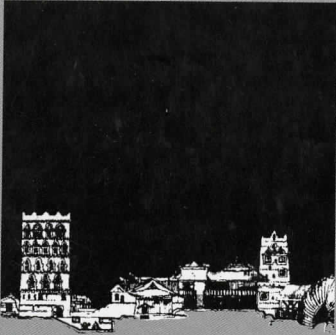


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On Design

The Dance of a Summer Day: Le Corbusier's Sarabhai House in Ahmedabad, India

M. SUSAN UBBELOHDE

Le Corbusier's Sarabhai house in Ahmedabad, India, is a remarkable example of an architecture that "reveals the world" to the occupants. Tracking the performance of the house through one summer day, this article demonstrates how it employs an overlay of climatic response, cultural understanding, and architectural design to support both body and psyche during this highly stressful season. From the cool moments of the early morning, through the furnace of afternoon heat, and into the slow cooling of the evening and dark relief of the night, the house is an active participant in the daily rituals of its inhabitants.

[T]his is the task of the house: to reveal the world, not as essence but as presence, that is, as material and color, topography and vegetation, seasons, weather and light.

—Christian Norberg-Shulz'

In 1951 the French architect Le Corbusier was commissioned to lead the design work for Chandigarh, the new capital city for the Indian Punjab. That winter, while busy with this project in Simla, he received inquiries from Gira Sarabhai, once a student of Frank Lloyd Wright, about the possibility of designing a house for her sister-in-law, Manorama Sarabhai, in Ahmedabad. Demanding a sufficient number of commissions to make his time and travels worthwhile, Le Corbusier eventually agreed to design a house for Sarabhai and her two sons — as well as four other projects in the city (FIG. 1).

Representing Le Corbusier, in May 1953 a young architect, Jean-Louis Véret, arrived in Ahmedabad with schematic design drawings in hand to live on site at the Sarabhai compound. His charge was to supervise construction of the Ahmedabad projects then underway: the Sarabhai house, the Shodhan house, the Millowners Association building, and the Municipal Museum. After his arrival, letters flew weekly between Ahmedabad

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FIGURE 1. Sarabhai house, viewed from the private garden. Ahmedabad, India, 1951–54. Architect: Le Corbusier.



and Paris to decide construction details. Then, when Véret was recalled to France for military duty, the job of construction supervision was completed by B.V. Doshi. During this period Le Corbusier visited Chandigarh twice a year, and often stopped over in Ahmedabad to check on his projects there.

It was a potent time for Le Corbusier. The architect was just completing the Unité d'Habitation in Marseille, and he had started his commission at Ronchamp. In Chandigarh, after years of professional frustration implementing his urban design strategies, he had been given an entire city to design. His architecture, too, was changing, beginning to engage in a greater exploration of mass and shadow, as well as aspects of design he described as "female," "nonrational," and "primitive." India was a propitious setting for such work. It was a new country, just a few years beyond independence and partition, and its leader, Jawaharlal Nehru, was looking with vigor toward the future.

Manorama Sarabhai was also an extraordinary client. Before marrying into the Sarabhai family she had been a Lalbhai. Both families belonged to the textile-mill-owning elite of Ahmedabad, described by William Curtis as "modern Medicis."² The Sarabhai family, in particular, was known for its patronage and contributions to the arts and sciences, including the establishment of major research and educational institutions. The site for the new house was deep within the Sarabhai family compound, in the residential area of Shahibagh north of the old walled city. Its program called for approximately 5,000 sq.ft. of space in two semi-detached structures — one for the older boy, the other for the mother and younger son.³ Among other elements, it specifically mentioned terraces for sleeping, a library, and a swimming pool (FIG. 2).

This article describes the experience of a typical summer day in the Sarabhai house. Using this approach, I argue it is possible to "dwell" in the Sarabhai house, profoundly connected to place and culture.⁴

Although Le Corbusier's architecture in Ahmedabad was not formally based on traditional or local precedents, he did notice much around him and draw avidly in his sketch-

books, attempting to understand how and why things were made as they were. His design work was also profoundly concerned with nature, perception, light, the movement of the body, and the positioning of the occupant philosophically and phenomenologically in the world.

As a modern architect, Le Corbusier cared about the influence of climate on architectural form and materials. In taking care to incorporate these values into the design of the Sarabhai house, he provided a family of deep cultural traditions with a modern house in which, in the words of Norberg-Shulz, the world is revealed as presence (FIG. 3A, B).

THE SUMMER SEASON

*Vishnu becomes the wind, the cosmic life-breath, and pulls out of all creatures the enlivening air. Like desiccated leaves the sear substance of the universe leaps to the cyclone. Friction ignites the whirling tumult of highly inflammable matter; the god has turned into fire. All goes up in a gigantic conflagration. . . .*⁵

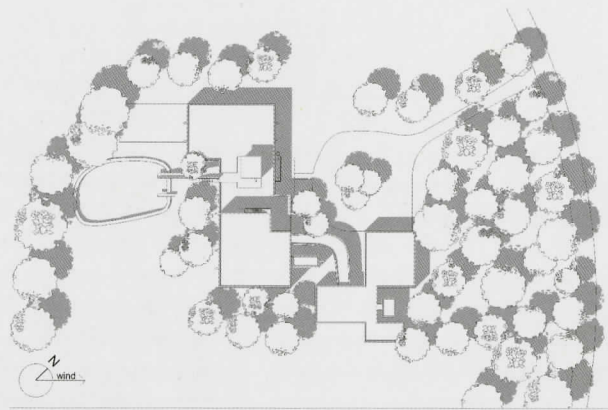


FIGURE 2. Sarabhai house site plan, illustrating the entry court to the north east of the house and private garden to the southwest.

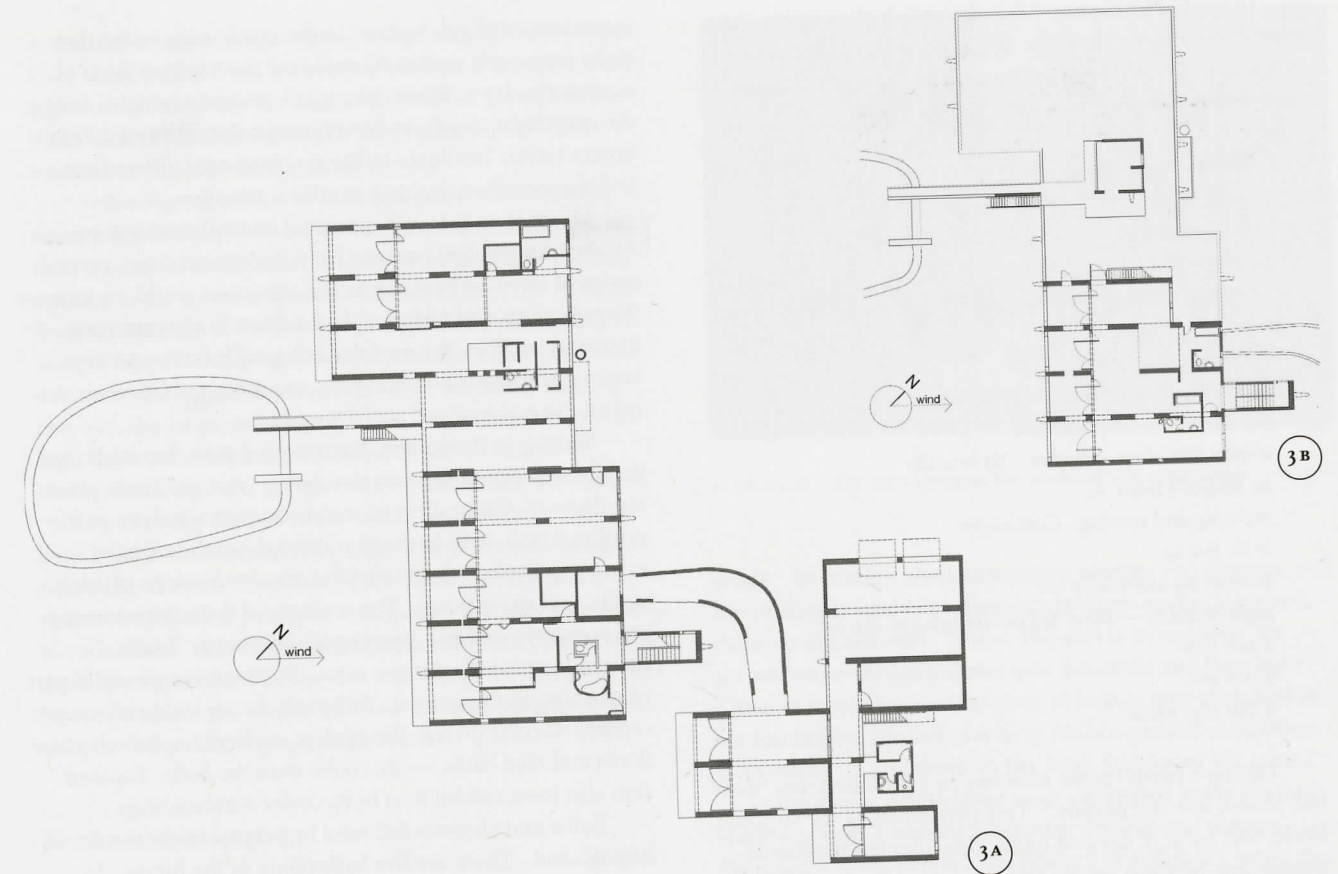


FIGURE 3. A) Sarabhai house first-floor plan. B) Sarabhai house second-floor plan. Drawn from as-built measurements.

As Hindu mythology describes the successive cycles of creation and destruction of the world, so too do the seasons in the Indian year seem magnified. In such a parallel, the phase of destruction caused by the fires of Vishnu equates to summer, the season by which its residents define the city of Ahmedabad. Ahmedabad sits just below the Tropic of Cancer, south of the Great Thar Desert, and the difficulties of its summer have been well recorded through history. Thus, during a visit in 1617, the Mughal Emperor Jahangir is said to have found the hot weather so awful, he ". . . described the city as 'gardabad', the abode of dust, and other less complimentary names."⁶

In mid-summer, through the center of Ahmedabad the wide Sabarmati River becomes a trickle of water connecting stagnant pools, orphaned in a trench of sand. Water buffaloes visit from all over the city to cool off in the shrinking pools, and an unending sequence of men and women load their small donkeys with river sand for building sites. On the city streets, vendors offer hats for shade, fresh watermelons are cut and readied with salt and pepper, and coconuts are beheaded and fitted with straws to reach the liquid within. Mangoes are piled on carts, while *pani wala* stands advertise drinks of water with blocks of ice and a single glass.

Arriving anywhere — a store, a house, a friend's garden — a glass of cool water is offered in welcome.

Throughout the area, summer clothes are of the thinnest cotton, designed to offer the lightest possible covering against the sun while letting a bit of breeze pass through. European travelers have remarked on this for centuries. As François Bernier, physician to Emperor Aurangzeb in the seventeenth century, related: "The heat is so intense in Hindoustan, that no one, not even the King, wears stockings."⁷ On city streets, only the slightest sandals cover bare feet. On entering a house, footwear is removed at the door so that bare feet may take pleasure in cool floors. In private, clothes are also quickly optional. As Marco Polo reported in the thirteenth century: "The climate is amazingly hot, which explains why they go naked."⁸

The fundamental rhythm of an Ahmedabadi summer is twelve hours of day, twelve hours of night. This cycle of light and dark, heat and coolness, becomes the dominant framework of life and behavior, human and animal. As the season advances, the repetition, invariable and absolute, becomes imprisoning. Day and night. Day and night. The cycle becomes as maddening as the call of the brain-fever bird, whose cries greet each day until everyone is convinced they've lost their mind.

Le Corbusier captured this diurnal rhythm in his *Poem to the Right Angle*. Here, the sun takes on a mythic role, much as in a Vedic song or prayer, boldly structuring the universe and declaring the rules of existence.

*The Sun master of our lives
far off, indifferent
He is the visitor — an overlord
he enters our house . . .
Punctual machine turning
since time immemorial
engenders every instant of the
Twenty-four hours cycle the gradation
the nuance the imperceptible
almost providing a rhythm. Yet brutally
he breaks it twice —
morning and evening. Continuity
is his but he
imposes an alternative —
night and day — these two phases rule our destiny:
a sun rises
a sun sets
a sun rises anew.⁹*

During a north Indian summer, in a profound way “these two phases rule our destiny.” This structuring of the summer world, this pulse of day and night, also rules the traditional relationship between people and buildings. During the days of summer, the harsh sun requires escape, a burrowing into the coolness of a darkened room, windows closed, shades drawn. All possible barriers must be raised between the vulnerable body and the scorching afternoon heat. Yet once the sun has set, buildings must be opened to exhaust both heat and occupants to the cooler evening. Buildings shelter and protect during the day, but at night the outside is gentle and welcoming.

The Sarabhai house performs an especially elegant dance with these realities of summer living: dawn — awakening to the world; afternoon — a protective refuge from the oppressive heat; dusk — opening to the slow cooling of the garden; night — cool terraces and roofs under the moonlight and stars. The dance of the house is experienced in the changing spatial order, the tectonic making, the thermal, haptic, visual, and aural sensations of being human. Over the course of a summer day, the house reinforces and then transforms our understanding of public and private, inside and out, repose and activity, the cave and the pavilion. Though modern in terms of form, the house recapitulates this daily traditional performance from late March until the rains arrive in June.

THE LUMINOUS MORNING

In the Sarabhai house, summer beds are set on the terrace, in garden bays, and on the lawn of the roof garden. It

is outdoors that one wakens to the quickening of the day. India rises early, and in Ahmedabad the sweetest hour of summer is dawn, when the night’s coolness mingles with the early light. Surfaces have cooled overnight and a light breeze brings freshness to the air. Bird calls, filtered sun, and the sounds of bathing stir one’s attention.

Dawn is an intensely personal and vulnerable time. Awakening involves passage from the unconscious, private realm of sleep and dreams to the conscious world. A journey through sleep and arrival with the dawn is a reappearing theme in myth — the new day bringing rebirth. As we become conscious and reinhabit our more public selves, we rejoin the material and social worlds.

Waking in the garden, the morning path first leads into the dim interior of the Sarabhai house (FIG. 4). Large pivoting doors on the southwest, in concert with windows in the northeast wall, have been open throughout the night to exhaust yesterday’s heat from the massive brick piers, tiled vaults, and stone floors. The coolness of the summer morning is experienced as a layering of sensations. Touch, inevitable as bare feet move across the floor, is a powerful part of morning in this season. Although the air inside is just perceptibly warmer than in the garden, surfaces — smooth stone floors and tiled baths — are cooler than the body. Exposed skin also loses radiant heat to its cooler surroundings.

Baths and showers followed by prayers begin the day in Ahmedabad. There are five bathrooms in the house. In early studies, these were all held coincident with its field of vaults.¹⁰ In the final design three were juxtaposed, breaking the powerful order of the parallel brick walls to create extremely private interior spaces. Most provocatively, one ground-floor bath is figurally associated with the swimming pool in the garden. By challenging the rhythm of the vaults, these rooms create a powerful exception to the collective



FIGURE 4. Sarabhai house interior view through living room to entry passage. This photograph was taken during the late morning hours just before the house was closed for the afternoon.

order of the house, emphasizing the privacy of these rooms. Cool water pulled from the rooftop tank on a summer morning washes heat from the skin and cools the air within the these tiled ritual chambers, offering a pleasing chill that remains in the memory through the day.

Following the privacy of bath and prayers, breakfast is eaten in the dining room on the northeast side of the ground floor (FIG. 5). Throughout the summer season, from spring equinox to the summer solstice, the sun rises in the northeast, flooding this side of the house with light. The windows here pivot to connect inside and out. Beyond the sunlit entry court, this northeast side of the house provides the family’s connection with the larger public world. It is here where the morning’s business is transacted, visitors are received, and the bustle of comings and goings can be watched and directed.

By allowing the northeast wall to be thrown open and letting the sun enter the rooms here, Le Corbusier dematerialized the absolute threshold of the house. Entry court, interior rooms, vaulted passages, and garden are fully connected to each other. This is the setting where the quiet privacies of dawn are superseded by the day, and where occupants of the house complete the transition from the unconsciousness of sleep to full public engagement (FIG. 6).

AFTERNOON SHADE

As the morning lengthens, the ferocity of the sun can turn life-threatening, challenging the body and mind to seek



FIGURE 5. Sarabhai house dining room with large northeast windows.



FIGURE 6. The entry court on the northeast side of the house.

shade. By midday, the temperature reaches 100 degrees, and the relative humidity plummets. Le Corbusier understood these conditions well: “Noon: The sun is in its glory. Its arrows strike vertically down into the earth; and they light furnaces upon it. . . . The giant of heat is now stretched to his full height, his feet crushing the hot ground; he gesticulates, walks up and down in the land, and waves his arms.”¹¹

Summer in Ahmedabad is an overheated world in which shadow affords a boundary between comfort and distress. Like the snake cooling beneath the peacock in Kalidasa’s verse, the Sarabhai house first offers relief in the shade of its garden:

*Fatigued by sun’s rays, like a sacrificial flame,
The peacocks stand, drained both in body and in mind;
They will not strike snakes who come winding near at hand,
To thrust a hot head in their feathers’ cooling shade.¹²*

Tucked into the far corner of the compound, the garden of the Sarabhai house is an oasis of green coolness and shade. Here, the exuberance and height of its trees create a filtered light that successfully establishes a first veil of shelter between house occupants and the rising heat of the day. Yet, however pleasant, no garden can provide enough shelter through the middle of the day. It is to buildings that the inhabitants of the region, and the subcontinent, have traditionally turned for protection.

Escape from the sun is an essential feature of the built environment of Ahmedabad. The *pol* houses which constitute the medieval city fabric feature a deep, shaded courtyard, the *chowk*.¹³ The architecture of the early sultanates and the Mughal period introduced a vocabulary of shaded arcades and porticoes throughout the palaces and mosques in the city. The mosque and courtyards of the nearby fifteenth-century retreat at Sarkejh used a similar strategy of shaded arcades at the edges of sunlit courts. Mughal palaces and forts throughout the region continued this pattern, extending it to include shaded pavilions for public and private audiences.



FIGURE 7. The arcade edge of the courtyard at Fatehpur Sikri.

Elsewhere in northern India, there are many other examples of a rich vocabulary of shade. The sixteenth-century courtyard edge in the Jami' Masjid at Fatehpur Sikri was elegantly reflected and expanded into the *diwan-i-am* and *diwan-i-khas* pavilions in the palace-forts of Agra and Delhi (FIG. 7). In the Rajput forts and palaces of Rajasthan, the Mughal style of shaded bays and arcades was given further intricacy as part of additions and alterations to earlier Hindu structures. In Amber, the palace is exposed high on a ridge, and shade is provided by columned pavilions and cool arcades added by Jai Singh I in the seventeenth century. In the desert city of Jaisalmer — where the buildings are constructed of cut golden sandstone and the narrow streets shade themselves — the eighteenth-century Salim Singh ki Haveli pushes a room far into the sky and then protects its edge with a shaded arcade (FIG. 8).

British houses in India continued this vocabulary of shaded rooms at the edges of a house (FIG. 9). Although

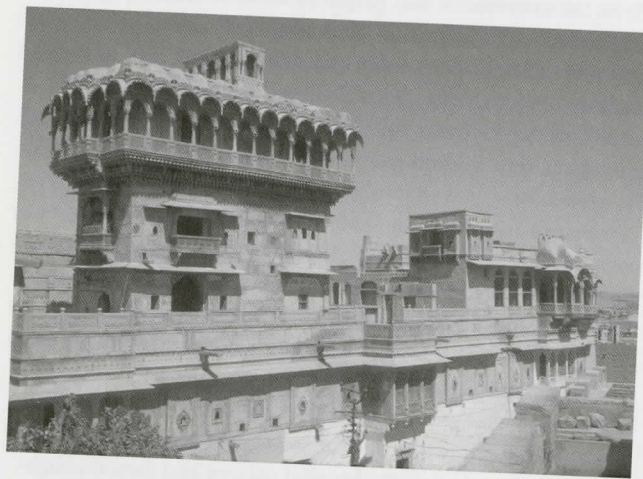


FIGURE 8. Salim Singh ki Haveli in Jaisalmer, Rajasthan.



FIGURE 9. Former residential bungalow in Ahmedabad now used for commercial offices.

vegetation was minimized immediately adjacent the house (to prevent the possibility of rot and "bad air," which were believed to cause malaria), grounds and gardens away from the house were well planted with shade trees that were considered "antagonistic" to the disease.¹⁴ This house type, which has come to be known as the bungalow, grew from an amalgamation of South and Southeast Asian building types, each of which emphasized a heavily shaded layer of space between the interior rooms and the garden.¹⁵ Over time the British adapted a Mediterranean Neoclassical vocabulary to their bungalow designs. According to Nilsson, "The porticos were usually placed on the shady northern front of the house, while the south facade was occupied by a loggia."¹⁶

On his first visit to India in 1951, Le Corbusier noted in his sketchbooks for Chandigarh: "do not hesitate to make grand empty naves [full] of shadow and air currents."¹⁷ He also paid attention to the shading strategies of residential buildings, noting the relationship between roof and shadow, sun and depth of penetration.¹⁸ But in New Delhi, he was dismissive of the British Neoclassical verandas, describing them with his most damning adjectives: "the fronts of the verandas are composed of walls and not of pillars. All of this is vague and Vignola." With the Sarabhai house, he concluded: "The plan attempts to realise the best possible conditions of shade and natural ventilation. The orientation of the building is strongly dictated by the prevailing winds — particularly at Ahmedabad. The other necessity is to make shade everywhere."¹⁹

At 23 degrees north latitude, Ahmedabad is on the same geographic parallel as Hong Kong, Dhaka, Havana, and the tip of Mexico's Baja Peninsula. During the summer months, after rising in the northeast, the sun climbs overhead through the morning hours, nearly reaching the zenith by noon. Le Corbusier originally oriented the Sarabhai house at 45 degrees off cardinal to open its vaults to the southwest monsoon winds. In summer this also allows the early morn-

FIGURE 10. Northeast dining room and living room windows receive early morning sun in May.



ing sun to light the entry court and slip into the house through the northeast windows (FIG. 10). This thin northeastern wall doesn't have to repel the sun. However, as the day heats up and the sun becomes unwelcome, it moves overhead, where it bears down on the roof garden, leaving the rooms below in full shade. Then, as afternoon progresses and the sun declines toward its setting point in the northwest, the deep recesses of the southwest garden rooms hold both heat and light at bay (FIG. 11).

Le Corbusier conceived of this shaded southwest garden edge of the Sarabhai house as a brise-soleil, or "sun breaker."²⁰ He first designed brise-soleil for projects in North Africa during the thirties, but they also came to define most of his buildings in India. In Ahmedabad, Le Corbusier's designs for the Millowners Association building and the Shodhan house made expressive use of concrete brise-soleil (FIG. 12).



FIGURE 11. Southwest garden rooms in shade during early summer afternoon.

However, for the Sarabhai house the architect used the term brise-soleil to make a statement about the fundamental order of family life. This would be expressed in a proper relationship between architecture and the natural world:

... the living room is opened to the sun, the space, and the greenery by means of a loggia which is really a brise-soleil, a portico, such as Socrates advocated, which allows the inhabitants of the house to savor the good things which a Bountiful God dispenses to men. It gives coolness in summer and warmth in winter. This portico, this loggia, this brise-soleil, links modern architecture with the most ancient traditions. Positioned according to the sun, it helps to bring rule into architecture.²¹

In the Sarabhai House, Le Corbusier designed a place for the life of the family that was responsive to winter and summer seasons, between public and private, between court and garden, safely held within brick walls and a vaulted ceiling. In this sense, the southwest garden rooms link the house to its proximate cultural and historical setting. With its deeply shaded bays, Le Corbusier connected the Sarabhai house to the collective Indian tradition in which alcoves of shade form the layer between inside and out.

THE CLOSED SHELL

Summer afternoons in Ahmedabad are too harsh to be mitigated with shade alone. In April, the afternoon temperature in the Sarabhai house garden will reach 104 degrees, while in May it reaches 115 degrees or more. Survival in such an environment demands a barrier to the heat itself. The outdoor world, so generously welcomed into the house during the morning, is now unbearably hot and bright. As the Sarabhai house mounts a defense, the building envelope

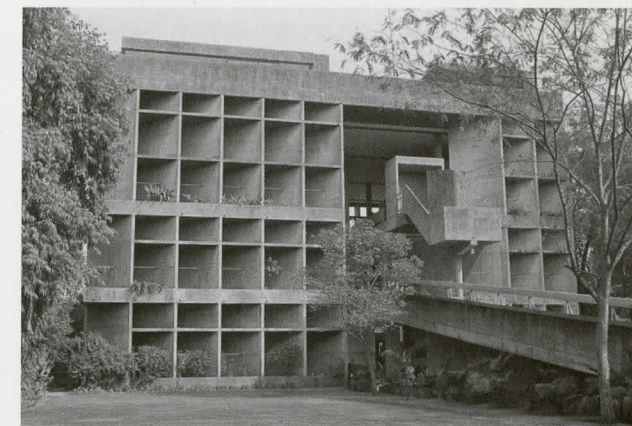


FIGURE 12. Millowners Association Building, Ahmedabad, India, 1951-54. West elevation.

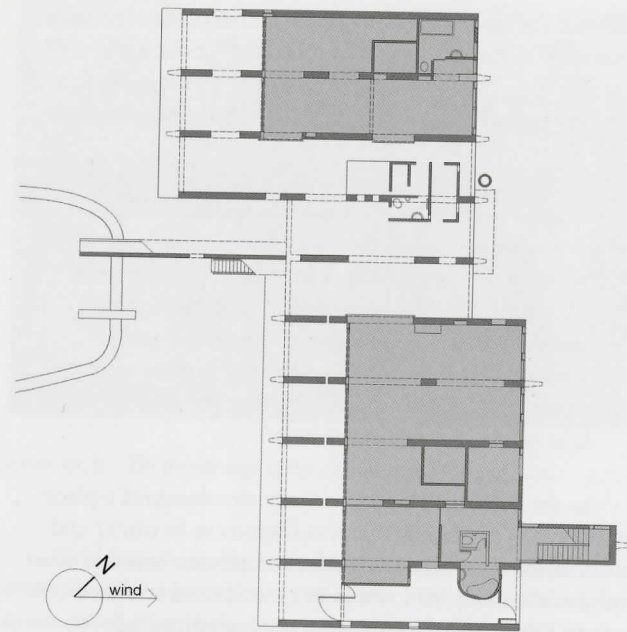


FIGURE 13. Detail of first floor plan, showing house closed for the summer afternoon.

becomes the "theater where the interaction between outdoor forces and indoor conditions can be watched."²² Ranks of pivoting windows and doors, which linked the morning interior to the court and garden, are now closed against the day (FIG. 13). The house retracts itself to form a closed shell against the hot, dry air which would otherwise surge in.

Le Corbusier never fully realized the necessity of closing the house to the hot, dry air of afternoon. Writing about his Ahmedabad designs, he emphasized the coupling of shade and air movement as the critical response to the climate: "Comfort is coolness, it is the current of air, it is the shade."²³ Although he visited India often, his travels were timed so that he never actually experienced Ahmedabad's oppressively hot summer weather.²⁴ He discussed the Ahmedabad climate with Gira Sarabhai, and his office in Paris created a table of climatic data for the city. However, Le Corbusier seems to have based his climatic understanding more on his own experiences.²⁵ His August vacations at Cap Martin on the Côte d'Azur were likely a more powerful source of climatic understanding than the temperatures recorded in the table. Ahmedabad delivers a far more brutal summer heat than the French Mediterranean. The design of the Sarabhai house is flexible enough to accommodate summer conditions of which the architect seemed ignorant.

By noon the threshold between inside and out is clearly drawn. The sliding panels are closed, bounding the rooms within as a separate realm. By closing off connection to the outside world, the rooms become redefined and connected transversely beneath the roof vaults. The ambiguous and open spatial definitions of morning are overwritten with clear

boundaries. The space of the house becomes private and individualized, a refuge for the afternoon hours (FIG. 14).

Such sharply bounded interior spaces, which hold the outside distant, are a marked contrast to the traditional spatial order of desert houses. There, a courtyard — "an open to sky space," as Correa has called it — is normally located within the house.²⁶ The many variations of the courtyard all open the interior of a house to light and air, the direct opposite of the Sarabhai strategy. In many such houses, a single deep courtyard also traps a reservoir of cooler air at its bottom. This well of coolness is typically shaded and further cooled with water. John Reynolds has used the phrase "thermal sailing" to describe the process by which shade, water and vegetation coordinate with migratory occupancy patterns to cool both the courtyard, the house, and the people in such a setting over the course of a day-night cycle.²⁷ In houses with two courtyards, one can be opened to the sun to pull air from a cooler shaded courtyard, perhaps with a fountain or trees, through the connecting rooms of the house.²⁸

The Sarabhai house, in contrast, keeps the interior mass isolated and the cave-like interior remains distanced from the hot, dry air of the afternoon.



FIGURE 14. The large pivoting doors on the southwest are closed between the interior and the garden.

The Roof Garden

If a closed tin box with deep brise-soleil were built in the beautiful Sarabhai garden, it would be uninhabitable on a summer afternoon. The materials of the house are crucial to isolating its interior from the heat. The soil of the Sarabhai house roof garden shields the rooms below, the effect enhanced by transpiration and evaporation from its vegetation (FIG. 15). The floor slab is in direct contact with the cool soil beneath. Working together with the brick walls and tiled vaults, as a protective surround, these massive materials create a thermal flywheel, storing the great heat of the afternoon and releasing it during the cooler hours of the night.

Jane Drew and Maxwell Fry, colleagues who championed the choice of Le Corbusier for Chandigarh, worked at length in tropical countries, both hot-humid and hot-arid. They have written that the challenge of a roof on a summer afternoon is primarily one of rejecting solar radiation.²⁹ Le Corbusier was well aware of this problem, and the sod roof of the Sarabhai house was intended to intercept the sun's heat before it could reach the more massive materials below. In structural terms, the roof is formed over Catalonian vaults of tile and brick. These first support a layer of rubble covered with a watertight membrane, which is then topped with soil, and planted with vegetation (FIG. 16). Grass and plants are watered daily through the summer season.

Such a roof engages a complex of thermal mechanisms to keep the interior cool. The planted layer reflects up to a third of all direct solar radiation, and absorbs the remainder. The grass and other vegetation further cool the roof through transpiration. As much as 80 percent of the heat received during a day never penetrates beneath this layer. What heat does reach the massive layer of soil, rubble, brick, concrete and tile is absorbed before it can reach the rooms below. It is then reradiated to the night sky at the end of the daily cycle.³⁰

While the closed shell of the house below presents a thin barrier between the hot air outside and whatever rem-



FIGURE 15. View of the roof garden, showing grass roof and large trees beyond.

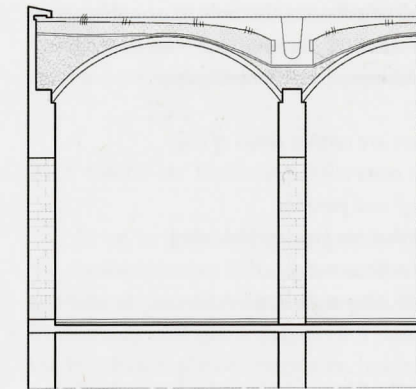


FIGURE 16. Section through the roof garden showing construction with scupper beyond.

nants of the early morning coolness are left inside, the roof assembly mediates the impact of the sun above. Such a combination works surprisingly well. The rooms inside peak at 96 degrees Fahrenheit, while the garden outside is nearly twenty degrees hotter by late afternoon.

Interior Comfort

Protection by a sod roof is not the same as being in an underground chamber, however. The roof garden is not capable of keeping the house interior below 80 degrees on a hot summer day. But how comfortable is the inside of the Sarabhai house at 96 degrees? Studies have found that air temperatures in the low 90s Fahrenheit are above any empirical measure of comfort, even in the tropics. And while it is definitely cooler inside than out, the air inside is also more humid. Relative humidity inside the Sarabhai house may range from 30–50 percent over the course of an afternoon. The additional moisture is welcome in the desert environment, but it also means that perspiration is more noticeable than outside, where the relative humidity may be as low as 10 percent.

If room surfaces were cooler than the air, radiant heat loss could provide an important degree of comfort; indeed, this is the effect that everyone dreams of on an Indian summer afternoon. Yet while the Sarabhai house excels at blocking heat gain through the roof, its interior surfaces are not quite the cool stone of our imagination. During early afternoon, the stone floor, brick walls and tiled ceilings remain only two or three degrees cooler than the air, and do not seem perceptibly cool to the touch. By late afternoon, even the roof assembly has reached the same temperature as the air inside.

If our touch tells us that surface temperatures are about as hot or cool as we are, then the surrounding environment feels thermally neutral. At 96 degrees, the interior surfaces of the Sarabhai house are still slightly cooler than body temperature. In such an environment, bare skin will still radiate heat to its surroundings, and the floors, walls and ceiling of the house have great capacity to accept such transfers. Protected from the sun and losing a bit of heat to surfaces around us, we are held in a delicate thermal balance. If we experience any increase in activity beyond resting quietly, we perspire freely and feel overheat-

ed. However, on summer afternoons the only reasonable activity is a nap, naked, under a ceiling fan in the privacy of a darkened room. Noel Coward once commented wryly:

*In tropical climes there are certain times of day
When all the citizens retire
To tear their clothes off and perspire.
It's one of those rules that the greatest fools obey,
Because the sun is much too sultry
and one must avoid its ultry-violet ray. . . .*³¹

Moving Air

Coupled with a quiet activity, moving air is an absolute necessity in a closed house on a summer afternoon, especially for the mid-range levels of relative humidity found in the Sarabhai house. At 90–96 degrees, air movement can make the difference between tentative comfort and certain torture. Moving air around a closed room does not cool it. Rather, it cools the body by increasing convective heat loss, and by assisting evaporative cooling from the skin. Experimental data indicate that temperatures as high as 92 degrees Fahrenheit are considered comfortable if the air is really moving.³² For this reason, ceiling fans find a place in nearly every house and apartment in Ahmedabad. Directly under a ceiling fan it is possible to experience a brisk but cooling 500–600 fpm at about two feet above the floor, exactly the position one might take for an afternoon nap.

Le Corbusier was aesthetically opposed to ceiling fans, conceiving of the Catalan vaults as an architecture of calm.³³ His client, however, was experienced with the Ahmedabad summer, and demanded that the vaults of the house be fitted with fans.³⁴ Through the years, these fans have been painted by visiting artists such as Robert Rauschenberg, creating art pieces that celebrate this most functional aspect of the house. The fans move the air throughout the house just enough to keep the edge of comfort within reach.

Above and beyond air movement, in the very dry Ahmedabad's summer it is also possible to evaporate water to cool and humidify the air. Desert coolers that do just this are locally made and relatively inexpensive to buy and run. By contrast, an air conditioner is a much more expensive option, costing from five to eight times more to buy, and proportionately even more to run. In Ahmedabad, those families who can afford to purchase and run air conditioners tend to have the window-box variety. In their houses, one room, often the parents' bedroom or sitting room, will be kept cool for the family to enjoy, while the servants and the rest of the household must make do with shade and cool drinks.

The Sarabhai house was originally constructed with dual air-conditioning plants, one for each side of the house. The library was the top priority, with the living room and bedrooms also included. Complete with ductwork, such central air conditioning indicates how little was spared for reasons of cost or technology in this house. Yet, astonishingly, these air condi-

tioners have rarely been used — not for lack of money, but for lack of need. While being in the closed house under a ceiling fan is not really the same as having a “normal” day in an office at 78 degrees, it has long been an integral part of Ahmedabad custom and culture to hide away for the summer afternoon.³⁵

Air conditioning is also not necessarily an unmitigated good. Many in Ahmedabad feel that becoming used to an air-conditioned environment substantially decreases your ability to conduct business outside your house — or even walk down the street. Moving in and out of air-conditioned rooms also makes one susceptible to colds and sinus problems. Moreover, the failure mode of a house that relies on air conditioning can only be catastrophic. As Nirad Chaudhuri writes, “I dislike the perpetual air-conditioned simper of all Westerners in India today. I do not trust it either, for I have seen the look of ferocity which comes into their eyes if the cooler fails for even a few minutes.”³⁶

SHELTERING THE SOUL

The Sarabhai house shelters the family from the heat of the afternoon, but the house is far more than a set of thermal mechanisms. With enough money and resources, machines can deliver exactly the air temperature desired, and in Ahmedabad, many commercial buildings use air conditioners to keep their occupants cool during the summer. But air conditioning alone is not capable of offering such a profound refuge from the summer afternoon. To accomplish that, architecture must provide a retreat as well as a defense against the stress of the season. According to Karsten Harries, what we require of a house “certainly cannot be reduced to being protected from a threatening outside: we need to be sheltered not only physically but psychologically. The soul, too, needs a house.”³⁷ The Sarabhai house delivers, par excellence, a house for the overheated soul.

To inhabit this house during a summer afternoon is to retreat into a dark and restful place. In contrast to the painfully bright afternoon, the inside of the Sarabhai house is surprisingly dark. The green garden has some capacity to subdue the brightness of the afternoon sun. But inside, the ubiquitous black floor, red brick walls, and rust-colored ceiling tiles absorb almost all the remaining daylight. Small panels on the parallel walls are painted in bright hues — red, green, yellow, blue and gray. But, although vivid against the natural brick and stone, these colors are highly saturated and relatively dark in value, adding little reflected light to the interior. The dimness of the interior is welcome during the hours of retreat.

Such a darkened interior can also be understood to offer refuge in a biological sense. Appleton has made the case that we are as biologically wired to find pleasure in refuge as we are in prospect. He wrote that “aesthetic pleasure in landscape derives from the observer experiencing an environ-

ment favorable to the satisfaction of his biological needs. . . . There is therefore a very direct functional association between darkness and concealment and a *prima facie* case for symbolically equating darkness with the refuge.”³⁸

Less than one percent of the light outside the Sarabhai house on a summer afternoon can be measured indoors next to the large northeast windows. And the daylight level continues to fall off as you move to the center of the house. This contrast between inside and out, sensed by both skin and eyes, is crucial to the making of a refuge. Much as the trees and water of an oasis create a realm of comfort and pleasure within the vastness of a desert, the half-light of the Sarabhai interior emphasizes the distance between the refuge and the garden. Inside, the relative coolness, dimness, and calm make a place of respite, a pause or suspension in the increasing urgency and discomfort of the summer day.

But the barrier between inside and out is not complete. Cutouts in the pivoting wooden doors reveal shockingly bright glimpses of sun and garden. By giving a presence to the possibility of sun and heat, these “decorative” windows operate in the tradition of the *jali* and cut stone screens, containing and yet offering glimpses of the world without.³⁹ Stunning examples of this tradition can be found in and near Ahmedabad. In the Sarkejh retreat, the tomb of Mahmud Shah presents the quintessential sanctuary, with droplets of western sun falling onto the cool dark stones of the tomb through cut stone walls (FIG. 17).

Thus, being inside the Sarabhai house is not the same as being in a vault or underground. Instead, the interior rooms present a more sophisticated condition of boundary — and as a result, of refuge. According to R.D. Dripps: “To a considerable degree this opposition of inside and outside is a construed rather than a received phenomenon . . . [the] edge therefore is a rather paradoxical construct, both separating and connecting the two realms it has revealed. This is as much a critical action as it is a protective one.”⁴⁰ This “critical” relationship between inside and out serves the refuge as



FIGURE 17. The tomb of Mahmud Shah at Sarkejh near Ahmedabad.

profoundly as the protection offered by the house. As Louis Kahn believed, “Even a room which must be dark needs at least a crack of light to know how dark it is.”⁴¹

THE CAVE IN THE GARDEN

Deep in the shadows and under the trees, the refuge of the Sarabhai house is fundamentally a cave. Situated in the suburbs on unrelievedly flat ground, the house is not cut from a rock cliff nor a chasm cleft into the earth. Yet, just as the Hindu temple becomes a sacred mountain, so the house is a cave bearing earth above and touching the earth below (FIG. 18). Penetrations offered to the garden lead to a dim, vaulted interior of rough brick and smooth stone. Inside, the rooms are irregular and unexpected, with bearing walls slipped open to create an extended and perceptually indeterminate plan, rather than a set of clearly defined rooms.

A cave presents a fundamental phenomenological condition. Harries has characterized this as a “natural symbol,” one which we understand and experience by virtue of being human. “The symbolism is not limited to any particular tradition nor projected into the world. It can be called natural in that it has its foundation in the nature of human being in the world, in . . . experiences of the opposition of earth and sky, darkness and light, matter and spirit.”⁴² By entering into the earth, one enters a separate realm. Space is configured in volume rather than plan, the sky and horizon are replaced by ceiling and floor. The space is interiorized, our relationship to the exterior world singularly defined and controlled by the mouth. Such caverns are a place of withdrawal from the larger world both physically and mentally.

The natural symbol of the cave also has, as Jung described it, an “almost unbounded fullness of reference.”⁴³ Being inside the cave on a hot afternoon offers both simple physical relief and layers of resonance, symbol and allegory entirely appropriate to the exigencies of an Ahmedabad sum-

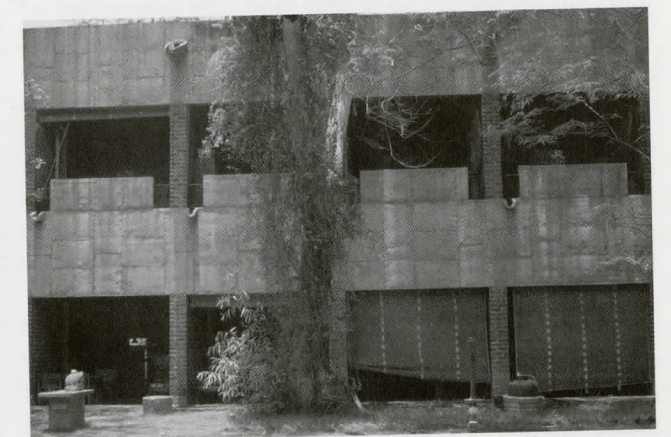


FIGURE 18. Southwest side of house with deeply shaded bays.

FIGURE 19. Cave entrances at Ellora near Aurangabad, Maharashtra.



mer season. The cave as refuge shares the concept of *locus amoenus*, a safe-haven where all physical wants are answered, a sanctuary in which psychic and physical well-being reign.⁴⁴

In India, caves have served as religious retreats and places of pilgrimage for thousands of years, playing an important role in the development of art and sculpture. (FIG. 19). As Lannoy noted, "For a thousand years almost all the most important sculptural monuments were caves. This is the most singular fact about Indian art, and distinguishes it from that of other civilizations."⁴⁵ The early Buddhist caves from the time of Emperor Ashoka (third century BC) were considered to house female earth spirits.⁴⁶ For monastic communities, the caves served many necessities above and beyond that of a naturally sacred space. According to Evans: "The way of retreat asserts the right to retire from the arbitrary assaults of a cacophonous and disarrayed world. . . . [I]t has the advantage at least of creating a precinct within whose boundaries there exists a topology, a causal sequence, and a purposiveness of some salient significance."⁴⁷

Most Hindu temples in India are constructed on flat ground rather than cut into a rock cliff. But they nevertheless recreate the procession of the cave from outside to inner core, from light to dark, from air to earth. The innermost sacred space, the goal of the entire processional path, is where "the interaction of shakti and deity, the gestation of grace, takes place," and is known as the womb-chamber or *garbha-griha*.⁴⁸ While the Hindu temple is explicit in its labeling of the womb-chamber, and Buddhist shrine caves were known as "wombs of grace," in Western thought there is no less a tradition of cave as womb. Entering the cave has long been recognized as a return to the shelter and protection of the womb, a rejoining with

Mother Earth. Such a fundamental understanding was identified by Jung: "The descent into the earth is also the symbol of the mother's womb, and was a widespread conception under the form of cave worship."⁴⁹ In her study of the cave as metaphor, Weinberg noted that "The sexual or uterine aspect of sacred grottoes is of great importance and probably always has been."⁵⁰

However, in *The Experience of Landscape*, Appleton warned that once a landscape or environment is labeled with sexual symbols, there seems little room for equally convincing understandings of that same form or place. "Once we have made up our minds that sexual symbolism lies at the root of the aesthetic pleasure we take . . . every dark cavern, partially concealed by foliage, . . . every cleft and chasm, can as certainly be recognized as a vagina." It would thus seem dangerous to imagine that the Sarabhai house is first and foremost a "womb-chamber."

However, Appleton also asserted, "It is, after all, the imagination which is principally involved in experiencing the environment aesthetically."⁵¹ And in inhabiting the Sarabhai house, the house for the body and the house for the soul cannot be separated from the house of the imagination. Just as we recognize the coolness and calm spirituality of the cave, we also recognize the return to the womb — consciously or unconsciously. While waiting out the overheated hours, the most common activity is to sleep. When the pleasure of the morning's freshness is depleted, sleep will carry you unconscious through the hours of exhaustion and heat. The house as a cave is exactly appropriate for these hours of limbo. Caves have long served as the place of respite, of waiting, of sleep. Jung wrote that "The cave represents the darkness and seclusion of the unconscious."⁵²

Ultimately, this is what an Ahmedabad summer afternoon demands — an escape from consciousness, an escape from the day itself. In the heat of the afternoon, the Sarabhai house is a proposition of shelter and protection, escape and refuge, cave and womb. The house demands our engagement with metaphor and symbol, just as it stimulates us experientially and phenomenologically. The house is a cave is a womb. We are profoundly sheltered through the heat of the afternoon, awaiting rebirth when dusk arrives.

THE NIGHT GARDEN

Eventually, every scorched summer afternoon in Ahmedabad gives way to evening, the welcome pause between day and night. At this point, the sun is low, a deep yellow glow filtering through the trees. The richly colored Sarabhai house garden again takes form in the growing shadows. In these moments comes the second dawn of the summer day. Birds reannounce their presence. As Le Corbusier's "giant of heat" puts away his arrows and retreats, people wake slowly from the stillness of their afternoon naps.

Even before sunset, as the sun drops lower in the sky, the garden begins to cool perceptibly. At the same time the house begins to feel less like a refuge than a prison. The mass of the building has been collecting heat all day, and the air inside has become stuffy; it is mentally, as well as physically, claustrophobic. The promise of a more humane world arrives gently at the edges of the house. Awakening from an afternoon nap, movement is from the darkness of the interior out to the garden.

In these hours of transition, the relation between house and garden is yet again transformed. As soon as the white hot light of afternoon gives way to deepening shadows, the first window is cracked open. A bit of hot air floods in, but it isn't much hotter than the interior has grown to be. Then, quickly, the large wooden doors are swung open; the cave is opened, exposing the interior to the garden — the two now profoundly continuous in the disappearing daylight (FIG. 20). House and garden are a continuity, a spatial analogy to the sensation of limbo that characterizes dusk.

Shortly after sunset, the 100-degree excesses of the afternoon drop to the just-bearable nineties. Unlike waking into the freshness of the morning, dusk sustains a slow and gentle reconnection to consciousness and the exterior world. With inside and out seamlessly the same, there is a pause, a stillness in the day on the verge of becoming evening. The last streaks of sunlight the greenery and catch the turquoise pool. The tranquility of the hour is expressed in the sedate and caressing character of ragas played at sunset.

The swimming pool comes into its own in the early evening. The concrete fascia of the house establishes a strong edge to the space of the garden. Playing against this datum, the toboggan and pool are potently figured and posi-

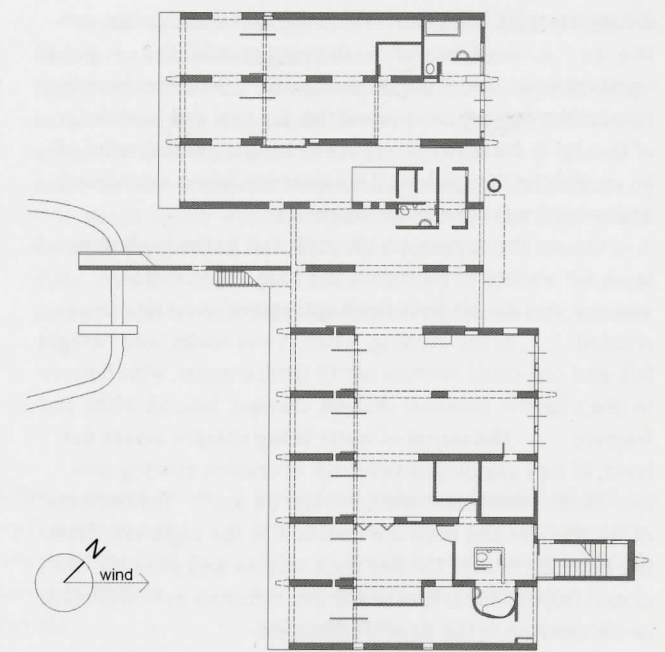


FIGURE 20. Detail of first floor plan of the house opened up for the night.

tioned, conjuring delicious thermal relief. Slipping gently into the cool water or sliding joyously down the wetted toboggan to splash into the pool is a refreshing transition from day to evening. Skin hot from sleep is quickly cooled by the water and emerges wet into the warm evening air. Echoing the morning, the swim is a rebirth, an awakening to the possibilities of the evening and night ahead.

The light fades and darkness arrives, day turning to night. Dusk is a reflection of dawn, sunset a cousin of the sunrise, and yet charged with profoundly different resonance. The purpose of the evening is pleasure with family and friends. Evenings are enjoyed on the garden side of the house, exterior and yet still private. Below the fascia, the house becomes an elegant garden pavilion, with small bays for conversation and drinks open to the evening sky, the terrace, and the lawn. In these garden bays, the large house is scaled to the small and intimate. Here the stone floor pushes out to meet the edge of the lawn, extending beyond the vaults to stitch garden and pavilion together. Held in the bays between warm brick walls, one sits within the threshold of both the dark interior and the fading light of the garden. In these spaces one occupies a border zone between in and out, house and garden, day and night.

According to Harries, "Human being belongs to both body and spirit, to the earth and to the light. An adequate understanding of dwelling must do justice to this twofold belonging, which is never without tension. . . . Our building must acknowledge both the sheltering power of place and the indefinite promise of open space."⁵³ In the material tension between the two, the Sarabhai house holds us in an extraor-

dinary moment and place. This edge and these rooms contain us, "... as a fringe of overlapping possibilities ... [in] an extraordinarily deep kind of ambiguity."⁵⁴ To sit in these bays is to hold a sensory memory of the day past and knowledge of the day to come, while experiencing the gradual relief of an evening in the garden. This moment forms a profound understanding of the Indian summer.

Out on the terrace, on the roof, and in the garden, paved areas are washed of their dust and heat. The lawn is watered, and the air feels fresh and moist. As Anita Desai recalled: "... in the evening, when it was cooler, and twilight fell, and one could venture out in fresh cottons, with flowers in one's hair — jasmine, *chameli*, *champa*, *bela*, all white and fragrant. ... The sound of water being sprayed across the lawn, of taps gurgling generously, of crickets stirring into life, drinks, sherbets, fruits on trees, on ice."⁵⁵ The coolness of the terraces and lawn are matched by the night sky, draining away the heat of the day from skin as well as earth. No clouds impede the action of the sky, infinitely cold and black in comparison to the fires of afternoon.

The Sarabhai house offers a landscape of possibilities for the summer evening. The garden bays, pool, and terrace on the ground level continue upward to the lawns and terrace of the first roof which inhabit the level of leaves and sky. Balconies, too, overlook the pool and garden. And on the roof water channels echo those in the Persian gardens of the Mughal courts. Linked by slim concrete stairways built against the walls, these green roofs easily join the garden below to make a striking tableau for a summer evening. The Sarabhai house is linked not only with contemporary life in Ahmedabad, but with grand historic traditions of summer entertainments and pleasures.

Mughal palaces and Rajput forts made special observance of evening pleasure, architecturally recognizing the sensual and sensory possibilities of the night garden. Paintings from the same courts, including miniatures from which Le Corbusier drew as he worked on the Ahmedabad designs, celebrated night life on the terraces and in the gardens of the palaces. As Michell has written,

Royal architecture had to provide suitable settings for private pleasures where monarchs could meet with their queens and concubines. Miniature paintings executed at the Mughal and Rajput courts give a good idea of the erotic life of the court. An often repeated scene shows the royal figure at night accompanied by one or more female consorts seated in an upper pavilion of the palace, or lying on a terrace beneath an awning.⁵⁶

The garden for the ladies of the court at Amber in Rajasthan provides an especially revealing glimpse into the nature of a summer garden in the desert:

Maunbari garden is a night garden, and it is ingeniously designed for this destination. Obviously, in a night garden there is no need for trees, since there is no need for shade, and it would hence be similarly senseless to grow colourful flowers, as it would be impossible to admire them in the moonlight which veils all colours behind a shading of light and dark. ... [T]he individual flower beds [are] planted with white or very light flowers which seemed to be luminescent under the moon. Moreover, most flowers belonged to highly aromatic species, filling the night air with their sweet smelling perfume.⁵⁷

As the night grows cooler, the warmth of the brick and concrete within the house confirms the day's heat, languidly giving it up to the small breezes that move through its vaults. Heat will also move upward through the soil of the roof garden to be reradiated to the night sky.

Retained heat is a real challenge for house designs in Ahmedabad. In their recommendations for roof designs in such climates, Fry and Drew advised against a massive roof such as that of the Sarabhai house. Instead, they proposed a double-skinned, lightweight roof to shade with little thermal mass.⁵⁸ The soil of the roof garden of the Sarabhai house does retain a great deal of heat during the night, and before it can begin transferring heat from the house interior to the night sky, it must lose its own heat. While temperatures in the garden continue to cool to a comfortable 85 degrees by midnight, it will remain warmer inside than out until dawn.

Chaudhuri once confessed, "Even I, in spite of my climatological philosophy, go half mad. What exasperates me most is that for a month or two no object feels cool to the touch even at night. Every material substance, if not hot, is above the temperature of blood."⁵⁹ The sensation of being surrounded by warm surfaces is especially oppressive when the alternative is a clear black sky of infinite coolness. Hence, just as Bernier noted in the seventeenth century: "For more than six successive months, everybody lies in the open air without covering — the common people in the streets, the merchants and persons of good condition sometimes in their courts or gardens, and sometimes on their terraces, which are first carefully watered."⁶⁰

If the family slept indoors on summer nights, the planted roof garden would be a great liability, no matter how well it managed to isolate the interior during the hot afternoons. However, the house offers a range of options for sleeping during the clear nights of the season. Since its southwest walls allow easy connection to the outside, garden rooms on both the first and second floors may serve as sleeping porches. More traditionally, after the paving has been thoroughly rinsed, beds may be pulled out to the freshness of the night terrace. As the summer season grows long and nights grow warmer, desert coolers may also be used. Air conditioners require enclosed spaces to be effective, but the desert cooler can be used at the edge of the house, and even outdoors. Thus, one can sleep outside under the clear sky with a veil of cool, humid air moving across one's body and dissipating into the garden.

While everyone sleeps, the long sides of the house remain open, doors and windows pivoted to erase the walls. Even the slightest breeze moves through the vaults, exhausting the heat from the interior to the cooler night. This process takes all night, and the interior does not finish cooling until nearly an hour after sunrise. By then, the mass of the house, so protective during the hot afternoons, is recharged, cool to the touch and ready to accept the heat of the day. Bare feet, such a critical part of experience in this country, will tomorrow ground the body with the coolness of touch.

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In the Sarabhai house, as everywhere in Ahmedabad during the summer, day is the time of containment, of a cloistered withdrawal into the privacy and detachment. The world is held at a remove, the house providing a shelter and refuge for each individual as they escape into sleep. It is at night that the connection is restruck, tentative and delicate. One sleeps lightly within the garden, open to the night world through dreams and the subliminal pleasure of coolness and dark. As was Akbar's pavilion at Fatehpur Sikri, the Sarabhai garden could be called the Khwabgah, the House of Dreams.

- house (both archival and published) indicate the north arrow in relation to the arrow of "vent" coming from the southwest.
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All photographs are by George A. Loisos and M. Susan Ubbelohde. Drawings are based on published schematic design drawings, sketches in correspondence and the archives of Fondation Le Corbusier, and measurements on site. Taal Safdie, Nick Anderson, and Abe Shameson all contributed to their production.