CHAPTER I

Traditional Architecture and Settlement Patterns

Above: The courtyard of Bayt al Rudaydah in Birkat al Mawz

Opposite: The falaj of Bayt al Rudaydah in Birkat al Mawz
Regional Styles and Building Traditions

Introduction
The forts and citadels of Oman represent the most obvious feature in traditional Omani architecture. Crowning cities and commanding the entrances to towns, they continue to have a dominant presence in the urban landscape. The design layout and building technology of this fortified architecture, which included residential spaces, is indicative of the level of sophistication that town planning and architecture reached in settlements across the Sultanate. The forts have remained a focal point for visitors to the country and a basic historic reference for the surrounding fabric of adjacent towns, despite the removal, through renewal or reconstruction, of the surrounding traditional urban fabric. The forts and towers have been restored through an ongoing national campaign that has been in effect for the last two decades and which has, despite the courses of renovation and restoration, preserved the exceptional value of these complex structures. However, the architectural heritage of Oman, though symbolised by these forts and towers, and explored through them in several publications, is not exclusive to them. Oman boasts an interesting and important vernacular architectural fabric that is just as rich and diverse as those imposing buildings.

The development of vernacular architecture in the Sultanate is closely related to the evolution of some of the earliest urban settlements in Arabia. A wide range of influences, from the Pre-Islamic, Islamic, Persian, Portuguese, Moghul and South-East Asian to
the Ḥāḍrami style of neighbouring Yemen and finally the buildings of East Africa, is also discernible in many of the regional variations. Whereas some of these influences are expressed with direct references (most obviously, the Portuguese fortifications at Muscat and the Ḥāḍrami influence in Dhofar), others are more vague. An examination of the architecture of towns such as Nazār, Misfāt al ‘Abriyyin and al Mudayrib demonstrates the importance of establishing references for each style, though the styles themselves are ultimately specific to Oman. Other towns, such as al Minzafah, illustrate an established and formal domestic architectural style within a developed urban town centre, with possible influences that may have been brought in by wealthy merchants from Zanzibar or East Africa. To define fully the overlapping influences requires further research into the cultural influx that occurred during the eighteenth and nineteenth centuries (including research into the social fabric that was attached to the architecture), which is beyond the scope and speciality of this book.
Left and bottom
Details of one of the mud-brick houses that was still inhabited in 1993 in the town of Nazār

Below
One of the grand mansions known as Bayt al Kabīr in the town of al Minzafah showing the complex design and the interior detail of the niches and arches
Even when obvious influences do occur, the detailing of the buildings—such as the carved window screens, the doors, the carved mud, lime plaster and stucco work, and the painted ceilings and calligraphic inscriptions—expresses important stylistic variations owing to the differing interpretations of local master builders and craftsmen. Local types became established in the architecture of the different regions, which employed local building materials, technology, design and town planning forms that vary remarkably between the coast and the interior, and between the eastern and southern parts of the country. Yet despite the regional differences, the similarities found in the plans and designs of both mosques and residential buildings clearly point to specific characteristics that evolved in and became exclusively attached to the architecture of the Sultanate.

However, the paucity of vernacular architecture makes the task of locating intact and cohesive examples difficult: a problem compounded by the fact that many of the more interesting settlements that survive are widely scattered. Many of the examples of traditional domestic architecture in Oman are in a dilapidated state, their owners having deserted the old quarters in favour of the newly developed and more prestigious modern parts of towns and cities.

Mosques are an exception to this trend since they remain in continuous use, and in some cases have even been renovated. One such example is the Ḥarāt al Ṣāmi quarter of Adm, which is now deserted with the sole exception of the renovated mosque of Al Ṣāmi. Other mosques that have been renovated through the
Ministry of National Heritage and Culture include the Manah Central Mosque near Buhla and the exceptionally beautiful mosques of Ja'lan Bani Bu 'Ali and Bani Bu Hasan.' Indeed, the Sultanate has a wealth of mosque architecture, especially in the interior and eastern regions, that merits recognition through documentation and restoration. Four remaining mosques in the old quarter at Manah alone testify to the need to list these buildings; immediate conservation and rebuilding is necessary to restore their extraordinary spaces and the particularly fine detailing of the niches and ceilings, most of which have collapsed. The same applies to several mosques in Ibra' al Sharqiyah and to the al Sharqi mosque in the town of al Ghafat, which was maintained through the mere virtue of continuous use, until its roof collapsed during heavy flood rains in spring 1997.

There are houses in Oman which have been maintained through continual habitation, including Bayt al 'Ud in al Muḍaybi and Bayt al Šafā in al Ḥamrā'. These now constitute exceptional examples of architectural design and layout, though originally they would have been landmarks in a far larger unified town structure. Indeed, considered in terms of town planning, both Ḥarat al Jami' and Ḥusn al Hawashim (a quarter in Adm) form complete complexes of housing and buildings which, although constructed in an intricate series of spaces, are skillfully integrated into the walled town. The design of al Ḥamrā’s old covered sāq, which has only two remaining shops, is similar in this respect and it is interesting to see that the old inhabitants still frequent the narrow streets of these deserted quarters. In
the absence of documentation, where the population has relocated to the modern urban environment of the newly constructed quarters, stepping into the abandoned remains of the original town affords the only tangible means of reading vernacular architecture's past.

**The Building Tradition**

The few master builders skilled in traditional building techniques, materials and styles still practising provide an important insight into the processes that created both individual buildings and settlements. Material from interviews with master builders has been included throughout the text of this book. While this often consists of descriptions of methods, styles and terminology specific to certain locales, broad parallels are also evident. One particularly informative source was Shaykh Maḥmūd bin Zāhir al Hīnāṭi, who, though not a master builder, is an eminent expert on historical buildings and vernacular building techniques. Information from discussions with Shaykh Maḥmūd bin Zāhir al Hīnāṭi provides a valuable introduction to the building traditions not only of Muscat but of the urban centres of the Sultanate in general, and forms the basis of the following description of building techniques.

According to Shaykh Maḥmūd, the master builder was traditionally responsible for designing the houses of ordinary people. The houses belonging to the élite were designed to a large extent by the owners themselves. Examples of houses built for shaykhs still survive in many towns.

Once the plan of the building was determined and marked out on site, the foundation trenches were dug. These varied in depth from 60 centimetres to 1 metre. For the foundations themselves, courses of stone set in ǧārīṭ lime mortar were used if the owners could afford it; if not, the stone courses would be arranged in an ashlar setting (closely packed stone with no mortar) known in Muscat as al zafr. Foundations were between 20 centimetres and 1 metre deep, depending on the owner's means.
Above foundation level, walls of houses were usually constructed in mud brick, though there were regional variations - for example, in southern Dhofar, where local limestone was used. However, in general stone was only used in fortified buildings such as citadels and towers, all other buildings being constructed in mud brick. The term used in Oman for a brick is *tfalab* (pl. *tfalāt*), which is derived from the Arabic word for clay silt, *taflab*. The clay was extracted from the date palm fields, known as amdād, with the feet, a process known as *taghyil*. The mixture was then mixed with chaff,饱和 in water and left to ferment for four to five days, during which it was turned every two days. One of the traditional ingredients used as a fermenting agent in mud bricks was *al khamar*, literally honey but actually a syrup extracted from sugar cane by boiling and known among builders as red sugar. The brick was then placed into a wooden mould and pressed by hand. The dimensions of the moulds used for making bricks were always 20 x 35–40 x 20 centimetres: according to Shaykh Maḥmūd, this size had been in use since the year 1000/1591. Prior to this, a cone-shaped brick was used, known as *huwa*. Once the bricks were removed from the moulds, they were left to dry in the open.

Mortar, known as *ghilab*, was made from a higher quality clay than that used for bricks, since mortar does not undergo the pressing process that condenses the clay in bricks. First the clay and the chaff were turned with a shovel, then mixed with water and pressed and kneaded with the feet, a process known as *taghyil*. The mixture was then fermented, for a longer period than in brick-making - a process known as *takbris*.

The ground-floor wall of a typical mud-brick house was four bricks thick, measuring between 80 centimetres and 1 metre once the mortar was added. On the first floor, this was reduced by half a brick in order to form a recess (mukhaddāb, meaning cushion) to support the ceiling beams, a pattern repeated on the second floor where the wall was three bricks thick. The wooden beams were left exposed on these half-brick recesses rather than being embedded into the wall, so that they could easily be replaced: this was often necessary due to the rapid deterioration of the wood caused by insect damage, particularly termites. In some cases, the thickness of the wall at roof level might be as little as one and a half bricks. The bonding of brick courses, which is known as *madd* in Arabic, is called *amdād* (sing. *madd*) in Oman. After every three courses, the wall was rendered with mud plaster or *ṣārāja*, in a process known as *tasbyih* (from the verb *shurryab*).

Ground-floor rooms are usually 3 to 4 metres wide and 3.5 to 4 metres high. About 80 centimetres to 1 metre below ceiling level are slit openings (*mrij*) 20 centimetres wide and 60 centimetres high for ventilation purposes, since fires were lit on the ground floor for heating during the winter. There are no other openings on the ground-floor walls directly fronting the streets, though there are openings on to enclosed courtyards (*fanā*).

The internal ceiling level of each floor is reflected on the external walls by a stone parapet (*bijāz*) which protrudes 20 centimetres and surrounds the building, protecting the surface of the wall from rain. A 30 centimetre brick protrusion running the full height of the building from the ground floor (the *shamsah*) indicates in elevation where the windows are placed.

Window openings, known as *drayshab* (sing. *drayshab*), are distributed according to the space available, though they are usually 1 to 1.5 metres apart and are no more than 30 to 40 centimetres above floor level so that the breeze can ventilate the room effectively. The *drayshab*, a small slit opening, is set within a larger frame or niche termed the *rawzanah* (pl. *rawzanān*), which measures 80 centimetres wide by 1 metre high and also contains shelves for storage (*diraf*). The arch above is known as the *'aqd*. Half a brick was used as backing for the arched recess, lessening the load on the wall when several of these niches are distributed across it. *Rawzanān* on the ground floor, which have no openings, are used as storage niches; indeed, the ground floor in the houses of the wealthy is used solely for storage purposes though it is also used as living space in the houses of the less well-to-do. The doors and windows themselves were made from local woods including *sidr*, *talb* and *'anbah* (mango tree).

The majority of traditional Omani houses consisted of only two storeys. The roof area was often used as a living area, and was enclosed by a 1 metre high parapet,
or *sitār* (from the verb *satar*, to conceal). Slanted openings are set into the wall, some sloping downwards and designed for shooting at people below (termed *marma saqt*), and others designed for aiming across. Water is removed by means of various types of drains (*mizrāb* or *mitrāb*). Occasionally these take the form of stone – or stone and *ṣāraj* – drainpipes, though more often they consist of carved wooden spouts protruding 80 centimetres from the wall surface. In areas where pottery is made, fired-clay drainpipes were used.

The main reception area is termed the *sablāb*; this room was designated for entertaining guests, its importance indicated by its position next to the main entrance and its generous proportions. (To this day a public *sablāb* is constructed in towns adjacent to the main square and Friday mosque, where the men meet after congregational prayers, during religious feasts and on other occasions that bring the community together.) The first floor is named the *ṣuffāf*; after the room situated here called the *ṣuffāb* (*ṣuffāf* is the plural of *ṣuffāb*). The second and third floor are known as *ghurāf*, from *ghurāf* meaning 'room'. The room on the top floor of a house, used as a space for seclusion, is known as the *gharbīyyah*. The *dahrīz* is a semi-covered area preceding the *ṣuffāb* on the ground or first floor, normally covered by a vaulted or flat-roofed arcade. Another semi-covered area, or loggia, preceding the rooms on the first or second floor and running directly above the *dahrīz* is known as the *ʿarshāb* to differentiate it from the *dahrīz*.

Shaykh Maḥmūd also described the ways in which certain key elements were constructed, including the arch, the ceiling and the staircase. There are three methods for building arches, although one of them, which employs a wooden frame, was rarely used. More common was a method using palm-frond stems (*jarīd*), in which the stems were fixed like spikes into the bricks and wedged against the floor so as to hold the bricks in an arched shape while the rest of the wall was constructed in layers above. The third method, also quite common, used an arch made from two interlocking palm-frond stems with the wide, wedge-shaped edge (*al karbah*) of the frond forming the base. Sections of the supporting walls that served as pilasters were constructed in brick to
the height of the springing line, where the arched frame was placed. Once the arch was constructed, the remaining area of the wall above the arches was filled with bricks. Where arches have a wide span, longer, thinner bricks were used.

The wooden ceiling beams were made from the trunk of an aged palm, known as nakblat al fard. Three sections were cut from the tree, each known as jizrah. The first was cut into five beams, while the other two were each cut into four. The ceiling construction above these beams was comprised of mats made from palm fronds (da‘in), selected according to their strength and straightness and woven together with rope (zfanah). Organic fibre from the palm trees (lif) was placed on the da‘in and plastered with a layer of mud. This was then finished with lime plaster rendering (sulhab) to prevent any surface cracks from occurring in the floor.

Staircases were constructed in stone or wood, with each tread (raftah) 30 to 35 centimetres wide. The first steps were built over an infill of mud brick, after which an arch was constructed to support the rest of the staircase.

As elsewhere in the world, the human figure was used in Omani architecture as the basis for determining measurements and proportions. The Omani system was similar to systems used in Southern Arabia and Yemen. The ḍbirā‘, known in Arabic as ḍbar‘, a word which means amongst other things to traverse (a country) and to cover (a distance), was a loose cubit measurement based on the forearm and changed in classical Islamic Arab architecture according to the city. The Hans Wehr Dictionary of Modern Written Arabic gives the Egyptian ḍbirā‘ at 58 centimetres, the Baghdadi at 80 centimetres and the Istanbul at 66.5 centimetres. The ‘architectural ḍbirā‘, ḍbirā‘ al mi‘māri, was also different and measured 75 centimetres. In Oman, the ḍbirā‘ traditionally measured a foot and a half; to this day traditional master builders feel more comfortable using imperial rather than metric measurements. The knee was used to determine the depth of the foundations. The hand span (shibr) and fingers (uṣba‘) were used for mud-brick sizes and other smaller spans and measures. The fitr, an Arabic measurement, was also used, representing the distance between the end of the thumb and the end of the index finger when extended. The qāmah, ‘stature’, was used for determining the heights of floors, and a further measure of height was delineated by extending the arm vertically to form the maddah.

The constraints of this form of measurement, coupled with rudimentary building materials, dictated the overall span of ceilings (therefore determining the sizes of rooms) and necessitated the use of structural forms such as vaults and arches. These elements combine in the layout of spaces as well-proportioned configurations that are pleasing and harmonious. This is as true of the buildings as of the urban planning. The aesthetic quality found in vernacular urban settlements, towns and cities across the Arab and Islamic world is the result of the skills practised in the design of buildings; the social, economic, cultural, political factors that defined the function of those spaces; and a sensitive response to the surrounding environment. Traditional Islamic architecture, in general, was based on a system of well-defined geometric and cultural concepts that were acquired through research, accumulated knowledge and wisdom. The process of urbanisation, which Ibn Khaldūn elaborated on in his Muqaddimah, was the very word employed for civilisation in Arabic: al ḥadārab.
The Climatic Influence on Regional Architecture
Farokh Afshar, Allan Cain and John Norton

In 1973 when the Development Workshop carried out its research in Oman, Sultan Qaboos bin Sa'id bin Taymūr had barely been in power for three years, following the long reign of his father. Very little change had taken place in the lifestyles and living conditions of most Omani; the vast majority of the country's towns and villages, their architecture and the building methods used, had remained unaltered for centuries. This was a unique moment in the history of Oman's built environment, which provided a special opportunity for considering the problems and potential of indigenous traditions and the contribution that they could make to the development of the country.

For practical purposes, the research undertaken by the Development Workshop divided Oman into six areas, which were representative of the country's different climatic and cultural contexts. These were: the northern coastal plain (the Batinah coast); the northern uplands around Nazwa; the Buraymi Oasis; the Muscat and Mutrah capital region; Suq; and the southern coastal plain and Salalah. The desert interior and the southern uplands were inaccessible at the time. Each area was considered at the levels of both the settlement and the house, in terms of its socio-economic context, its climate and geography, and the materials and technology used in achieving the built environment. The coverage given to each region, however, was partly dependent on the amount of field work undertaken in that area. The area of the southern coastal plain and Salalah, for instance, was treated in the most detail.
For the purposes of this book, the original thesis produced from the findings of the Development Workshop has been abridged and structured to give an outline of the building traditions in each of the six regions. The sections on the Batınah coast and Salalah, however, include additional passages about 'arish, a material made from date palm on the coast and coconut in the southern plains area. These texts are invaluable for the information that they provide about buildings constructed from 'arish as they no longer exist, despite being a major building type at this time.

The Northern Coastal Plain: The Batínah Coast
The northern coastal plain extends from the United Arab Emirates in the north for 270 kilometres south-east to Nakhl where the Jabal al Akhdar mountains run down to the sea. Backed by mountains and in places only 10 kilometres wide, at the time of our study this coastal strip was dominated by a narrow band of date gardens and cultivation immediately behind the beach. Most people lived by fishing and cultivating crops. The date palm was a major resource, not so much for export, but rather as the source of food and materials for almost every aspect of life, from the construction of dwellings and boats through to making mats, fish traps and furniture. The date gardens represented one determining factor in the location of houses and settlements in the area.

A second factor shaping the form and location of settlements and houses was the climate, with hot and humid conditions from May to October. The Batínah coast's climate is directly affected by its proximity to the sea. Relative humidity averages a high 75 per cent in both summer and winter months, which in traditional building made cooling by ventilation a necessary consideration. It was important therefore to understand the pattern of local winds. Daily temperatures on the beachfront vary as little as 10°C, and annually range from 25 to 40°C. As distance increases from the beach, the range of temperature increases as well: inland of the cultivated belt it is both cooler at night and hotter in the day. This temperature difference over the short distance from the sea to the inland strip behind the date gardens creates the alternating daytime onshore sea breeze and night-time land breeze. In the daytime hot air rises inland and draws cooler air from over the sea, while at night, as the air over the sea remains at an almost constant temperature, it is warmer than inland: this warmer air rises and draws cooler air from inland. People living on the beachfront made use of these sea breezes to cool their houses, and this affected both house design and choice of building materials.

A third factor that influenced settlement patterns was the nature of water supply. Falaj al Qabil, near Şuţar, was an example of a village supplied by water from a man-made, horizontal, underground water channel, or falaj, that brought water from the mountains and channelled it through the village and into the date gardens. The village was clustered tightly around the water collection point. However, it was also located close to the date gardens, where the date palms effectively obstructed the sea breeze with the effect that the village became
intolerably stuffy in the summer, according to its inhabitants. For this reason, many people moved out to summer houses in the date gardens, and only came back to the village in winter. The village houses were well-suited to cooler conditions, with mud-brick walls, which provided insulation from the cool winter nights and limited air movement through the house. Located further inland from the date gardens were settlements where water came from wells, as was the case in Muladdah.\(^{10}\) Here, each house compound was situated quite far from its neighbours, allowing free movement of air through the settlement. The ventilation made summer conditions bearable, and there was less need to move into the cooler date gardens during the hottest months. Houses were built with winter rooms of mud brick and summer rooms of lightweight construction using date-palm fronds, or ‘arish, through which breezes could pass easily.

It is apparent from Falaj al Qabil and Muladdah that both settlements and houses were invariably designed so that one part could be used for summer living and another part for winter living. Seasonal migration between villages or between different parts of the house, for reasons of both climate and seasonal changes in activity, was the most notable characteristic of Batinah coast buildings.

The house of Muhammad Sharif ‘Abdullah, a relatively prosperous merchant, on the beachfront at Šuhr illustrates this seasonal ‘migration’ within the home, and the use of different materials. Twenty metres from the sea, it was built with rooms at the rear of the courtyard compound, constructed from mud-brick walls and flat timber and mud roofs, with small windows to provide protection from cool nights and to limit ventilation during the cooler winter months. On the other side of the courtyard, facing the sea, was an identical set of rooms
for summer use, but built instead with 'arisb stems on a
date-palm tree-trunk framework. These screen walls
allowed the sea breeze to pass through into the room,
and by creating a contrast between the dark interior and
the bright, outside light afforded privacy for the family
inside: people could not see in but the occupants could
see out through the screen, achieving with a simple
local material the same effect obtained with the sophisti­
cated and traditional wooden screen or mashrabiyyah of
Egypt. To obtain extra cooling from air movement, the
main summer bedroom was also equipped with a simple,
sackcloth, multi-direction wind-catcher or bādgīr (also known as a malqaf) – a pole-framed tower structure on the roof of the room, on which sacking was hung to divide the tower into an X-form; this caught the onshore or offshore breeze and channelled it down to the room below. This simple device was probably an idea imported from Dubai, Iran and Pakistan, where the use of elaborate wind-catchers is widespread. ‘Abdullah’s house had a second wind-catcher constructed from masonry columns and rigid X-shaped panels built with ‘arish stems and plastered with gypsum, instead of sackcloth. The wind-catcher could be closed down in winter by placing boards at the base of the tower. We conducted tests to assess the effectiveness of these types of wind-catcher, which showed that both worked well and made a considerable contribution to cooling the rooms below.

Muhammad Sharif ‘Abdullah’s house also had a sablah, the Omani term for the majlis, an important feature of all Arab architecture. This was a room at the entrance used for receiving special visitors who pass no further into the building and its courtyard. This room had openings on three sides to encourage ventilation and was built with mud-brick columns and walls; in other houses, the majlis was frequently built from ‘arish, but served the same function.

By the early 1970s the extent to which a house owner used ‘arish was often determined by wealth. To some degree, the choice by the richer inhabitants of the Batinah coast of more permanent materials over ‘arish can be explained by the palm’s main drawback: its short lifespan. However, there was also some degree of prestige involved in the use of new materials, which did not necessarily perform as well in relation to local climatic conditions as indigenous materials but which enhanced the status of the owner.

The suitability of ‘arish for the climate of the Batinah coast was demonstrated by its distribution within the area as a whole. Poorer houses along the beachfront and summer houses in the date gardens were often built entirely of palm. Inland from the cultivated belt, where relative humidity drops and the diurnal and annual temperature range increases, its use decreased; some houses only used it in ventilating screens and for animal
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pens and storerooms. The use of 'arisb was at its most advantageous where the summer climate has a combination of high temperatures and humidity and air movement is an important factor in attaining comfortable conditions. 'Arish wall panels allowed free passage of air into houses. Screens, like those described in Muhammad Sharif ‘Abdullah's house, also provided a vital protection for occupants of rooms from excessive sunlight.

The basic component of 'arisb housing was the date-palm frond stem. It was usually about 2.5 metres long, with a gently tapering but robust stem, which is more rigid than that of the coconut-palm frond used in the Salalah region. Although stems were not used for structural purposes (posts and beams provided the load-bearing framework), the date-palm stem gave greater rigidity in a wall than did the coconut-palm stem. A palm-frond stem was used either with its leaves left on or stripped. Single stems were tied together to form a type of mat, or da'in (pl. du'tun), the standard size of which was 2.2 metres high by 4 metres long, though the length could be varied. Approximately 140 stems were required to make a single-thickness da'in. Du’tun could be bought ready made in their simplest form, or, where a man owned some palm trees he would bind his own stems to form a da'in.
A da'in was usually supplied with each stem tied to the next one, in such a way that the top of one stem was adjacent to the bottom of the stem beside it, giving equal strength and thickness throughout and negating the tapering of the stems themselves, which become weaker the thinner they are.

Du'în were made up in different combinations to suit varying conditions and functions within the building of a house. They were all held together with string, and in the basic da'in this was the only binding used. Five common types of panels have been identified, though the full variety depended on the builder. The first of these was the simple screen, which was often used in a perimeter wall to the property. The bottom part of the screen had no leaves on it to allow for the passage of air, while the top part had leaves left on for privacy. When this type of screen was used as a wall, horizontal bracing was added. Secondly, there was a lighter type of screen which had all its leaves removed. This let air movement through and acted as a visual screen for a house’s occupant who could look out from behind it, undetected. The third type of screen was formed out of ‘arish tied top to tail so that there was an equal distribution of leaf and thickness of stem; du‘în were often bought in this form. Once in position, bracing was used to give strength and keep the leaves in place – the tighter the leaves, the greater the insulation, making it ideal for insulating rooms. The fourth kind of panel was a variation on the third; the most popular for winter rooms, it was of double thickness. Lastly were the panels used for roofs. These were of one or two layers of ‘arish, but always had their leaves pointing down the roof; the top layer protected the under layer, keeping out any water and guarding it against the desiccating effect of direct sunlight, therefore helping to prolong the life of the main roof panel, the inner layer.

The amount of ventilation, insulation and illumination could all be varied by increasing the density of the palm-frond stems in the screen, or da‘în. Screens for light and ventilation were made with a mixture of tightly and more broadly spaced stems that formed windows, while other panels were made up of several layers of stems and provided insulation and little or no ventilation. In some houses, extra panels were put up against summer screens as cooler winter weather arrived. Typical houses were made up of a variety of spaces, where the type of wall screen reflected the function, and allowed more or less ventilation. Salim bin ‘Abdullah’s house at Umm al Bawsh in the date gardens near Ṣuḥār gives an indication of the different use of ‘arish screens and panels.

The Northern Uplands around Nazwa

The northern uplands divide the Batinah coast from the Rub‘al Khali interior desert of Oman. The principal area of habitation is the central valley at the foot of the limestone mountain range of which al Jabal al Ahḍar forms part. Al Hamra‘, Buhla, Nazwa, Izki and Manah, the main towns of the region, lie in fairly broad valleys, and at the time of our study were either surrounded by or next to an area of date gardens and garden plots. Water came mainly from underground irrigation channels, although cultivated areas also made use of wells.

Traditionally, this was an area which had been powerful, independent and self-sufficient. This was reflected in the houses, which, compared to those of the Batinah coast, were architecturally far more substantial and hence more decorative.

The high altitude of the northern uplands modifies the climate, which is both cooler and drier than in the coastal region, and has greater daily and annual
temperature ranges. As in the Batinah coast region, rainfall is very scarce. Winters are often too cold for comfort at night, and days during the five summer months are extremely hot. The more rapid heating and cooling of exposed rocky valley slopes, compared to the relatively shaded gardens in the valleys, creates an effect similar to the daytime and night-time on- and offshore breeze of the Batinah, but here air is drawn up the slopes in the daytime, contributing to cooling in the hottest months.

Since cultivated land was at a premium, most of the built area was either on land unsuitable for farming or in the wadis where flash floods occur. The location and form of settlements was also determined by the need for security, so they tended to be compact and clustered around a fort. Al Hamra’ was typical of the towns of the region, making use of the valley sides, with the richer houses at the bottom near the gardens and water and the poorer houses near the top, but with the whole settlement clustered together to form a fortified whole. The market was usually close to the fort, and these two buildings represented the focal points of the town, although by 1973 the newer administration and public facilities built outside the traditional centres were beginning to change this.

The towns and villages displayed two characteristics related to climate. The houses were clustered together along narrow streets to provide shade and trap cool night air, in conditions where air movement was less important. Seasonal migration from these town dwellings to summer houses in the date gardens was also necessary during the hot summer months. Set in relative isolation
in the gardens, these were built for the most part with thick mud-brick walls, sometimes with alcoves in them; a few were built with stone; all had flat timber roofs with da'in matting and mud covering. Roof beams were often decorated. Here, as in other parts of the country, the decorated Omani door was common. Some newer cement buildings imitated the thick dimensions of traditional walls, which made them very comfortable, but also very costly.

Houses in the towns often shared walls and the mass of mud building helped to maintain a stable thermal mass throughout the whole settlement, with little daily temperature variation within the building structure despite the fairly wide temperature range of the local area. Many of the town houses were two- or three-storey structures, built up (in the case of al Ḥamrā') in ascending levels. These dense clusters of buildings were most comfortable in the cool season.

Individual houses were predominantly built around a central courtyard, which functioned as a light well and ventilation shaft. Cool night-time air sank into the base of the courtyard where the sun could not penetrate, and remained there to cool the house during the daytime. On the roof, the parapet was high enough to provide privacy for the enclosed terraces, which were also used as living space. Inside the house, the sablah was an almost standard feature, at times doubling as a workshop, and in general being more flexible in its function than the sablab of the coastal region. Apart from this, ground floors had very few or no openings. Although the lower floors were mainly closed, the upper floor of many houses had window openings facing the daytime valley breeze. The night-time breeze was less welcome, and there were fewer openings towards the higher slopes from which this cool air would descend.
**The Buraymi Oasis**

Buraymi Oasis, which gives its name to the surrounding area, is on the frontier with Abu Dhabi and Saudi Arabia and is the largest of several oases. It is not far from the western end of al Jabal al Akhdar. Located in the hot conditions of the desert, the oasis environment modifies this climate; it is cooler than its surroundings due to the presence of trees and irrigation, but humidity is higher. In 'Ayn in the United Arab Emirates had developed into a substantial and wealthy town with oil revenues. Poor road links with the rest of Oman, however, contributed to the discrepancies between al Buraymi and al 'Ayn.

Once again, water was the main factor that influenced the original settlement pattern of al Buraymi, and houses were generally built on land not suitable for cultivation and above the level at which falaj carried water into the settlement. The main towns and villages were all situated around the date gardens, including the stūq and the forts. The streets were quite wide, providing little shade, and even secondary streets were not narrow enough to provide protection from the sun. Buildings were either one- or two-storey structures. Al Buraymi stūq was a completely covered structure, much of it with corrugated-iron sheeting, which contributed to extremely hot selling conditions. As well as the clusters of buildings around the fort and market, there were also houses scattered amongst the date gardens, set several metres above the level of the gardens themselves. Houses were thus protected from flooding, which was not uncommon.

Because of the climate, insulation was maximised in the buildings, which had small windows and thick mud walls. Roofs were constructed in the same way as in the northern uplands, although by the time of the study corrugated-iron roof sheeting was being introduced in several buildings, even though it created much hotter working and living conditions than the traditional materials. Concrete blocks were also beginning to be used and local builders said that there was very little mud-brick work being done.

**The Muscat, Mutrah and Ruwi Capital Region**

This region covers the capital area from As Sib, at the southern end of the Batinah coast, to the mountains which run into the sea at the southeast, cutting off the area from the coast further west. There are four natural bays, two accommodating Muscat, the capital of Oman, and two Mutrah, which in 1973 was the new and expanding port.

The region is close to the Batinah coast and hence has a similar general climate, though this is modified by the surrounding bare rocky mountains. This is best exemplified in Muscat, where the town's protected harbour opens on to the sea, while the rest of the settlement is surrounded on three sides by steep rock faces. The light-coloured stone mountains around Muscat act as reflectors for solar radiation, focusing heat on to the town even after nightfall because of the heat storage capacity of the rocks. Muscat is said to have temperatures 5°C higher than those of the surrounding country and therefore depends on local daily land and sea breezes.

In 1973, Muscat and Mutrah were the only two major established towns in the north of Oman, the latter with more room for expansion than Muscat, which was, however, the traditional seat of government. In both, the ideal settlement climatically was one of narrow shaded streets that also allowed for air movement between the houses. However, Muscat and Mutrah have different characteristics. Muscat functioned largely as a seat of power with the palace, embassies, government and commercial offices making it the wealthier residential area. The buildings in the settlement were more widely spaced than in poorer Mutrah. They were freestanding, larger, more spacious and better maintained. In 1973, this meant that cars could be more easily accommodated, and that houses were open to air movement. It also meant, however, that the wider streets were exposed to the sun and uncomfortable for pedestrians. The exception was the stūq, which was compact, its shops separated by narrow, winding alleyways that were shaded and cool.

Mutrah, on the other hand, had become the major trading centre of Oman. It was more densely built up with shops, houses and offices closely packed together. Streets were narrow and on a human scale, catering for the cart and the camel. In terms of shade, this was an
advantage. However where the car had begun to penetrate, the result was congestion. The houses in Mutrah were closely grouped, both physically and socially, into communal clusters. The most identifiable grouping was that of the Lawatiya Quarter, the residential cluster built by the early Indian merchant community in the post-Portuguese era. There are two access gates to this area, leading to narrow alleys. The houses are two or three storeys high and form a protective wall around the area, with no openings at street level. At the time of the study, many of these buildings were in poor condition.

In both Muscat and Mutrah, the high population and the scarcity of available land for building had resulted in a relatively dense settlement pattern, albeit exhibiting the differences mentioned above. This meant that natural ventilation through the settlement was restricted, and other means had been found to encourage air movement and cooling. The courtyard house was one example, trapping cooler night-time air in the base of the courtyard. Another was window openings designed to facilitate air movement and to help keep interiors cool.

Typical windows in the indigenous houses of Muscat and Mutrah had multi-level openings; an example is shown here from Najwani House on the beachfront of Mutrah. This house had thick limestone walls which, due

![Image of the courtyard house in Mutrah with annotations explaining the cooling mechanism through night-time air trapping and natural ventilation.]
to the material's thermal capacity, had a relatively constant temperature on their internal surfaces. Ventilation was therefore important for cooling. Muscat and Mutrah receive daytime onshore sea breezes which aid cooling. Windows were designed to allow this breeze, cooled by the sea, to blow into the dwelling, but it was necessary to exclude solar radiation which would otherwise raise indoor temperatures. Two shading devices were used, one of which was a wooden awning-type construction and the other a gypsum-plaster lattice window. The lattice windows of Muscat and Mutrah were generally elaborate, finely-detailed gypsum panels set into the wall. Their purpose was to allow daylight to enter and air to circulate, and to afford a view while excluding glare and solar radiation, as well as maintaining visual privacy. In the houses of the Muscat/Mutrah area, lattice openings were usually found in the upper portions of the window, or as high window and ventilation openings. Because of the air's high moisture content, the sky reflects a great deal of light and skies are much brighter than in dryer climates. The lattice-work screens (similar in function to the 'arish screens on the Batinah coast) protect the eye from its harsh glare. Openings high up in rooms are also necessary to allow for the escape of warm air which collects in the upper reaches of a room due to convection.

Another elaborate window design was found in the windows of Bayt al Zawawi (also known as Mughabb) in Muscat, which had incorporated an evaporative cooling system. The cooling unit used a porous, unglazed water jar, which was placed in the window opening, so that air entering the room passed over it. Water seeped through the water-filled jar and kept the outer surface of the jar permanently moist. Air passing over the surface caused the water to evaporate, absorbing heat energy, thus cooling the air and providing a supply of cool water in the jar itself for drinking. Once again, shading devices and lattice windows were used to prevent solar radiation from entering the room. This same evaporative cooling system, using porous water jars known as mazyarah, existed in Egypt and tests there have shown that it could reduce temperature by as much as 10°C.

**Şūr**

Located at the southern tip of the mountains which run through central northern Oman, Şür developed as an important terminus for trade routes from the desert and Dhofar, at the point where the Oman Gulf opens into the Indian Ocean.
In 1973, Sur proper, al ‘Aygah and Bilad as Sur formed one economic unit. Bilad as Sur was an agricultural town, an oasis area a few kilometres to the south-west of Sur, the market and trading centre, which is located on the coast. Al ‘Aygah, a smaller settlement, was an extension of Sur proper on the point of land across the narrow straits east of Sur, and reached by ferry. Sur’s importance as a trading centre in the past had resulted in a large community of Indian merchants and shopkeepers going back several generations, as well as a community of fishermen, boat-builders and traders with links to the rest of the Omani peninsula. By 1973, however, the economy had been in decline for some time and unemployment was already high. Nevertheless, a few local crafts and trades still flourished in Sur proper.

The town of Sur is almost completely surrounded by sea, lagoon and tidal flats, with a good natural harbour which contributed to its development. Much of the apparently dry land is seasonally covered by water. Since economic activity for the whole region centred on the town, due to its harbour and trading facilities, a densely clustered built environment developed. Almost all the permanently dry land, other than open public spaces, had structures of at least one or two storeys.

The climate of Sur is uncomfortably warm in the months between May and September though generally spring and autumn conditions are favourable. Winter nights are disagreeably cool. Being on the coast, Sur has relatively high humidity throughout the year; there is, however, very little rainfall. As with the other coastal areas, Sur receives daytime northerly onshore and nighttime southerly offshore winds. This daily fluctuation is modified by seasonal variations in the prevailing wind system. In the winter, the northerly onshore sea breeze predominates, strengthening the daytime winds and negating, or even reversing, the normal night-time breeze. On the other hand, in the summer a southerly land breeze prevails, strengthening the evening and night-time winds and somewhat reducing the daytime sea breezes. This is an unfavourable condition, since air movement is required particularly for cooling at midday in the summer when temperatures and humidity are high.

The residential areas of Sur had a relatively uniform high density, with houses, mosques and the occasional shop built either immediately beside each other, sharing a common perimeter wall, or separated by a tiny alley or passageway. Streets were narrow and corridor-like and ran roughly at right angles to each other. Principal streets connected the perimeter of the settlement (shore area) to the suq area. This was the social and economic focus of the community, with tradesmen and craftsmen’s workshops found along with a number of cafés. The suq differed from the dense settlement pattern of the rest of the town, with activities located around a large open square. The area was left open for sellers to set up temporary stalls during market times, sometimes in quite unhygienic conditions. Socially as well as economically, and in the context of Sur’s high density, the market provided a place for larger groups of people to meet. However, in 1973 the traditional economic focus of the market had begun to shift as the government financed new building outside the town.

The summer climate in Sur called for air movement to be encouraged in the settlement and through houses. The high density inhibited the penetration of sea breezes at ground level, although the juxtaposition of narrow shaded streets and the larger open space of the market allowed hotter air in the market to rise, drawing air through the streets.

More comfort could be achieved through the design of houses, and the courtyard type predominated. A perimeter wall, generally 2.5 metres or more in height, surrounded each site, with direct access to the street. The rooms of the house developed along the perimeter wall, and would generally be added one by one starting from the back of the courtyard, eventually extending along two or three walls of the courtyard but not usually enclosing it completely on four sides. A first floor usually followed. To benefit from the sea breeze the northern part of the courtyard was frequently left unbuilt, or with a lower storey only; this also helped to reduce the effect of one courtyard being built in the ‘wind shadow’ of a neighbouring courtyard to the north.

The first floor and the roof area were important spaces where the sea breeze could be enjoyed, and many
Limestone was the material predominantly used in the town houses of Šur; this was laid in a mud mortar and often had gypsum plaster applied on the exterior walls. The quality of limestone varied greatly, soft stone being quarried along the shoreline and harder stone further inland. The soft stone weathered easily and had to be maintained. In many cases houses were owner-built, though local builders did exist. Woodworking crafts were still in existence, though only three or four workshops remained, making doors, windows and cabinets. The extremely fine examples of door and window woodwork seen around Šur seemed to have been forsaken for simpler designs from India, as skilled handiwork gave way to machine production.

The Southern Coastal Plain and Šalālah
The Dhofar (Zafār) coastal plain is widest between Rakhyūt and Šalālah (4 to 5 kilometres) and tapers to a narrow stretch between Taqah and Mirbat to the east. Behind, rocky hills and mountains rise to almost 1,500 metres. The plain is predominantly a limestone shelf, with only a thin layer of fertile soil. In 1973, planting along the coast was mainly coconut-palm groves which were once irrigated by a sophisticated falaj system, though agriculture in the region had recently fallen into decline. The main town of Šalālah lies just inland on the Dhofar coast, facing the Indian Ocean. At the time of our study, Šalālah was both geographically isolated and troubled by fighting in the hills behind it, though historically there were strong ties between the town and the people of the interior. The economy of Šalālah depended on its coconut plantations and its fishing industry. Traditionally many of Šalālah’s population were fishermen or involved in some other aspect of fishing, such as processing during the winter sardine season. A large catch was composted and dried on the beach; its oil was collected and exported to the Gulf or used as a waterproofing agent for wood, and the dried residue was used either as agricultural fertiliser on the coast or as cattle fodder in the interior. The people of the interior (Jibali) were herdsmen, grazing cattle on the grassy slopes for most of the year. In the dry season, when the hills were bare of vegetation, the herdsmen relied on dry sardines to feed the cattle. This was one basis for trade...
between the hills and the coast: cattle were traded for sardines and other basic commodities required in the interior villages. By 1973, fighting had cut off this trade, and both the Jibali and the inhabitants of Salalah suffered as a result. In addition to this, the influx of refugees into the Salalah area had led to a demand for land and building materials that could scarcely be met. However, it also stimulated the building industry, with craftsmen coming to the region from India and Pakistan in response to the demand.

Salalah developed in a linear form parallel to the sea. The coconut-palm plantations created a dividing line between 'urtsh houses on the beach and substantial limestone town houses inland. Because of the scarcity of agricultural land, there were few buildings within the coconut groves.

Salalah has a form of monsoon climate, although it has little in common with the weather patterns of, say, India. The summer monsoon season is not a season of rain but one of mist and slight drizzle, the humidity averaging 95 per cent in July and August. Stronger southerly winds that start in May cause cool water to be drawn to the surface of the sea and this lowering of temperature results in an almost saturated air. This cool damp air moves up over al Jabal as a thick mist, producing a clear belt of vegetation along the coast. For the rest of the year Salalah’s humidity is quite moderate. The area receives little rain, with a total of only 25 millimetres in each of the summer months and an average yearly total of only 80 millimetres.

The climate is uncomfortably hot in May and June and for parts of October. The months of July and August, though disagreeable due to the high humidity, benefit from the cooling effect of the moist onshore winds. In the winter months, the temperatures are relatively cool at night. Most of the year Salalah receives the daily onshore–offshore winds, but this pattern is modified by seasonal prevailing winds. These generally produce a dominant southerly wind in the summer and a dry cold wind for a brief spell in the winter, which is strong enough to damage lightweight buildings.

Climate was a major factor influencing the form and location of buildings, and ventilation was essential. During the summer the onshore breeze was drawn into each house. Air movement provided relief from the constant warmth and extremely high humidity of these months. Houses were situated not only to draw in maximum breeze, but also so as not to block air movement to the houses behind; where possible each house was situated so that there were no obstructions between it and the southern exposure, allowing breezes to reach the building unimpeded. Thus many traditional Salalah town houses had a large, south-facing yard in front of them. This was defined by a low-facing yard in front of the house as to interfere with the breeze reaching the windows of the south wall.

However, the unstable local situation at the beginning of the 1970s resulted in an influx of refugees that changed the settlement pattern and density, since the growth of the town was limited by the boundaries of the militarily secure area. Unlike the indigenous scattered settlement pattern, new settlers were building in open spaces in their own tribal areas in the existing town, thus congesting some of the formerly open spaces and leading to poorer ventilation and insanitary conditions.

As far as houses were concerned, the basic social unit was the extended family. Quite often a number of brothers occupied the same house with their families, as a single economic unit. The family house was inherited by the heir to the family power. Therefore, the Salalah house could be seen to represent the accumulated wealth of many generations. As the family grew, more rooms could be added to accommodate it. Although many changes had taken place socially and economically, on the whole building continued to use the forms of this incremental growth. Families built for future expansion and still favoured durable and reusable limestone, despite the fact that its price had greatly increased compared to concrete. Though quarried locally, limestone was mainly cut by hand by the local population, and old limestone houses in the town were said to be two hundred years old. In the early 1970s, however, attempts by local government to mechanise the process were underway, and living patterns of the West and the use of non-indigenous materials, furnishings and implements were beginning to influence many buildings.
Surveys of different houses in Ṣalālah showed the house form in all stages of development. The basic form was the courtyard house, built on a plot that was usually square. A family would first establish a perimeter wall and a temporary shelter within, which was often built in 'arish as a short-term measure. If possible, the owner soon began to build with a more permanent material such as limestone, intending eventually to build on more than one floor, or at least to provide the base for his children to do so when the need arose. Load-bearing walls were built to support several storeys, and the limestone could be reused if future changes were made to the house. The basic plan was almost always symmetrical, and arranged around a central courtyard, with the

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\*Evolution of the courtyard town house*

**Top** House originally constructed in 'arish in a new settlement area near Ṣalālah

**Bottom** Mud plaster and 'arish house with limestone addition

**Top** One-storey house constructed in limestone with 'arish and composite roofing

**Centre and bottom** Two-storey house in the old town centre of Ṭa’qah, constructed in limestone with 'arish roofing
entrance on the southern wall in the centre or slightly off-centre. The first room to be built was either at the front (south) of the plot, with windows facing the open space in front of the house, or at the back (north), opening on to the courtyard. Drawing air into the rooms was an important consideration.

The growth of the house over time took place in a spiral-like manner. Once the ground floor was completed using load-bearing materials, rooms were built at the front on the first floor. Construction continued to the back and around the courtyard, then started at the front on the second floor. In many cases the houses were completely owner-built with family support; this was particularly true for those using local materials, though in some cases the owner contracted out parts of the construction, such as roofing or concrete walls.

As already mentioned, buildings in Salalah were predominantly of two types: the ‘arish structures near the beach; and the substantial limestone houses found predominantly inland or in old built-up areas. The distinction between these two forms of construction was largely social and economic. Limestone was used as the principal material for houses of the townspeople and merchants, while ‘arish was used for the dwellings of the descendants of slaves and sardine fishermen. ‘Arish was a cheaper material than limestone and also responded directly to the local microclimate which has higher humidity levels than further inland. Further back from the beach, ‘arish was used in combination with a clay plaster to produce walls with greater insulating properties which provided thermal protection for the winter. These walls had screened window openings.

The ‘arish used in Salalah is quite different from that used on the Batinah coast; it is harvested from the coconut palm, as the date palm does not grow in the region. The coconut palm is much more leafy; its frond stems are shorter and taper very quickly. While date-palm ‘arish can be used in pre-assembled panels in an almost ‘prefabricated’ system, coconut-palm ‘arish requires more of an in situ method of construction. Walls of coconut-palm ‘arish are not self-supporting (as are date-palm ‘arish panels), but require hardwood posts or some other supporting member to provide rigidity.

The dimensions of an ‘arish room had first to be plotted out on the ground and its corners established with heavy hardwood or palm posts driven into the ground. Long posts, often naturally forked, were set at the centre points of the end walls to support the roof-ridge beam which would run between them. At intervals of about 30 centimetres along the length of the wall, posts of a smaller diameter were driven into the ground. Thinner horizontal members, either ‘arish stems or hardwood sticks, were tied to the posts to form a lattice
framework. This lattice was tied, so that a cavity was formed between pairs of horizontal members. Coconut-palm fronds with leaves on them were then inserted into the cavities formed between the horizontal members, constituting the substance of the wall.

With the walls completed the roof structure was assembled. Apart from the two roof posts in the end walls and the long hardwood ridge beam tied horizontally between them, the basic roof structure was assembled on the ground before erection. This comprised a lattice of wooden sticks and 'arish stems loosely tied together, which could easily be hoisted into position by two men
using ropes. The lattice was tied to the ridge beam and the supporting walls, and then post-tensioned by pulling all the ropes taut. Palm stems with leaves were fixed to the lattice once it was tied firmly in place, with the tips of the leaves pointing downwards. Each successive layer was tied to overlap the one beneath, on the same principle as thatching or shingling, in order to facilitate water shedding.

The room was then complete, unless the owner chose to render it with mud or some other material such as gypsum. Rendering material was applied directly to the wall surface, which had previously been moistened. No lathing was necessary because the 'arish leaves provided an excellent roughened surface for the plaster to adhere to.

Our study included tests of building materials used in the Salalah area to understand the qualities of each, particularly their heat transfer properties which played a part in modifying the internal microclimates of buildings. We chose to test limestone, 'arish panels plastered with mud on both sides, and concrete block, selecting rooms in houses in the new settlement area of Salalah. We found that the internal air temperatures of every room exceeded the comfort limit for most parts of the day. Air temperatures within the limestone room were consistently above the upper limit of the comfort zone. Within the mud-plastered 'arish-walled room, temperatures were comfortable in the morning and at night, but above the comfort limit in the afternoon and hottest in the evening. Within the concrete-block room, temperatures were well above comfort limits by late morning, and continued to be so throughout the afternoon and evening.

Because of its heat transfer properties, limestone is advantageous in maintaining moderate comfortable temperature conditions within a building in the cooler winter months, but during other times of the year none of the materials tested produced a comfortable thermal environment inside buildings. Thus, as we have already seen, factors such as air movement had to be considered in the design of buildings in the Salalah region. The south side of a house, facing a large yard, was pierced with numerous large openings to allow air to pass freely, while the north wall had only a few small openings so as to provide protection from the cold, dusty northerly winter wind. The courtyard form also ensured that any part of the building was only one room deep which aids cross-ventilation.

Our study also assessed the performance of the traditional courtyard house in coping with the area's climate. At night the temperatures of the sea and land are similar, which produces little or no breeze. The principal of radiant heat is important: the relatively warm earth radiates heat energy to the dark sky. Exposed horizontal surfaces such as flat roofs cool rapidly, in turn cooling the adjacent air. This cool dense air on the roof seeks the lowest available level and settles into the courtyard, displacing any warm, lighter air which may have remained there. The courtyard becomes a cool air 'well'. As the night progresses to early morning, the land continues to cool and falls significantly below the temperature of the sea, resulting in a land breeze. The north wall, with its small openings, receives little air movement. Cool heavy air continues to be deposited in the courtyard well. With the morning sunlight land begins to heat up again, approaching sea temperature, and air movement tends to disappear. Roofs and south walls are heated up because they receive direct sunshine. The courtyard remains shaded, protecting its well of cool air. As the day progresses and the land warms, the sea breeze takes over. Air passes freely through the rooms of the house.

Postscript

Oman has a rich and diverse geographical and social context, in which a wide range of locally suited settlement and building solutions have developed over centuries. In the early 1970s, our study of the country's indigenous building, and its potential contribution to building and planning in the future, recorded a large array of existing practices and a skilled use of materials that could provide viable, durable and comfortable solutions to building needs. These can still, in many instances, point the way towards defining and achieving a sustainable and comfortable built environment which is at one with both tradition and contemporary needs.