housing, Volume 2, The Oriental Urban House*, carefully documents the wide range of courtyard house solutions that emerged in such cities as Ur, Monenjo-Daro, Kahun, and Athens, which formed the essential prototype that spread ultimately from the Spain of the Moors on the west to the valley of the Yellow River on the east (1). With Columbus' voyages from Spain to the new world, the house form continued further west and joined and reinforced the indigenous form that had emerged independently five hundred years earlier, from Chaco Canyon in today's New Mexico to the desert coast of contemporary Peru and Chile.

It should be noted that the courtyard house emerged as both an urban and rural prototype. Its key characteristic, however, is not its context but rather that it represents a fundamentally different conception of space from the Northern European house form. In the courtyard house, outdoor space is captured and included in the residential volume and ultimately becomes the heart of its morphology. This is an arid region concept that serves its climate well. In contrast to this, the Northern European prototype uses the house form to distinguish between indoor space and outdoor space and is fundamentally conceived as excluding and protecting the inhabitants from the often cruel and unforgiving climate. Thus a house or a building becomes an object in a field of outdoor space or a figure on a background. Probably the best example of this approach is a North American suburban home: a 40 x 40 ft object sitting in the midst of a 60 x 100 ft lot. The house self-protectively turns in on itself. It represents a compact enclosure of what is indoors; everything else is outdoors.

The courtyard house has a fundamentally different view of the relationship of indoor space to outdoor space. In the patio or courtyard home, the house itself is an interlocking combination of indoor and outdoor spaces that together



The courtyard house is an interlocking combination of indoor and outdoor spaces.

make up the house. More importantly, the character and scale of the outdoor space is not significantly different than that of the indoor space. In a sense, the house is made up of a variety of rooms, some with roofs and others without. The patios or courtyards are simply rooms without roofs.

Courtyard houses provide an ideal prototype for desert communities. In the colder periods of the year the courtyard, if properly oriented, provides a source of sun at the heart of the house, not at its perimeter. By maximizing the number of habitable rooms that face the courtyard, the major portion of the house is afforded an adjacent sunny outdoor space. Even in the desert communities where nighttime winter temperatures reach freezing, the daytime temperatures are sufficiently moderate that this courtyard can become an active and usable living space. It provides a safe outdoor play area for young children and a safe outdoor sitting area for adults and the elderly. In the hot season of the year, the courtyard can serve the same purposes in the morning and evening and, while often hot in the sunny areas during the day, the walls provide a portion of shade on at least some part of the courtyard throughout the day. Overhead shading in the summer can be achieved through deciduous vines and trees or light partial coverings, for example, cloth, palm fronds, or open-weave mats. Courtyard housing has the additional attributes of providing easy and natural privacy, allowing for increased densities without negatively affecting the quality of life, and forming a limited oasis microclimate that can moderate climatic extremes and provide a manageable green space appropriate to limited water resources.

Courtyard housing can produce better desert housing with significant cost savings.

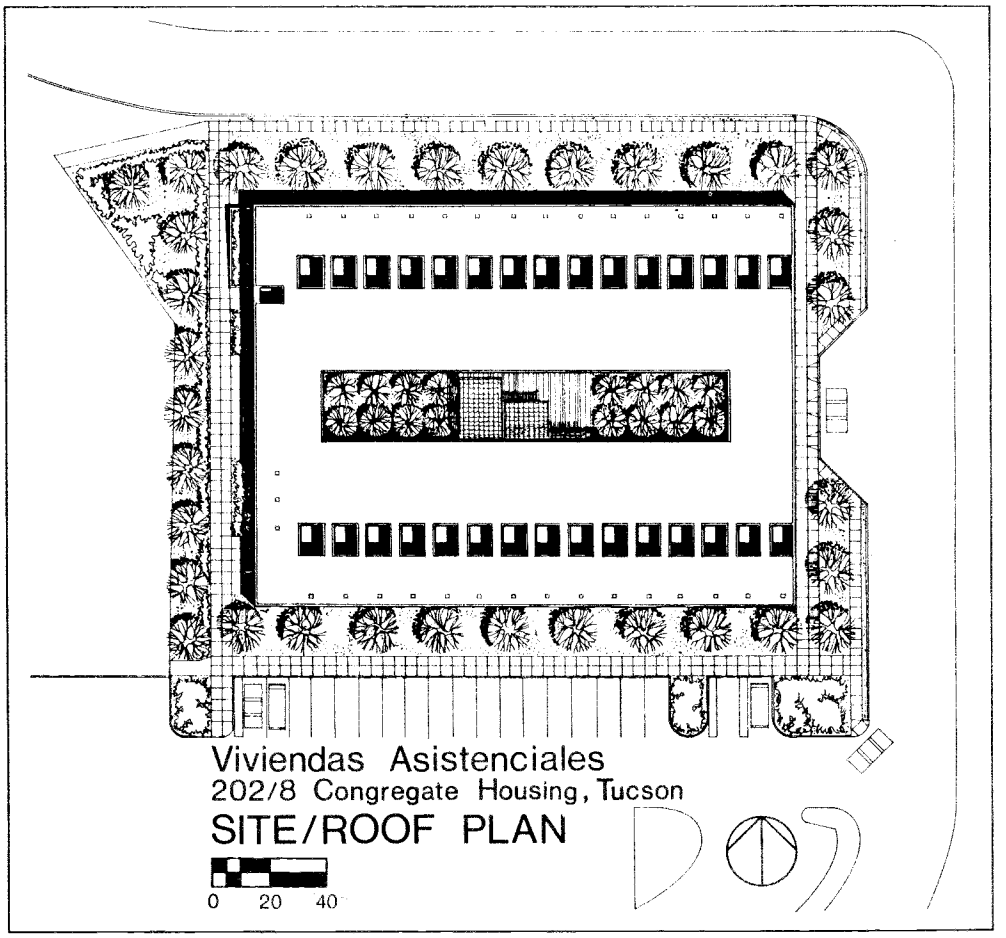
Courtyard housing has economic implications in that it can produce better desert housing with significant cost savings. In the underdeveloped desert regions, the lack of availability of wood or steel products makes it difficult to develop spaces with a structural span of more than 3 m. By making the courtyard the large "room" of the house, one can provide a larger space without the material cost associated with that structural span. Thus a low-cost house could have a central courtyard "room" of 6 m without the associated cost.

This same spatial attitude that creates courtyard houses extends to courtyard cities as well. Urban space, principally streets and plazas, maintains the same relationship to urban buildings and blocks that courtyards have to the rooms of the house, that is, approximately the same size and proportion. Thus outdoor space in a courtyard city is not conceived as an open rambling park but instead is viewed as a contained space with a specific length, width, and height. In the same way that a house is viewed as an interlocking composite of indoor and outdoor space (rooms and patios), the city itself is conceived of as an interlocking composite of indoor and outdoor space on the next larger scale (blocks of buildings and streets and plazas). By the clarity of its edge definition and its scale and proportion, streets and plazas become clearly defined urban spaces that maintain a human scale.

The courtyard house as seen in this photo from Sucre, Bolivia, emerged as both an urban and rural prototype.

What this spatial attitude ultimately requires, of course, is a relatively high-density, low-rise urban form: low-rise in order to freely integrate outdoor space into built space and high-density to properly define outdoor space at a human scale. Outdoor space, by its proximity to indoor space, gets intensive use and consequently earns the right to be designed with the same care as indoor space. The courtyard city becomes a honeycomb of carefully designed indoor and outdoor spaces, with a range in scale from the smallest private patio to the largest public space to accommodate the size and variety of human groupings and activities.

A comparison of densities is interesting. Although we tend to associate only high-rise construction with high densities, a more careful study reveals that not to be the case. In the *Ville Radieuse (The Radiant City)*, Le Corbusier recommends structures of 15 stories and projects a density of 1,000 persons per hectare (2). In the Organization of American States publication *Normas Minimas de Urbanizacion y Servicios Publicos (Minimum Standards of Urban Design and Public Services)*, the Colombian architect German Samper Gnecco develops a low-rise, high-density prototype that also reaches a density of 1,000 persons per hectare but at one and two stories only (3). Peter Land, in his publication



In the courtyard house, outdoor space is captured and included in the residential volume and ultimately becomes the heart of its morphology.

Economic Garden Houses, High-Density Development, develops a vast array of inventive low-rise, high-density schemes, each with extensive private outdoor patio space, which reach densities of up to 600 persons per hectare (4). These results are achieved at only one to two stories with auto parking adjacent to each unit.

Latin America, which is closest in history and climate to the arid regions of the Sonoran Desert, has been developing some new and interesting examples of courtyard houses brought into the twentieth century. A few examples of the most recent and exciting work and research follow.

PREVI (Proyecto Experimental de Vivienda)—Lima, Peru. Between 1965 and 1975 the United Nations, in cooperation with the Government of Peru, built an experimental housing community based on the concept of low-rise, high-density development with courtyard houses. The site was on the outskirts of Lima, Peru, in the center of Peru's coastal desert. An international competition was held requesting submissions for housing and developmental schemes, under the direction of architect Peter Land, United Nations project manager. Ultimately 13 projects from Colombia, Denmark, Finland, France, Germany, Holland, India, Japan, Poland, Spain, Switzerland, the United Kingdom, and the United States, and 13 projects from Peru were selected. Twenty of each design were built in addition to a community center, a kindergarten, and a school. The successful project provides a clear look at new communities based on the low-rise, high-density courtyard house concept combined with the most advanced ideas in low-cost building materials and construction methods.

Chinchorro Housing—Arica, Chile. In the northernmost region of Chile, up against its border with Peru, sits the city of Arica. Situated on the Pacific Ocean in the midst of the coastal Atacama Desert, Arica has a negligible annual rainfall. In the late 1950s the Chilean firm of Bresciani, Valdez, Castillo, and Huidobro designed and developed Poblacion Chinchorro, a community for workers of high-density, low-rise courtyard houses.

German Samper Gnecco, INSCREDIAL, Revisita Escala, and Rogelio Salmona—Colombia. Colombia, at the northwest corner of the South American continent, is now intensely involved in the development of low-rise, high-density development. With the leadership of German Samper, the architect whose work represented Colombia at the PREVI development discussed above, INSCREDIAL (the public housing agency), *Revista Escala* (an architecture and urbanism journal published in Bogota, Colombia), and the architect Rogelio Salmona, great strides have been made in developing the appropriate model for high-density, low-rise development in Latin America.

Tucson Community Development/Design Center (Centro de Arquitectura para La Comunidad). Tucson, Arizona, is an American city that lies on the eastern edge of the Sonoran desert. Its history too is Latin American. From

1540 to 1821 Tucson was a Spanish colony, and from 1821 to 1850 it was part of Mexico. The Tucson Community Development/Design Center is a community-based, non-profit architectural planning and development firm. Its work is specifically aimed at solving the needs of low-income people. Between 1973 and 1983 the Design Center completed a series of projects of courtyard houses based on the low-rise, high-density principle. The *Menlo Demonstration Project* is an inner-city courtyard housing project for low-income families, the elderly, and the handicapped; *11-Mile Corner* is a housing cooperative for farmworkers; *Viviendas Asistenciales* is an apartment project for the low-income elderly and handicapped in Tucson, Arizona, and *Santa Cruz Village* is a similar project in Eloy, Arizona. All four projects are based on the principles of a high-density, low-rise courtyard approach to desert housing.

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A variety of rooms, some with roofs and others without, make up the courtyard house.

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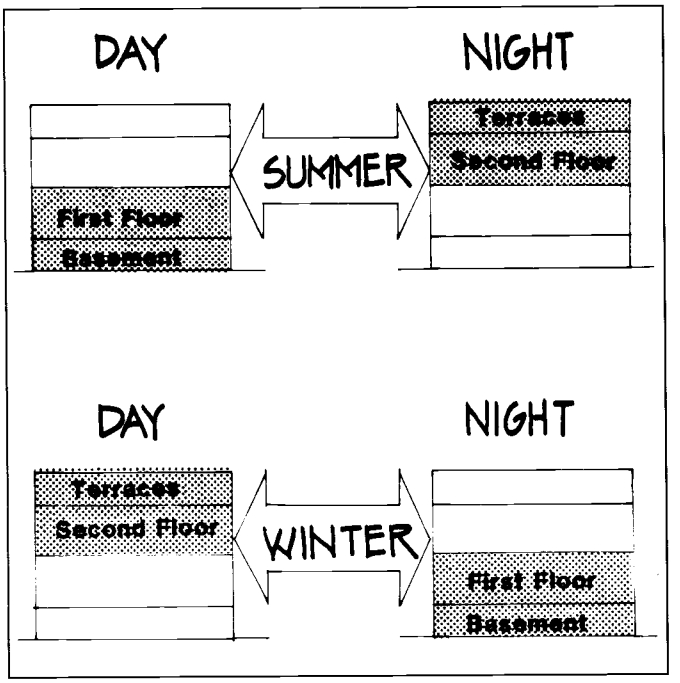
Characteristic Urban Features of the M'zab Valley Communities of Algeria

Khalifa A. Solieman and Kenneth N. Clark

In the seventh century A.D., a group of Muslims known as Ibadis established a set of communities in the M'zab Valley of southern Algeria, located on the northern edge of the Sahara. The Ibadis of M'zab isolated their communities to ensure security and to insulate themselves from outside influences. As a result of their geographical and political isolation, the planning and architecture of this independent group devoted to Islam demonstrate a unique response to religion, topography, and climate.



Daily usage of M'zabite home illustrates movement between day and night in summer and winter.

The M'zab Valley communities exhibited a consistent overall urban pattern consisting of three elements: fortified winter towns (*ksars*), summer towns in the valleys (*wahat*), and cemeteries. The basic arrangement of these communities followed the terrain: the white buildings of the *ksars* were laid out on high ground, the valley contained palm groves that sheltered the summer dwellings, and the desert areas contained the cemeteries. Each *ksar* (winter town) had its corresponding *wahat* (summer valley town) where M'zabites spent hot parts of the year. Most of the population moved seasonally between the sunny urban areas on the hill and the lush shady cultivated areas of the valley.

Traditional Urban Features

The urban layout of towns such as Ghardaia, Beni Isguen, and Melika, exhibited the basic elements of winter towns: the mosque (*masjid*), the Friday mosque (*Azzaba masjid*), the neighborhood (*ashira*) the open market (*suq*) and fortifications (walls, towers, and gates). In contrast the elements of the corresponding summer towns were palm orchards divided into neighborhoods surrounded by circulation walls with towers that defined ownership of the irrigated areas and ensured the privacy and protection of summer courtyard houses. Irrigation and the cultivation of dates formed the economic base for the winter towns. Cemeteries—the third element of M'zab settlements—were located on unusable land; each was connected to certain neighborhoods of the town.

Characteristic urban features of seventh-century M'zab communities included a network of wide streets and narrow alleyways designed for pedestrian and animal circulation. The wide streets connected the major community facilities; the *Azzaba masjid* and *madrasa* (school) in the centermost area of the *ksar*, public open spaces such as the *suq*, the cemeteries, and the summer valley town. Alleyways were used as passageways for pedestrian traffic, starting from wide streets and ending with cul-de-sacs. These alleys tended to follow the contours of the land and often were sheltered by the two-story houses, creating welcome shaded passageways in the Sahara sun.

To fortify the old city, a series of heavy walls protected the ksar with towers and gates located at strategic points. This allowed the M'zabites to selectively close off the town during times of exterior siege or internal strife. Even today, strangers and visitors to the town are required to leave the ksar at sunset, unless they are accompanied by a resident.

The M'zabite Superimposed Courtyard House

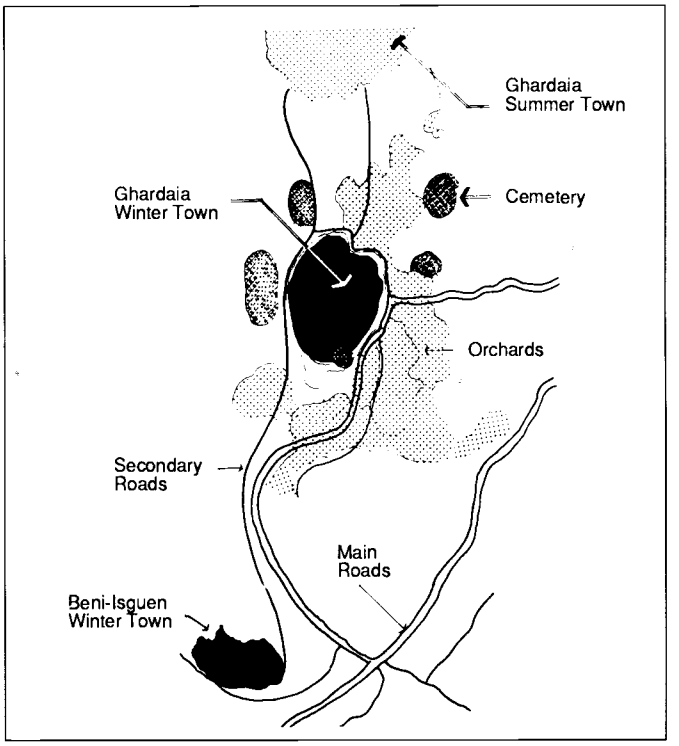
The traditional M'zab house consisted of four different levels: ground and entry floor, upper floor, roof terraces, and basement. The ground floor contained the main spaces in the house: the entry, central room (roofed courtyard with small lightwell), family living room, kitchen, and multipurpose room. The central room was used for family interaction, children's play areas, and for weddings and festivals. It was also used for daily activities such as sleeping, cooking, eating,

and weaving. The family living room was used mainly for family activities or for receiving female guests. Parents and children used the multipurpose room for sleeping, as well as for storage and animals.

The upper floor had a more open courtyard and contained male guest rooms, bedrooms, storage rooms, and other multipurpose spaces. This floor was usually reached by covered stairs and was connected to the neighboring house by a wall opening which facilitated socializing between female members of M'zab families.

The roof terraces contained many spaces divided by partitions for various summer family activities such as sleeping and sitting at night. The terraces were always reached by an open staircase. Underground floor spaces also contained main family spaces used in the summer day for activities such as sitting and sleeping.

Thus, the traditional M'zab house allowed residents to enjoy life in the open air and also live securely in a confined area completely protected on all sides. This type of setting maintained the privacy of domestic life in accord with the Muslim way of life, M'zabite sociocultural values, and the severe environmental factors of the desert.



Visual organization of Ghardaia, a M'zab Valley community.

Contemporary Factors

Much new housing in the M'zab Valley has been built using contemporary construction methods and materials in the European form of apartment blocks. However, some of the houses built outside the walls of the *ksar* still adhere to the courtyard as the central focus, while allowing many modern conveniences into the structure.

Perhaps the most difficult aspect of modern life is the automobile, whose presence in the M'zab has significantly altered the proportion and use of open space. Recent planning and architectural innovations were mainly the result of the French colonization of Algeria and the recent exploitation of Saharan oil resources. At the same time, the M'zab was also subject to a very high rate of population growth and necessary expansion of the urban area.

As a result M'zab communities, which were traditionally controlled by the people who worked and shared ideas collectively, have now come under many outside influences, functioning through the authority of the municipalities, instead of the strictly independent Islamic community. The primary issue today is how to integrate these new developments into the community's principles and traditions.

This material has been excerpted from **Khalifa A. Solieman's** master's thesis entitled *M'zab Community, Algeria, North Africa: Planning and Architectural Aspects—Past, Present, and Future*. **Kenneth N. Clark** is a professor of architecture at the UA and served as advisor for Solieman's thesis committee. Clark's specialty is the design of arid lands architecture in North Africa, southern Spain, and Mexico.

Toward A Responsive Tohono O'Odham Dwelling

Richard G. Brittain and Matts A. Myhrman

This article introduces the Tohono O'Odham, some characteristics of their desert climate, and some of their desires for a more responsive architecture. Specifically, we are describing an ongoing process of getting to know them and one project, the Baboquivari District Office. Our general goal is to help the Tohono O'Odham build for themselves and respond to the following conditions:

- the tendency for Federal money spent on Indian housing to go to non-Indians as payment for materials and contracted services;
- the tragic scarcity of job opportunities on the Reservation and, in particular, a lack of satisfying, creative, constructive work with a visible product that the creators can be proud of;
- the preference of many Tohono O'Odham for a dwelling that, although modern, comfortable, and energy-efficient, reflects their cultural heritage and the desert in which they dwell.

Tohono O'Odham

The Tohono O'Odham, the *desert people*, recently reestablished their ancestral name after many years of being known as *Papagos*. They reside in a portion of the northwestern Sonoran Desert. Their ancestral homelands bridge the international border of Mexico and the United States; however, in 1916 the United States defined for them a four-part Reservation of 4,462 square miles in southern Arizona. Recent estimates approximate the tribal population on the Reservation to be between 7,500 and 12,000 with about 2,000 living in Sells, the largest community.

Their land is the hottest of North American deserts. Hot summers, cool winters, extreme diurnal temperature fluctuations, low humidity, high evaporation and a biannual rainfall pattern dictate strategies for maintaining human comfort. At Sells mean daily temperatures range between 72°F to 101°F in July and 36°F to 65°F in January. Water evaporation from an open tank can exceed 6 ft annually. Sells receives a yearly precipitation of about 12 inches with approximately the same amounts falling during the winter and summer rainy seasons.

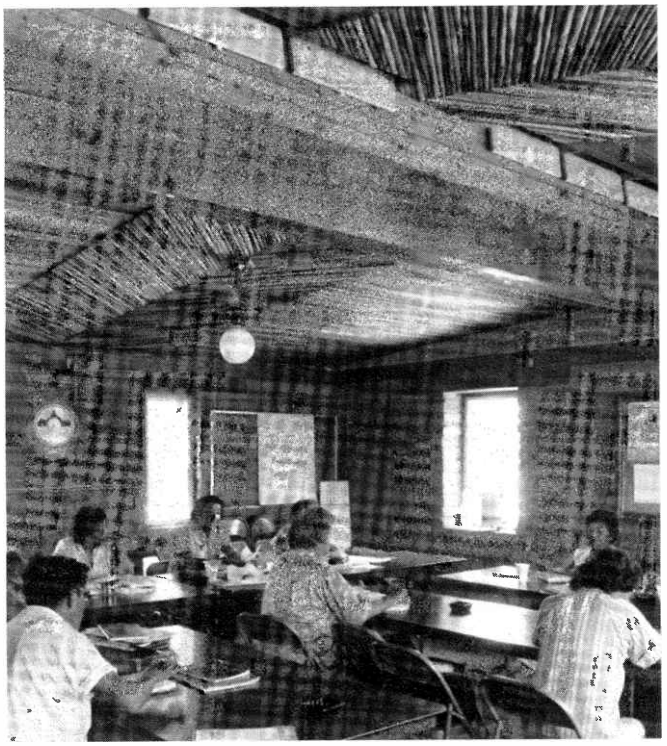
Contemporary Housing Preferences

Beginning in 1976, a number of activities occurred that produced information about Tohono O'Odham preferences for housing. The first was initiated by Father Richard Purcell, then priest at the Covered Wells Catholic Church on the Reservation. His informal interviews with Tohono O'Odham revealed a strong preference for certain aspects of traditional earth houses (1). His interviews elicited such statements as:

> ... I think it's a good idea to ask us Papagos how we want our house and not just build something the white people like. Maybe we like something different than they do. For my house I always want to have it like the way we are supposed to have it in our way. I want my kitchen to be in another place away from our sleeping place, yes, like two different buildings, but close together and with the watto (shade) in-between to kind of hold them together.
>
> ... We need to have a cooking place in one house and a sleeping place in another house. It's not good to sleep and eat in the same place. And you shouldn't put your toilet too close to your house like they always do in town ...
>
> ... The only kind of house I want is one made out of shampt (adobe). That's the best kind. And I like it to have cement on the outside.
>
> ... I don't like that new house we got now. It's too big, and it's all cement walls and floors. It makes us sick to stay in a house of cement. It gives us colds in the wintertime. And that gas for the heat is bad for us Papagos, too. It makes us get a headache. I guess wood is the best thing to use in the stove. The beans just won't cook on that gas.
>
> ... But in my new house I want a special little place in one of the rooms for my saints ... I don't like them to be just on the dresser or someplace like that ... Yes, something built into the wall like that is what I want and I always want to cook on a wood stove and use wood fire to make the house warm.

Author Brittain, then a graduate student in the College of Architecture at the University of Arizona, became involved with the information gathering process in 1977. At that time, representatives of the Tribe, including then Tribal Councilman Ed Kisto, requested assistance from the College in developing alternatives to the Federal Department of Housing and Urban Development (HUD) program. These Tohono O'Odham representatives described several problems associated with the program, many of which were later identified in a report for HUD by the Papago Planning Department (1978) (1):

> ... the image created by the houses was inappropriate—they didn't look like they belonged in the desert or to a Papago;
>
> ... the housing was too costly to be paid for by those who most needed it and cost too much to heat and cool;
>
> ... only the needs of people living in, or willing to live in the larger communities were being addressed;
>
> ... the replacement of owner-built traditional



The Baboquivari office complex is cooled entirely by ceiling fans, vents, and operable windows. Vents are located low on the north side of the building to allow cool air to enter the building and at the high point of the roof to allow hot air to escape. The use of saguaro ribs, a traditional material, reflects Tohono O'Odham preferences for building materials.

housing by contractor-built housing meant the loss, to the extended family, of the benefits of working together on such a project;

... traditional Papago values like sharing, equality, and not standing out as better than your neighbors are undermined by the sharp contrast between expensive federally-subsidized new homes and the traditional low-cost owner-built adobe homes;

... of the millions of dollars spent to construct HUD housing, none of it had entered the Papago economy. The money had all been used to stimulate the Anglo construction industry through purchase of materials and services off the Reservation.

In response to this request for assistance, a number of day-long meetings were held at Ed Kisto's ranch with Tohono O'Odham and Anglos to discuss Tohono O'Odham housing preferences and develop tentative design concepts for a responsive dwelling. Additional resource persons were then consulted; written and photographic resources related to traditional houses also were reviewed. Next, Kisto and Father Purcell arranged tours of several villages so photographs and measurements could be taken of existing structures with the desired design features or qualities. Conceptual drawings and a scale model for a prototype dwelling were prepared by Brittain. These materials were shown to various groups and individuals, with their comments and suggestions recorded for later use in refining the design. The value of the three-dimensional model for communicating design concepts to Tohono O'Odham became clear during this stage.

At this point, however, the process came to a temporary standstill. Funding was not obtained for the actual construction of a prototype dwelling. Ed Kisto began to explore with the Baboquivari District Council the possibility of building a district office using sun-dried, asphalt-stabilized adobes produced in the village of Pisinimo. Although such a building would not be a residence, it could incorporate certain aspects of the prototype dwelling and demonstrate that a Tohono O'Odham crew could build with adobes made on the Reservation an energy-efficient, passive solar building.

The Baboquivari District Office Complex

A decision was subsequently made to proceed with the project, and the authors were asked to prepare an initial conceptual design and model. We felt strongly, for several reasons, that adobe was the appropriate material for the project:

- Stabilized mud bricks were being produced on the Reservation.
- Adobe would provide the required thermal mass for a passive solar design.
- The construction team to be assembled for the project would probably already have experience laying adobes. If not, these skills could be learned easily, something not true of the skills required to lay concrete block or do frame construction.
- The aesthetic fit with the desert and traditional architecture was good.

"I think it's a good idea to ask us Papagos how we want our house and not just build something the white people like. Maybe we like something different than they do."

◆ In terms of the demonstration value of the building, it would make sense to build with a user-friendly material, one appropriate for owner-builders.

◆ Very little maintenance would be required for the exposed adobe walls.

Meetings with the District Council and with Ed Kisto provided additional information about such things as proposed uses, space requirements and the preference that restrooms be in a separate building. An initial design and a cardboard model were subsequently presented to members of the Baboquivari District Council at two of their regular day-long meetings in July and August of 1981. Ed Kisto and Madelaine Sakiestewa, chairperson for the District Council, provided translation of the authors' presentation into Tohono O'Odham and of comments made in Tohono O'Odham into English.

Following these meetings, changes were made in the design until consensus was reached that it was right for the people and for the place, a site just southeast of Topawa, at the junction of the dirt road leading to Baboquivari Canyon. The building was laid out in true scale on the site using saguaro ribs and stones as markers. After the Council had walked around the site and experienced the proposed design, adjustments were made in location of the building and certain dimensions. Again, the value of using something other than normal architectural drawings to convey the proposed design became evident.

Our commitment to significant client involvement in the design process dictated patience and a pace geared to "decision by consensus." These were essential to the validity of the end result and to client perception and acceptance of the actual building. The time was well spent.

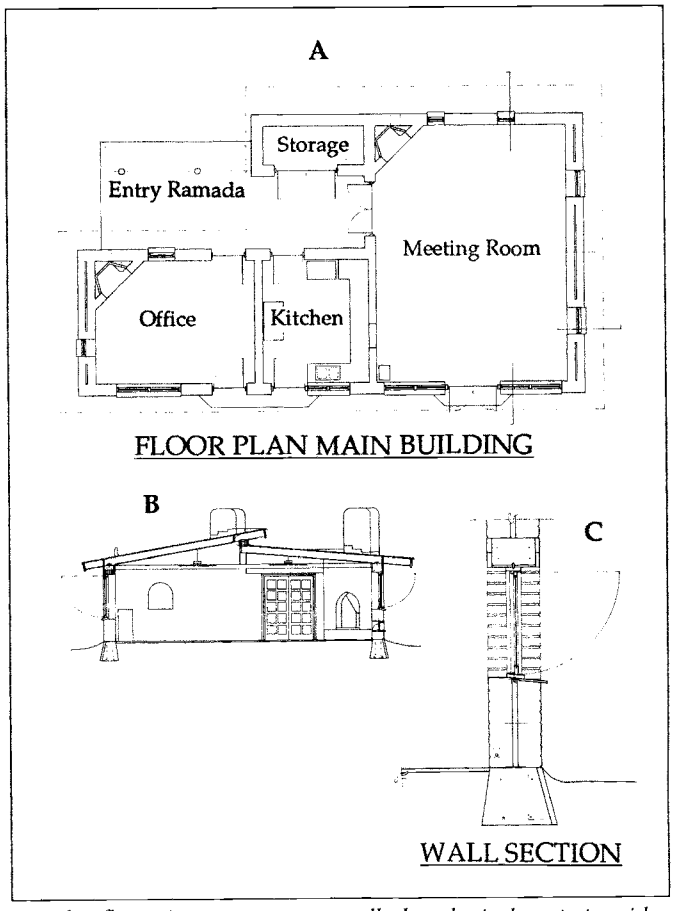
Actual site preparation and construction began in November 1981 with Ed Kisto functioning as overall project manager. Since the job was too small to justify a foreman solely for supervision, the authors shared this role with Ed Kisto and a Tohono O'Odham member of the crew, Simon Lopez. Tribal labor came primarily from Topawa, the small village just north of the building site. The building was ready for use in January of 1983.

As in a traditional rancheria, the arrangement of the separate structures is loose and informal. The dispersed pattern ensures that neither the ramada nor restroom will shade the solar south windows during winter. Also, the buildings define an outdoor space much used for gathering and socialization. It is almost as if the spaces created between the buildings are as significant as those enclosed.

The floor plan for the main building incorporates an office space, a full kitchen and a meeting room. The long south wall faces 15 degrees southeast and captures early morning sun during the winter months. In addition, this orientation provides views from the east-facing and the larger south-facing windows of Baboquivari Peak, held sacred by Tohono O'Odham as the home of their creator I'itoi.

Climatic conditions at the site make cooling considerations most important. The office utilizes only ceiling fans, cross-ventilation and convective venting but could accommodate evaporative cooling at any time. To date the evaporative cooler has not been added. The overhead fans—two in the meeting room and one in the office—provide the equivalent of natural breezes at a very low energy cost. Also critical in keeping the building cool is the roof overhang along the south side. Its dimensions ensure that the south wall and its glazing are fully shaded during the hottest summer months yet allow full penetration of the winter sun into the structure. Ground cover prevents reflected radiation during the summer.

For heating, the building depends primarily upon direct solar gain through south-facing glass in doors and windows. Storage of the absorbed heat in the brick floor and high-mass wall materials prevents daytime air temperatures from becoming uncomfortably high. At night this reservoir of stored heat prevents the inside air temperature from dropping uncomfortably low. In addition, the effect of radiant energy from the warm floor and walls makes the spaces feel comfortable even when the room air temperature is less than that normally required in a structure of low-mass construction. A total area of south-facing glass equivalent to about 10 percent



A) This floor plan incorporates well-placed windows to provide good cross ventilation; windows on the south side of the building are appropriately sized for passive solar heating. B) The use of a properly sized eave prevents summer sun from entering the building but allows sun to enter in the winter to heat the building; 10-in fiberglass batt insulation above the ceilings is essential to the cooling of the building. C) East and west walls are insulated with 2 in of urethane between two layers of adobe. This prevents heat loss and gain and provides thermal mass on the interior to help maintain comfort.

of the floor area to be heated has kept the building comfortable despite the use of single-pane glass throughout. Open fireplaces with efficient Count Rumford-type fireboxes that use outside air for combustion provide backup heating during especially cold and cloudy periods. Mesquite firewood purchased from local woodcutters replaces nonrenewable fossil fuels that must be purchased off the Reservation. The firewood is used for cooking outdoors. Propane usage islimited to the kitchen range. Hot water for dishwashing is provided by a 10-gallon electric heater under the kitchen sink.

The walls of both the restroom structure and the main building were built using 10 in x 14 in x 4 in asphalt-stabilized, sun-dried adobes made in Pisinimo, about 60 miles from the job site. Transportation charges added significantly to the cost of the bricks, but since the hauling was done by Tohono O'Odham, the money entered the local economy. Stabilized mortar for laying up the walls was mixed on-site using local adobe soil and emulsified asphalt purchased in Tucson.

In keeping with the collective resourcefulness of the Tohono O'Odham, locally available materials were used wherever appropriate. A red and a white flagstone found in the nearby foothills was used to pave the main entry ramada on the northwest corner of the main building. Support for the ramada roof structure is partly provided by two mesquite posts, and a single layer of ocotillo stalks laced together by wires provides the shade covering. A portion of the ceiling of the meeting hall consists of dry ribs from saguaro cacti nailed to the roof joists in a V-pattern. Since completion of the office complex, the District has built a number of traditional brush and wattle-and-daub buildings nearby that are visible from the windows of the meeting hall, with Baboquivari Peak on the horizon. The traditional structures enable the Tohono O'Odham to associate the materials used in the new building with the buildings they constructed in the past.

Ongoing contact with the clients leads us to believe that the buildings at the office complex are performing well. The meeting room is comfortable year-round using only the ceiling fans and fireplaces. Minor problems have required attention, but little unexpected maintenance has been necessary. Landscaping with desert species and the addition of a rustic mesquite post fence have further enhanced the fit of the buildings.

Conclusion

In retrospect, the authors feel that they and their Tohono O'Odham counterparts gained considerable, valuable experience and made real progress toward the Tohono O'Odham building for themselves in a way responsive both to their cultural heritage and their present situation. We view this building and others we have done as the first steps in an uncertain but ongoing process. What happens next depends largely upon the interests and aspirations of key individuals like Ed Kisto who find these initial experiences inspiring. Should the Department of Housing and Urban Development choose to make Federal money available for "unconventional" housing (i.e., housing that does not meet its normal technical standards), the process could take a significant new direction. An ideal scenario would provide Federal money for certain materials and supervisory assistance to families interested in building for themselves with earthen materials. Whatever happens, be it one of the possibilities mentioned here or something as yet unforeseen, we hope to continue our involvement for as long as we are needed.

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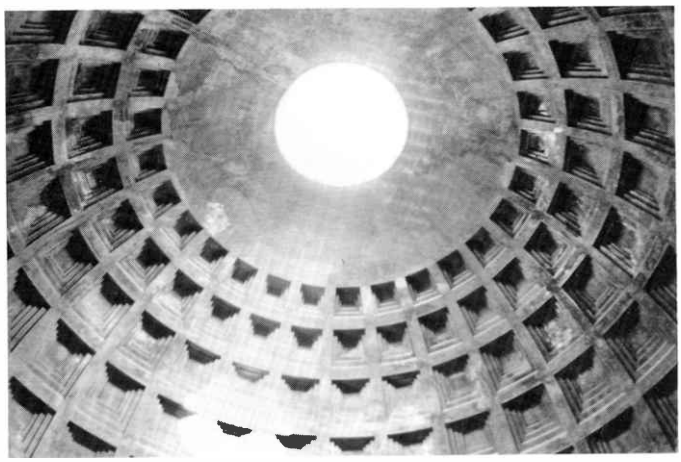
Richard G. Brittain *is a research associate in the UA College of Architecture whose specialty is resource conservation in desert architecture.* ***Matts A. Myhrman*** *is a self-employed consultant specializing in alternative building strategies.*

Daylighting Strategies: Skylighting in Hot Dry Climates

Warren R. Hampton



Although not entirely suited for the conditions in hot dry climates (due to the unprotected skylight), the Pantheon in Rome is a fine example of the integration of daylighting and natural ventilation in a delightful architectural space.

This article might have been entitled "An Alternative to the Well-considered Window." While this author strongly advocates skylighting as a unique and utilitarian form of natural lighting for spaces in hot dry climates, he does not recommend elimination of windows designed for view and ventilation. Windows alone, however, do not provide satisfactory daylighting of deep spaces due to poor penetration and distribution of the illumination within the space; this can result in glare and local overheating. Skylighting in combination with properly designed windows can effectively illuminate deep interior spaces and offers opportunities for natural ventilation.

To allow the penetration of daylight into a building interior requires the architect or lighting designer to evaluate two components of sunlight—the thermal and the luminous. This evaluation should include the analysis of thermal gains and illumination from direct solar radiation, and from diffuse sources such as the skydome and adjacent reflective surfaces including the ground itself. It is important to consider aperture size as a function of light transmission *and* its resultant thermal impacts upon the building interior. Improperly designed apertures can result in overheating of the interior spaces, visual discomfort from glare and unwanted deterioration and fading of furnishings and other materials.

Daylighting in hot dry climates requires an integrated design approach toward energy performance of the building envelope and illumination of the interior. Architectural morphology must respond to passive heating, cooling, and ventilation requirements, and be properly configured to capture and distribute natural illumination effectively and efficiently to the interior spaces. The architect or lighting designer must sensitively apply the design principles for thermal performance alongside those for daylighting and actively pursue the investigation of options using computer simulation and photometric model testing.

The Skylighting Option

The daylighting of architectural space utilizes diffuse light from the skydome, direct beam radiation from the sun, and reflected light from adjacent object surfaces. Daylighting strategies are broadly grouped into two categories: sidelighting and toplighting. Sidelighting uses natural light transmitted through vertical building surfaces; the light enters a space laterally through windows located in perimeter walls. In toplighting, natural light enters primarily through apertures that are part of the roof and are located above the ceiling line. Toplighting strategies include horizontal skylights, roof monitors and clerestories. A skylighting strategy (toplighting) is one designed to capture illumination from the skydome and direct beam radiation and/or reflected sunlight.

Toplighting is a very flexible strategy for daylighting; skylights may be located for *specific illumination* of sculpture or other architectural features, or spaced evenly across the roof for *uniform illumination* of the space below. Lam points out that when utilizing toplighting there is no need to overlight one area in order to get sufficient light for adjacent areas, commonly a problem with sidelighting (1). Interior areas adjacent to the window aperture receive very high levels of illumination that drop off abruptly a short distance into the space which can result in problems with veiling reflections and glare. Reflections from adjacent surfaces can also negatively affect the quality of light available through a window.

Toplighting (as measured by illumination levels in relationship to heating and cooling loads) can be very efficient in low-rise buildings with daylit atria, on the upper floor(s) of high-rise buildings, and in deep residential spaces. A uniform distribution of illumination of the space can be achieved with a minimum glazed aperture.

The sun is the ultimate source of daylight. Daylight received on the Earth's surface is a combination of direct beam radiation and sunlight diffused in the atmosphere. Under the predominantly clear skies of a hot dry climate the total amount of natural illumination received at any location is dependent upon solar position, latitude, and local atmospheric conditions. On clear days, the bright and intense sunlight results in illumination levels on the ground surface exceeding 10,000 footcandles (107,600 lx). For a clear skydome, typical of hot dry climates, the horizon is approximately 3 times brighter than the zenith luminance. The clear

skydome, however, is considered brightest in the region nearest the sun, and darkest 90° away from the sun's position. According to Hopkinson the deep blue sky may have a very low luminance from the horizon up about 30° elevation during the hours around midday, and may consequently be insufficiently bright to act as the principal source of interior illumination (2). As a result, sidelighting which attempts to capture this illumination is not the best solution to daylighting in a hot dry climate.

Intense sunlight, clean atmosphere, and reflective ground surfaces bring about the problem of glare. Glare results from excessive brightness in the visual field originating from sky luminance, light reflected from the natural landscape and/or from man-made features of the environment such as buildings. In hot dry climates, Hopkinson estimates the ground can be 4 times as bright as the sky and as such can be the primary source of glare (2). Windows transmit this glare into building interiors.

In citing historical precedents for skylighting, Lam states that the use of small horizontal openings to provide light and ventilation in thermally massive, vaulted roof structures is uniquely appropriate to the predominantly sunny, dry, desert climate with its hot days and cool nights (1). This combination ensures that the ceiling vault and upper walls will be the primary reflecting surfaces, minimizing glare at eye level.

During both winter and summer conditions, the level of interior illuminance from an overcast sky is remarkably higher than from a clear sky. In a hot dry climate with primarily clear skies, skylighting must utilize either direct beam radiation or reflected sunlight to maintain a minimum roof aperture consistent with the desired thermal performance of the structure. Lam points out that optimizing the performance of toplighting today implies using light indirectly (1). Incoming sunlight must be baffled and redirected to avoid glare and local overheating and to provide the light distribution desired. Lam also states that skylights may be the best option in equatorial locations where their horizontal orientation will maximize collection of the incident sunlight from a high solar altitude. Under similar conditions a very small area of glazing in a deep well can illuminate a large area effectively. The skylight should be no larger than necessary to provide the desired illumination under sunny conditions (i.e., the aperture should be ± 1% of the floor area) (1).

In summary, skylighting offers the architect and lighting designer opportunities for supplementing windows designed for ventilation and view. Appropriately designed skylights direct the light into deep interior spaces and provide better distribution of the light indoors.

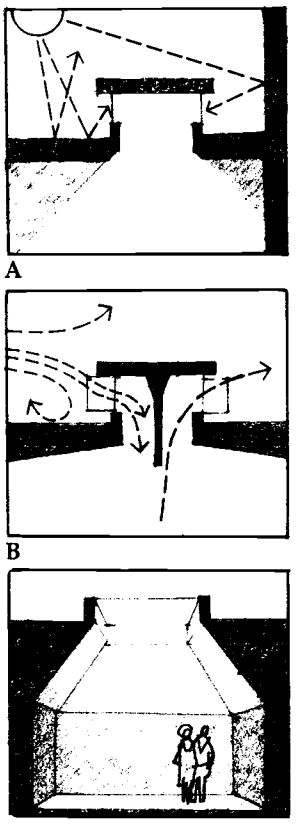
Proper design for daylighting interior spaces requires consideration of both energy and lighting issues. In hot dry climates these lighting issues and energy issues must be carefully integrated and the design responses must be balanced in the final building design. Some of these issues follow.

Orienting Building Masses. Proper siting is an issue that develops from the scale of area master planning down to city blocks, individual lots, and buildings themselves. By ensuring maximum exposure to the south, passive heating and natural illumination opportunities are created. An east/west elongation of the building affords control of solar radiation for both thermal and luminous advantage.

Preserving the Thermal Integrity of the Building Envelope. To preserve the thermal integrity of massive walls and insulated roof structures, penetrations are usually minimized. Fewer, smaller openings result in dimly lit, sometimes gloomy spaces and interior wall surfaces of low luminance. Visual discomfort in the form of glare results when the intense light entering through these openings is viewed in contrast with surrounding wall/ceiling surfaces. The rule must be "minimize the opening while maximizing the amount of daylighting potential."

Reflections from the Roof Surface and Adjacent Building Surfaces. The roof surface surrounding the skylight affects both the thermal and the lighting performance of the building envelope. Massive or thermally reflective materials adjacent to the aperture can reflect both light and heat into the skylight. These factors must be carefully considered when positioning an aperture for daylighting and these reflections must be controlled.

Detailing Openings Through the Roof and Ceiling. Proper detailing of skylight openings can reduce glare in interiors. Contrast grading, through the use of color



A) Sunlight reflected from adjacent roof and building surfaces is an important component of skylighting in hot dry climates.
B) Properly designed skylighting devices can function as windcatchers and/or vents for convective air currents. C) A coffered ceiling is an effective method for distributing light uniformly within a space without creating discomfort from glare.

shading, and spreading the intense natural illumination across a ceiling or wall surface softens and diffuses the light. Likewise, locating skylights next to vertical wall surfaces or in sloped or vaulted ceilings lessens glare. Coffers and lightwells effectively control the entering light.

Softening and Diffusing the Light. Reflecting the rays of the sun from a surface before allowing the light to enter the interior both softens the light and helps to reduce the attendant glare while minimizing heat buildup on the interior. The character of the reflecting surface is crucial to the effectiveness in reducing glare; the surface should be of a matt or diffusing finish and not glossy or mirror-like. The apparent brightness of the reflecting surface should also be considered so that it does not create uncomfortable glare. In hot dry climates reflected sunlight can be a major component of lighting interior spaces.

Tinted Glazing. A twentieth-century solution to the problem of glare is the use of tinted glass. This glass limits the amount of transmitted illumination and therefore controls the differences in apparent brightness between the interior and the exterior. Glare-reducing and low-transmittance glazings also impart a color tint to the daylight; this color tinting can result in an unnatural appearance of the exterior environment. Such glazings are often chosen for their thermally reflective properties with disregard for their light-related qualities. Specialized glazings can offer effective solutions to glare and overheating, but they can also significantly limit the use of daylight in building interiors.

Reflectances of Interior Surfaces. Interior surface reflectivity controls the distribution of daylight within a space. In hot dry climates interior surfaces should be light colored but not so bright as to cause visual discomfort. Hopkinson recommends that full white be avoided in favor of a 70 percent light reflective color (Munsell Value 9) on walls and ceilings to minimize glare (2). Objects and furnishings within the space must also be chosen for their light reflective qualities. Hopkinson recommends a range of 50 to 70 percent reflectance (Munsell Value 7.5-9) for these surfaces (2). The proper design and selection of wall/ceiling and furnishing reflectances will ensure a smooth and even distribution of the light throughout the room.

Designing for Natural Ventilation. Skylighting is a unique opportunity for combining natural ventilation options with lighting. Operating skylights located in the upper reaches of the space can utilize natural convection to remove excess heat. Properly designed and oriented skylights can also serve to catch natural breezes and direct cool air to the interior.

Simulation and Testing. There are many computer programs available for energy performance simulation in building design. Programs that evaluate the thermal and luminous impact of windows and skylights are also available. However, they have not yet reached the level of sophistication to predict the performance of detailed skylight configurations. Model tests performed under actual site conditions remain the best method for simulation and evaluation of skylighting options (3). Due to the extremely short wavelength and speed of visible light, the lighting levels measured within the model will be virtually identical to those in the actual space.

In summary, the design of openings for a hot dry climate requires that window/skylight areas be minimized to control thermal loads on the structure and yet allow for effective lighting of interiors. For conditions in hot dry lands, the Building Research Station in the United Kingdom suggests that a minimum glass area as low as one-sixteenth of the floor area to be lit should be adequate for normal residential buildings (4). To maintain physiological and psychological comfort within a space a high quality of daylight is desirable but the quantity of daylight must be minimized to avoid thermal complications. The primary concerns for natural lighting must be the following: 1) to maximize the amount of daylight penetrating through an opening, and 2) to minimize the effects of heat gain, glare, and deterioration and fading of materials.

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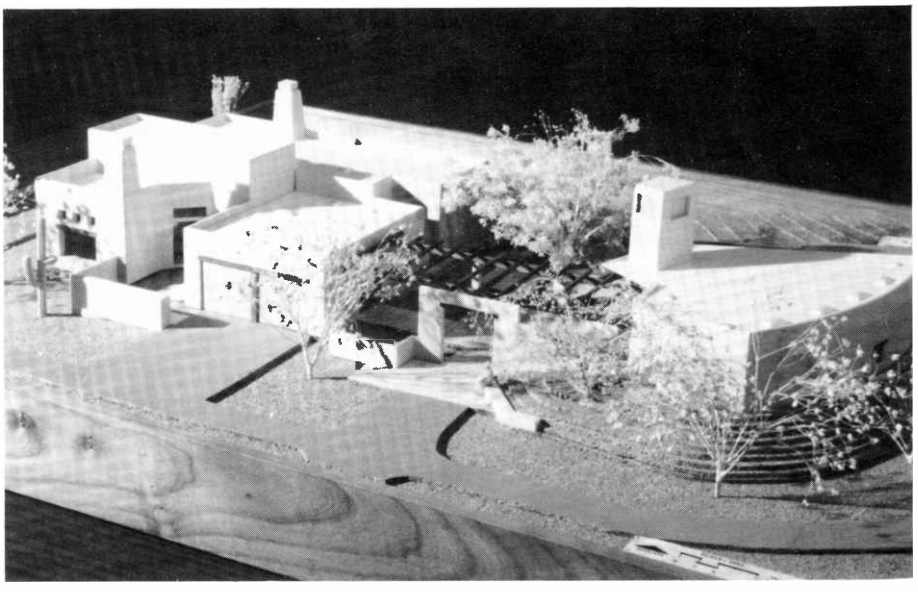
Desert House: Water and Energy Conservation in the Sonoran Desert

Richard G. Brittain and Martin M. Karpiscak

A number of interested parties have joined forces to design and construct a house that will serve as a model of water conservation and energy efficiency for the general public, developers, homebuilders, the business community, and government officials. *Desert House* will be occupied by a family and will have a public demonstration and education center attached. The house is to be located at the Desert Botanical Garden in Phoenix, Arizona. The conceptual design phase has been completed and fund raising has begun for the subsequent phases.

Desert House will demonstrate that water- and energy-efficient features can be incorporated aesthetically and economically into single-family homes without reducing their sales appeal and residents' quality of life. Commercially practical concepts, methods, materials, and equipment will be used in the design, construction, and operation of the house and its landscaping.

Current participants in the project include the city of Phoenix, Salt River Project, Desert Botanical Garden, Valley Partnership (a consortium of development and related organizations in the Phoenix area) and the University of Arizona's Office of Arid Lands Studies and College of Architecture.



Model of Desert House.

Description

Water Efficiency. The water efficiency goal of Desert House is 107 gallons per capita per day (gpcd). Present Phoenix residential water use is approximately 180 gpcd. Features of the Desert House would, therefore, reduce both indoor and outdoor water use by almost 41 percent.

Strategies for water conservation include the following:

Outdoor

Xeriscape landscape design that incorporates the use of:

- low-water-use plants
- efficient irrigation systems with seasonal control and moisture sensors
- contoured yard, patios, and walk ways directing rain to plants
- rooftop rainwater harvesting for direct use by plants or for storage and later irrigation of plants
- experimental graywater reuse for subsurface irrigation

Indoor

- 1-gallon-per-flush toilets using municipal water
- 2.75-gallon-per-minute or less low-flow showerheads
- 1.5-gallon-per-minute or less faucet aerators
- hot water loop
- sewer discharge limited to toilets, kitchen sink, and dishwasher

Energy Efficiency. The energy saving goals are to reduce the overall energy consumption of Desert House and to shift its peak energy demand (i.e., run equipment during evening/early morning hours, 10 pm to noon in summer and 10 pm to 7 am in winter).

The following strategies have been selected to accomplish these goals:

- thermal mass
- landscaping, porches, and outdoor living spaces adjacent to the home toprovide optimum shade for the structure and maximum outdoor living area
- high-efficiency heat pump
- in-line solar hot water preheater
- hot water supply loop to all faucets
- hot water tank and pipe insulation
- cost-effective and energy-efficient appliances
- double-glazed windows/doors
- sun screens
- orientation
- appropriately sized windows and skylights for daylighting and passive solar gain in winter
- vented roof
- insulation

(continued on p. 28)

Desert House (continued)

Education

Desert House includes a public information center featuring an orientation slide presentation, brochures, detailed signs, and scheduled guided tours. User-friendly computers will enable visitors to obtain specific information on water- and energy-conservation aspects of the house, and to explore alternative strategies.

Desert House information brochures will offer simple, practical approaches in a how-to format, emphasizing the positive aspects of water and energy efficiency, its costs, and its application to the visitors' residences.

Project Goals

Desert House is intended to raise the water and energy conservation awareness of builders, landscapers, suppliers, the business community, government officials, and the general public. Through the use of commercially available, cost-effective technologies, the project intends to demonstrate the positive aspects of conservation. Desert House will demonstrate that conservation can occur in an attractive and comfortable residence without major expense or change in lifestyle. It will present ways to decrease overall water and energy use and also demonstrate means to offset peak water and energy use in an urban setting. The project will demonstrate that conservation can occur at both home and community levels with no significant impact upon present lifestyle.

UA College of Architecture research associate ***Richard G. Brittain*** *specializes in resource conservation in desert architecture.* ***Martin M. Karpiscak,*** *a research assistant scientist in the Office of Arid Lands Studies, specializes in water conservation in residential and agricultural settings.*

VISITORS

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James W. Rowe

As director of the Western Hemisphere Cooperation of the American Association for the Advancement of Science (AAAS) and executive director of the Interciencia Association (IA), James W. Rowe travels extensively. Earlier this year his travels brought him to the Office of Arid Land Studies where he shared information on the Interciencia Association.

In the mid-1970s, several associations for the advancement of science in the Western Hemisphere, including the AAAS in the United States, initiated regional cooperation in meeting hemispheric challenges and problems in science and technology. Their efforts to cooperate led to the formation of the Interciencia Association.

Membership consists of national organizations for the advancement of science in Argentina, Brazil, Canada, Chile, Colombia, Ecuador, Jamaica, Panama, Peru, Trinidad and Tobago, the United States, and Venezuela, and the national research councils of Costa Rica and Mexico. The AAAS, the U.S. member, provides the Executive Secretariat.

Interciencia addresses concerns in the following areas: protection and proper use of natural resources, biotechnology, human resources, physical/biological marine sciences, global climatic change, and problems in arid and semiarid lands.

Interciencia program areas include: 1) publication of the trilingual, bimonthly journal *Interciencia*, 2) regional symposia focusing science and technology on practical problems of development such as energy, forests and marine science, agriculture and nutrition, 3) encouragement of new or inactive associations, 4) encouragement of cooperation among R&D institutions on new sources of energy, food and industrial raw materials from plants, and 5) organizing symposia on applications of biotechnology and genetic engineering in Latin America, and publication of a biotechnology newsletter from Costa Rica.

Rowe is well qualified to direct such an effort. He was educated at Vanderbilt, George Washington and Georgetown universities, where he specialized in political and social sciences, international law and relations, and Latin American studies. After being named a Fellow of the Institute of Current World Affairs in 1961, Rowe lived and taught in Argentina and Brazil, and traveled throughout Latin America. He has been a visiting lecturer at more than a dozen U.S. universities, and is the author of over thirty articles or monographs on Latin America, as well as a contributor to several books and encyclopedias. Articles he has authored have appeared in the *Washington Post* and various journals including *The Reporter*, *The New Republic*, *Problems of Communism*, *Interciencia*, and *Science*.

Since 1974 Rowe's professional efforts have centered on improving communication and cooperation in science and technology in the Americas. He is co-founder of the journal *Interciencia* and the organizer or co-organizer of more than 30 inter-American scientific symposia in 10 countries.

For further information on the Interciencia Association write:

Interciencia Association
c/o American Association for the Advancement of Science
1333 H Street, NW
Washington, DC 20005
Telephone: 202-326-6650
Cables: ADVANCESCI
Telex: 248-933-SCIEN-UR

Anne de Lattre

For the past 20 years, Africa's Sahel has been battling conditions imposed by severe and recurring drought. The Club du Sahel is a group formed to coordinate responses to these conditions. The organization promotes regional programs to develop water resources, transport, communications, livestock and agricultural productivity, and reforestation.

Members of the Club du Sahel held their annual meeting in Tucson, Arizona, December 13-15, 1988. Co-hosted by the University of Arizona and the U.S. Agency for International Development (USAID), this was the group's first meeting in the United States.

Club director Anne de Lattre visited the Office of Arid Lands Studies and offered insights on the objectives and activities of the organization. According to de Lattre, the Club du Sahel was established as an informal forum for the countries in the Organization for Economic Cooperation and Development (OECD), the European Economic Community (EEC), and the World Bank. The framework of the group permits dialogue between member states in the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), other governments, and nongovernmental organizations. The objective of the Club is to coordinate planning and activities among donors, regional organizations, and the Sahelian countries themselves. In this way, the Club is able to mobilize resources, provide information on the Sahelian states, and generally support the work of the CILSS.

The Club du Sahel was founded in Nouakchott, Mauritania, in 1975 and is headquartered in Paris. Member organizations include USAID , the United Nations Food and Agriculture Organization, and the EEC. Member countries include CILSS countries Austria, Belgium, Burkina Faso, Canada, Cape Verde, Chad, France, Gambia, Japan, Mali, Mauritania, the Netherlands, Niger, Senegal, Switzerland, the United Kingdom, and the United States.

Critical issues in the Sahel are low food production and the deteriorating environment. The region's population has doubled over the last two decades and is expected to double again during the next 20 years. Resources in the region already are strained. Rainfed agriculture has not improved, drought has claimed countless livestock, farmers are cultivating inappropriate lands, and desertification is increasing.

When the Club first formed, it looked as though mobilizing resources might alleviate the problems in the region. The group was, in fact, quite successful in this endeavor. But it then realized that to achieve improvement it needed to promote policy changes. To determine appropriate actions, the Club began evaluating existing projects.

According to de Lattre, "The methods of education must change drastically. Given the present demographic growth it is very difficult to envision educating within the present system; new methods must be found." De Lattre continued, "To increase the likelihood of succeeding, the governments in the region should develop a different view of their role. If the institutional framework changes, you will see changes. We must find new instruments so that the donors can deal directly with the people they are attempting to help."

I HAVE BUILT A WALL IN THE DESERT.

A TALL WALL.

A WALL FIVE KNEES HIGH.

IT IS CARRYING A COOL SHADOW

ON THE SCORCHING LAND.

THE WALLS GROW MUCH FASTER

THAN TREES HERE AND GIVE BETTER

SHADE FOR LESS WATER.

WITH A THOUSAND BUCKETS OF WATER

I CAN BUILD A TALL WALL TO

GIVE ME SHADE FOR A THOUSAND

YEARS. EACH BUCKET OF WATER

IN EXCHANGE FOR A YEAR OF SHADE.

AND THE EARTH OF THE WALL IS

THE TOKEN OF LAND.

NADER KHALILI
CERAMIC HOUSES

PUBLICATIONS

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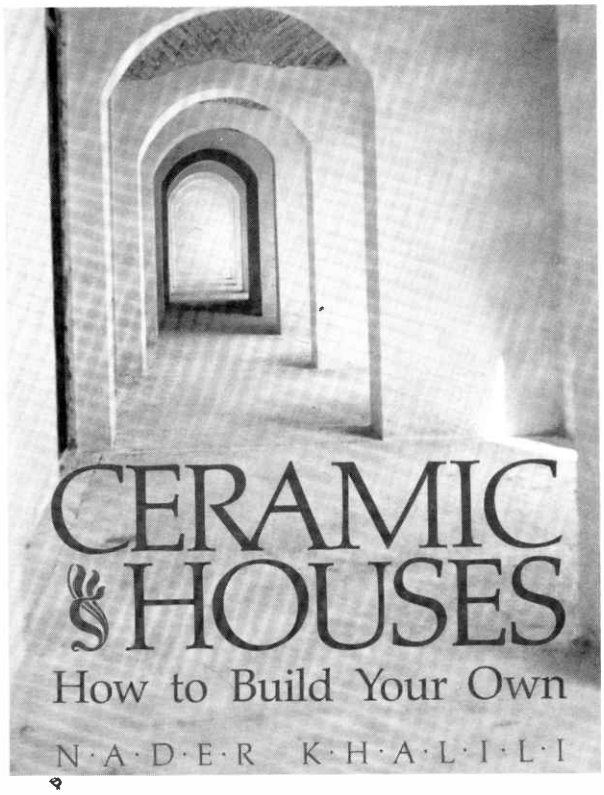
***Yemen: 3000 Years of Art and Civilization in Arabia Felix*. 1988. Edited by Werner Daum. Pinquin, Innsbruck; Umschan, Frankfurt/Main. 483 pp. US$50.00.**

This book presents an encyclopedia of new and available research on all aspects of Yemeni culture and is a catalog for an exhibition of the same name now residing in Europe. The editor has taken on the tremendous task of compiling all available information on Yemeni art, architecture, history, politics, and society and has done so extremely well. *Yemen: 3000 Years of Art and Civilization in Arabia Felix* is a must for anyone interested in traditional Arabian culture or in the origins of one of the Middle East's oldest civilizations whose architectural tradition rivals any in the world.



***Ceramic Houses: How to Build Your Own*. 1988. By Nader Khalili. Harper and Row, San Francisco. 221 pp. US$19.95.**

Ceramic Houses provides philosophical and historical background on earth building and briefly describes the exploration that led Khalili to firing his first structure. An abundance of technical information has also been presented regarding the selection and preparation of proper mud for firing; design and construction principles covering the essential parts of a structure from the foundation to the roof including details of Middle Eastern vaults, domes and arches; and, the actual firing techniques, materials and equipment required. Each topic is described clearly through simple text, numerous diagrams and photographs depicting step-by-step procedures. Both the lay person with no construction experience and the earth-building professional will find *Ceramic Houses* understandable and full of valuable information.

Since 1981, the periodical ***Mimar: Architecture in Development*** has been a constant resource of contemporary architecture and technology in developing countries. In 1984, its publisher, Concept Media Pte Ltd., began producing a series of Mimar books entitled "Architects in the Third World." Like the periodical, the Mimar monographs are of high quality and bring to international attention the architects whose works have gone unnoticed due to their isolation from the more mainstream architectural movements. Following are reviews of three of these monographs.

***Hassan Fathy*. 1985. By J.M. Richards, Ismail Serageldin, and Darl Rastorfer. Concept Media Pte Ltd., Singapore; Architectural Press, London. 172 pp. US$30.00.**

Egyptian architect Hassan Fathy championed the cause of indigenous mud-brick housing with his book *Architecture for the Poor*. The humanism and sensitivity expressed in this book is further explored in the Mimar book *Hassan Fathy*. Fathy's works, including private houses, housing projects, and community planning, are discussed within the international, regional and individual context of Islamic architecture. The book is extremely well documented with drawings, sketches and splendid photographs in the Mimar tradition. *Hassan Fathy* is highly recommended as it goes beyond the architect's practice to discover the origins of the man, his poetic passion for nature, and the development of technologies suited for indigenous cultures.

***Charles Correa*. 1987. By Hasan-Uddin Khan. Concept Media Pte Ltd., Singapore; Aperture, New York. 176 pp. US$30.00.**

In this revised edition of the 1984 Mimar monograph, the work of Indian architect Charles Correa is thoroughly documented; the book contains an exemplary representation of Correa's career of over 120 projects. *Charles Correa* is divided into sections by building type—housing, hotels, public buildings, and urban planning—and includes an introduction to Indian architecture and an essay by Correa. The book is illustrated by many of Correa's own drawings, expressed in a brilliance of color representative of his own buildings. Correa boldly expresses an architectonic interpretation of Indian culture and this book does a superb job of recognizing his contributions to contemporary international architecture.

***Sedad Eldem: Architect in Turkey*. 1987. By Sibel Bozdogan, Suha Ozkan, and Engin Yenal. Concept Media Pte Ltd., Singapore; Aperture, New York. 176 pp. US$35.00.**

Sedad Eldem is one of Turkey's most influential architects and has played a pivotal role in shaping the visual form of that country. This book explores Eldem's search for a modern Turkish architectural vocabulary in a chronological documentation of his work. As in other Mimar books, the context of Turkish architecture introduces his projects; a personal profile of Eldem follows. A foreword by Hans Hollein introduces the influence of modern European architecture to Eldem's work and his unceasing attempt to fuse it with the vocabulary of the Turkish vernacular. This book is a solid documentation of the modern architectural movement in Turkey.

CONFERENCES

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ADOBE 90
Sixth International Conference on the Conservation of Earthen Architecture
Las Cruces, New Mexico, U.S.A.
October 14-19, 1990

Earth has been used as a building material on every continent. It is estimated that between 30 and 40 percent of the world's population today live in houses made of this ancient building material. ADOBE 90 has been organized to promote the exchange of ideas, experience, methods, and research findings on the conservation of earthen architecture. The conference will assemble experts from the many countries that have traditionally used the earth as a building material. Participation from Asia, Latin America, and Africa is being encouraged.

ADOBE 90 has been organized by The Getty Conservation Institute, the Museum of New Mexico State Monuments, and ICCROM, under the aegis of US/ICOMOS. The conference will be of importance to all who study or work on the preservation of historic and cultural structures and sites in which the basic building fabric is earth in its various forms: adobe, pise de terre, wattle and daub, cob, etc.

Submit abstracts by December 1989.

For more information on ADOBE 90 contact:
Michael Taylor
Museum of New Mexico State Monuments
P.O. Box 2087
Santa Fe, NM 85704, U.S.A.
505-827-8940

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Third International Conference on Desert Development
Beijing, People's Republic of China
July 23-28, 1990

The theme of the Third International Conference on Desert Development is Balancing Economic and Ecological Constraints. Conference sponsors are the International Desert Development Committee and the Institute of Desert Research, Academia Sinica.

Topics include: sand dune stabilization; afforestation in desert areas; renewable energy applications; livestock and grazing management; salinity control; soil and water management and conservation; desert community development; dryland and irrigated agriculture; desert housing; integrated approach to desert development; economics of desert development; and desertified land rehabilitation.

Registration fee: US$200.
Last date for enrollment: January 1, 1990
Last date for receipt of paper abstracts: February 15, 1990
Working language: English
Papers and abstracts may be submitted to the following address:
IDDC Conference Coordinator
International Center for Arid and Semi-arid Land Studies
P.O. Box 4620
Texas Tech University
Lubbock, TX 79409-1036, U.S.A.

Chinese participants should submit abstracts to:
Mr. Yang Youlin
Division of International Cooperation
Institute of Desert Research, Academia Sinica
174 Donggang West Road
Lanzhou, Gansu
People's Republic of China

Address all correspondence concerning the conference to:
Professor Zhu Zhenda
Institute of Desert Research, Academia Sinica
174 Donggang West Road
Lanzhou, Gansu
People's Republic of China
Telephone: 26725-226/464/206/210
Telex: 72149 ICERD CN
Cable: 3097 Lanzhou

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Symposium on Land Drainage for Salinity Control in Arid and Semi-Arid Regions
Cairo, Egypt
February 26-March 3, 1990

The symposium is sponsored by the Ministry of Public Works and Water Resources of the Arab Republic of Egypt, and the Ministry of Foreign Affairs, Kingdom of the Netherlands. The conference will present the work of the Advisory Panel on Land Drainage in Egypt and related projects and will provide for the exchange of experience with drainage projects in other arid and semiarid regions.

Topics include: physical features of areas in need of drainage; design of drainage systems; drainage technology; ecological aspects, including reuse of drainage water; and economy of drainage.

Registration fee: US$250.00.
For further information write:
Drainage Research Institute (DRI)
Irrigation Building
13 Giza Street
El Giza, Cairo
EGYPT
Telex: 94014 EXWAP UN
or
International Institute for Land
Reclamation and Improvement (ILRI)
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