

Architecture Culture in the Mediterranean Region. Specific Tactics of Passive Conditioning in Our Architectural Heritage

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Abstract

The purpose of this paper is to explain how human interaction with the environment has emerged an architectural culture deeply rooted in the territory in the Mediterranean Eurasian region. The importance of this work lies in the consideration of architecture as a basic result of an evolutionary process since ancient times shows this interaction elemental. It is therefore in our historical and artistic heritage that we must seek the architectural achievements made in terms of sustainability.

An effective way to present this goal is by exposing specific tactics of passive conditioning, without mechanical means, revealed by the buildings of our architectural heritage. The most decisive reason of a successful research has been the consideration of domestic architecture as a repository of these tactics of passive conditioning. Tactics are technical solutions that have endured over the spontaneous consciousness of the people ensuring their survival.

Therefore, this paper shows some of the achievements of domestic architecture that resides on the spontaneous consciousness of the Mediterranean peoples in relation to sustainability, energy and the environment. These achievements justify its firmness by historical traceability and its validity by bioclimatic behavior. At the same time legitimizing the greatness of their constructive and artistic expression, with the use of local materials, has reached insuperable heights.

The results allow conclusions about the desirability of protecting, catalog and preserve the specific tactics of passive conditioning residing in the Mediterranean architectural heritage for possible consideration as a first step towards zero energy cost architecture.

Keywords: Architecture, bioclimatic, domestic, environment, heritage, Mediterranean, strategy, tactics.

Introduction

The energy crisis and climate change have led to a growing concern evidenced by the profusion of lines of research in all fields of scientific knowledge. We are seeking solutions for research lines opposite essence, in the field of architectural knowledge: one that proposes new methods and architectural models and another that explores the architectural heritage.

In the last century a new architectural movement emerged breaking with traditional construction principles and focusing on new energy-efficient models, looking for an architecture that can be implanted in any territory. A world leader of those who defended this counterculture movement is Victor Olgyay that, in 1962, proposed a new architecture known as "bioclimatic architecture". Alongside this cultural current, a concern to preserve the good work of vernacular architecture tied to a specific territory or entity biogeography is consolidated all over Europe. It is worth noting the work of Javier Neila González, relating to environmental conditioning architectural techniques, which presents the invariants revealed by vernacular architecture as references for a good architectural design in each territory. These invariants vernacular architecture are reference passive design can be completed with actions proposed by the new bioclimatic architecture.

If we consider, according to Charles Redman, that culture is a tool that acts as an intermediary between human group and the environment, so that humans use tools or cultural systems to adapt to the environment, we can observe architecture as a cultural system that develops adaptation tools, showing crucial environmental information and tactics that have led man to successful adaptation to their environment.

The first step before starting the observation of these coping mechanisms is to find a large homogeneous territory but adjusted to the desired level of knowledge. Large tracts of homogeneous territory allow general solutions and small areas we provide detailed knowledge. The area of this study is the Eurasian Mediterranean ecosystem that goes far beyond the Mediterranean sea basin in the east to reach Afghanistan. Mediterranean ecosystems of the world are limited to five relatively small areas are in the southern and southwestern Australia, in central and southern California, reaching in the Mexican state of Baja California, in the center of Chile, in the coastal province of Western Cape in South Africa and in the surroundings of the Mediterranean Sea that extends from the east to the plateau of Iran.

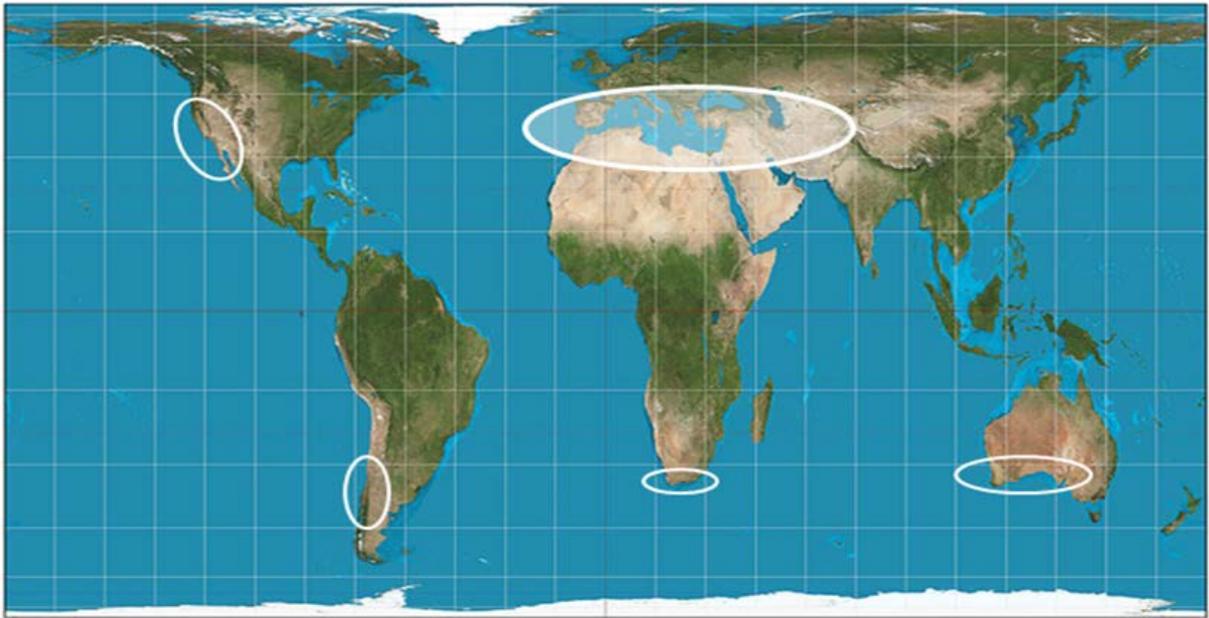


Figure 1 Mediterranean ecosystems. Source: Own elaboration map based on satellite image projection Peter.

They have a common climate, latitudinal situation around 35° N and S and a position in the west of the continents bordering their desert areas. These regions have similar landscapes but have been subjected to various processes of humanization. The Eurasian Mediterranean ecosystem is the cradle of Western civilization for millennia that welcomes human activities, while other regions have been populated only a few centuries ago showing a lower population density. Of the five Mediterranean ecosystems in the world, it offers the best documented set of cultural systems developed by the process of humanization, with more and diverse data, and has a large architectural heritage that presents new opportunities to study.



Figure 2 Mediterranean (red) and Temperate macrobioclimate (green). Source: own elaboration map.

The territorial area can be delimited by references or references bioclimatic biogeographic, however, the criteria for both disciplines were needed to define homogeneous areas of different widths that allow different levels of observation. Therefore, we have identified three biogeographic subregions macrobioclima included in the Mediterranean: the Irano-Turanic, dominated the cold deserts and steppes, the Saharian-Arabian, where are the hot deserts and the Mediterranean basin, the territory of the sclerophyllous.

Tetsurō Watsuji emphasizes the importance of environmental conditioning of human existence and teaches us to understand human existence and cultural history from the knowledge of the types of climate and landscape that are both paradigms of forms of history and culture.

Watsuji emphasizes the importance of environmental conditioning of human existence and teaches us to understand human existence and cultural history from the knowledge of the types of climate and landscape that are both paradigms of forms of history and culture. Watsuji think that the Mediterranean climate has a friendly nature compared to the nature of the Japanese climate, referring to the scarcity of torrential rain, the dry environment, weak wind and places in Italy the real cradle of European. he maintains that the separation between the humidity and heat shows the face of a happy nature, rational and submissive, where the Greeks learned to look to a nature nothing hidden, found it rational rule and fused with it; therefore the climate was manifested in the Greek spirit and Hellenistic culture emerged.



Figure 3 Warm desert area (red), the steppes and cold deserts area (brown) and sclerophyllous area (green). Source: own elaboration map

The last guideline to adjust the field of observation refers to the archaeological and built architectural heritage preserved. The contents of this paper are based on the observation of those who are part of domestic architectural culture lies in the spontaneous consciousness of the people, which remains selective knowledge of

materials, basic construction techniques and associated lifestyles. The study of the heritage in an homogeneous environmental context helps us to understand the rationale and the origin of adaptive tools that have been developed through the history of the region.



The interaction between man and environment is a process that begins with the emergence of cultural systems, if we understand architecture as one of those systems that made possible the permanence of man in each territory, we can find information on adaptive tools that emerged despite and because of environmental limitations. These tools are specific actions or tactics facing towards environmental conditioning.

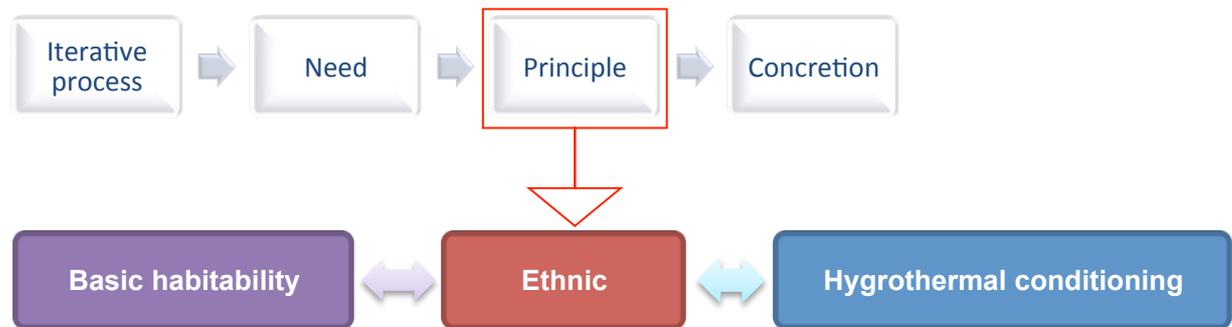
Environmental tactics of passive conditioning

The tactic is a specific action, a system or method that executes within an overall plan or strategy devised by man for a purpose.

The tactic helps tidy up resources and reduces the margin of error minimizing spontaneous actions. An environmental tactic is the concretion of an idea or method integrated into a bioclimatic strategy which aims to achieve wellness in buildings. Environmental tactics emerge to operate facing to bioclimatic aspects (the action of climatic factors and the availability of natural resources), to meet cultural aspects resulting from the way of life in each country, and even to improve indoor comfort in the buildings.

Environmental tactics and bioclimatic strategies present in domestic architecture are part of a spontaneous conceptual project, synthesis of Mediterranean culture and environment. We are facing an iterative process that begins when a need arise from an environmental constraint or a cultural aspect linked to a particular lifestyle. This need stimulated an idea or a principle that takes shape in a habit, a constructive system or an architectural element. The first achievements arise from basic habitability needs, once man has sedentary. Later, with the progress of civilizations emerge the need to adapt the spaces to societies organized in each territory.

The Mediterranean region was providing to the first architectural types that constitute the seed of all posterior architecture. Based on architecture that is already habitable and ethnic, hygrothermal conditioning systems are developed that contribute to greater interior comfort.



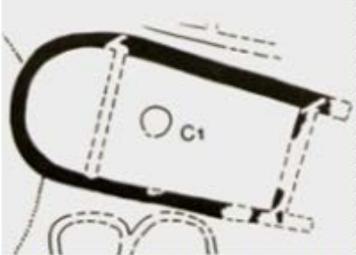
The basic habitability needs are those who seek to healthy living conditions inside the home, are the first to appear in the historical sequence. They materialize in tactics to protect against climate factors, to preserve or renew the indoor environments, for water supply and indoor natural light.

The ethnic needs are inherent in a human community or people with affinities in their way of life, social organization, in their family relationship in trade relations, in the technical capacity to manage natural resources, ... The ethnic tactics arise after the lifestyles had left their mark on the architectural culture and the human groups enjoyed dwellings with basic habitability and started to organize themselves into societies for historical significance. The dwellings are organized according to complex schemes, are zoned according to orientation, are related to form spontaneous or planned urban fabric and are used according to the comfort in the rooms. New specialized architectural types were born: palaces, forts, markets...

The hygrothermal conditioning needs are the last to show up in the historical sequence, the most complex, and its goal is improved the basic habitability. They are based on physical principles for heat transfer, so it requires complex technical and scientific knowledge. They arise into advanced civilizations that have developed systems of thought (mathematical, philosophical, physical) and scientific methods. The heat transfer processes are not isolated so they must be involved a combination of conduction and convection with radiation. The main goals are: to cool overheated indoor environments, to accumulate masses of fresh air and to heat in the coldest periods.

Below are the objectives or needs of hygrothermal conditioning, the idea or principle governing the concretion of this need and the description of specific tactics. Shows the evidence its historical and current presence.

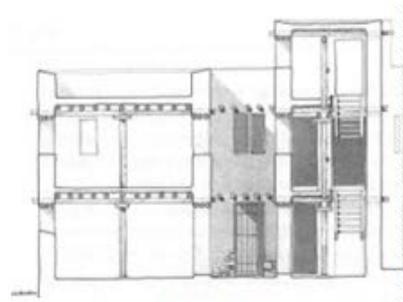
HYGROTHERMAL CONDITIONING

GOAL	TACTIC	Circunmediterranean area, sclerophyllous and hot deserts	Asian area, deserts and steppes domain
Principle	HISTORIC ATTACHMENT	CURRENT PRESENCE	HISTORIC ATTACHMENT
<p>HEAT Convection</p>	<p>Hearth</p>	<p>The hearth or stove is a heat source, fixed or mobile, which can tempering a room housing. In the Asian area, the archaeological remain more antique is the hearth with smoke ventilation in bathrooms. in the Circunmediterránea area, the archaeological remain more antique is the opened hearth in the center of the meeting rooms.</p>	
		 <p>Fixed central hearth, 6500 BC, Lerna, Greece.</p>	 <p>Fixed hearth, Fez, Morocco</p>
		 <p>Bathroom with hearth, s. XVIII BC; Tell Hariri, Syria. (Andre Parrot, 1958)</p>	 <p>Stove, Iran. (Horne)</p>
<p>HEAT Solar radiation</p>	<p>Mass built</p>	<p>Solar radiation is a heat source known since ancient times. Building mass protects the solar radiation and the glass transforms into heat, tempering the space by the greenhouse effect. Although Mediterranean dwellings are facing courtyard and they close their facades to the street to protect, in the yards we see different levels of exposure to solar radiation. In many areas, courtyard facades are built with wood and glass lattice that capture solar radiation in winter benefit the greenhouse effect, and are protected in the summer by curtains, porches or iwans</p>	
		 <p>Tunisia</p>	 <p>Isfahan</p>
		 <p>Shiraz</p>	

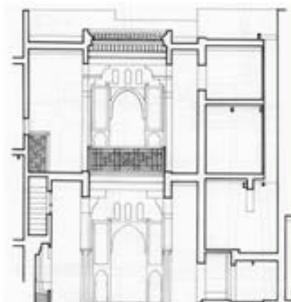
STORE ENERGY
In mass

Mass built

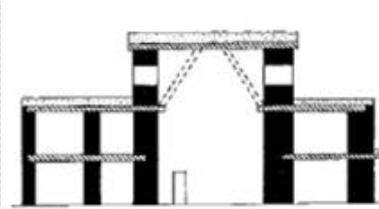
The dwelling protects the external environment when charging its mass with the energy received from the environment, the sun and the ground, until the building mass exhausts its thermal capacity, from this moment it becomes energy emitter to the environment. The proper arrangement of thermal mass in the house, where it is necessary to accumulate cold or heat, is a sophisticated and complex system of passive conditioning of Mediterranean house. Sections of traditional dwelling shown how along history and in each area change the arrangement of the thermal mass. Overall, Mediterranean dwelling accumulates energy in the basement and ground floor walls, built of brick, adobe or stone. The upper floors and the courtyard facades have little thermal mass to accumulate energy, either by building materials, the facade design or the protection systems against solar radiation.



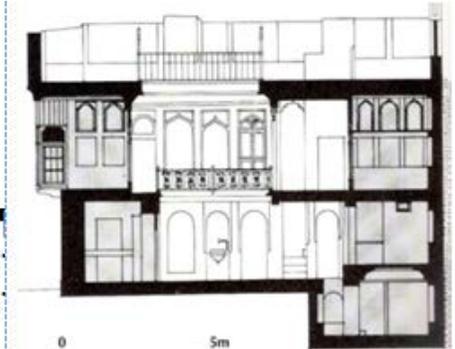
House, s. XIII BC, Ugarit, Syria. Hypothetical recreation



House, s. XVII AC, Tell Hariri, Syria



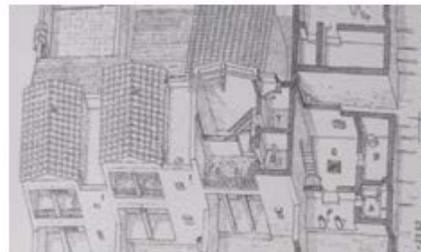
Hypothetical recreation of the palace of Mari, s. XVIII BC, Tell Hariri, Syria



Traditional house, Baghdad, Iraq

Roof

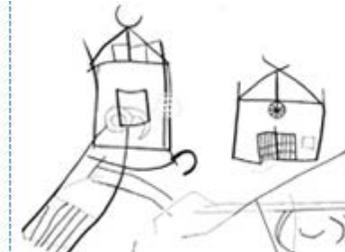
The roof has little thermal mass and in some cases is ineffective to accumulate. The flat roof constructed with wood beam, mats and mud, and the sloping roof constructed with wood beam, air chamber, wood planks and tiles are resistant elements with little ability to store energy. By contrast, the domes and vaults built with adobe and stone provide mass to accumulate energy but due to its small thickness, are rapidly converted into heat emitters at night.



Greek house, s. V BC, Priene, Turkey.



Arizon house, s XIX AC, Cadiz, Spain.



Megaron elevation, s. XBC, Gordion, Turkey



House in Akcakent, Kirsehir, Turkey. Author: Birol

STORE ENERGY
In mass

Roof



Roof plain, site of Cnossos, s. XVII BC, Crete, Greece ☐



Restoration work in Riad Laroussa roof, Fez, Morocco ☐



Roof, 6700 BC, Catal Hüyük, Turkey ☐

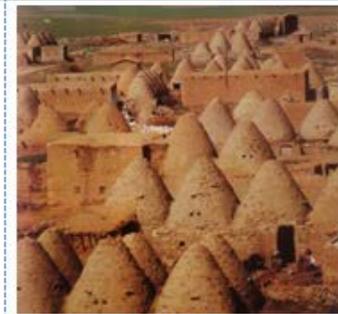


roof plain, Iran ☐

☐



Alberobello, Italy ☐



Harran, Syria ☐



Compound Herat, Afghanistan ☐



First vault radial, XII BC, site of Tell-el Rimah, Iraq ☐



Tunisia ☐



Nasiriya, Iraq ☐

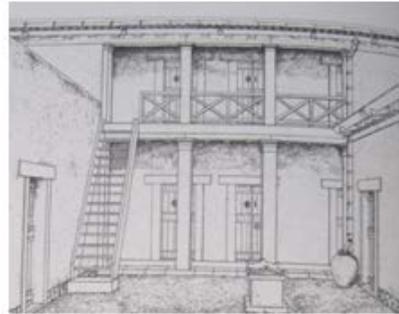


Seh-Qaleh, Iran ☐

STORE ENERGY

In air

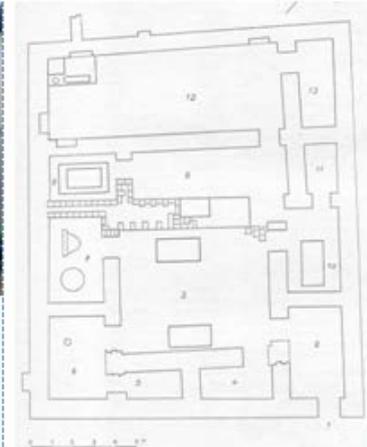
Courtyard It is an uncovered indoor space where accumulate cool air. At night the building masses lose temperature by heat emission to the sky, the courtyard atmosphere is keeping cool during the day until the masses are reloaded by solar radiation and begin again to release heat to the environment. Environmental conditions vary depending on the size of the yard, the intended end use (domestic, industrial, social) and containing elements (vegetation, water, stoves).



Greece house, s·V·BC, Olinto.



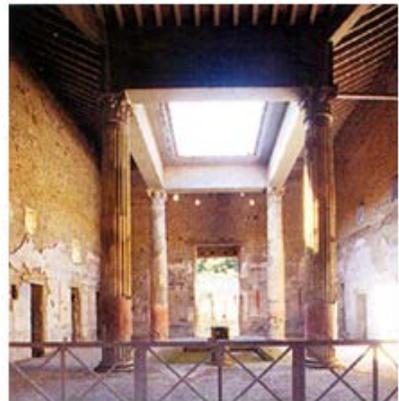
House in Granada, Spain. ¶



House, 3000·AC, Tello, Iraq.



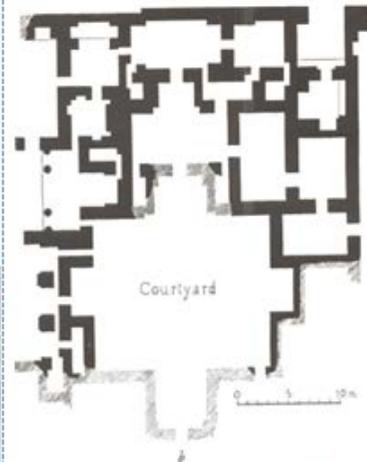
House in Iran ¶



Roman house, Pompey, Italy ¶



Riad in Fez, Morocco ¶



House, s·VI·AC., Ctesiphon.



House in Isfahan, Iran ¶



Roman house, Emporia, Spain. ¶



House in Murcia, Spain ¶



House in Nain, Iran ¶

STORE ENERGY

In air

Basement Basements accumulate air mass to ground temperature. Most of the ground floor and the courtyard floor of the Persians houses are below street level. The underground floors are used in summer and higher floors in winter. The man makes internal migration by the house searching the best comfort conditions.



Roman house in Bulla Regia, Tunisia.



House in Ghardaia, Algeria.



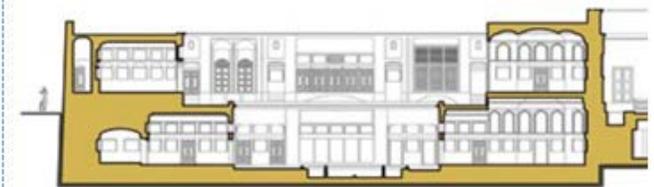
Secrets room, La Alhambra, Granada.



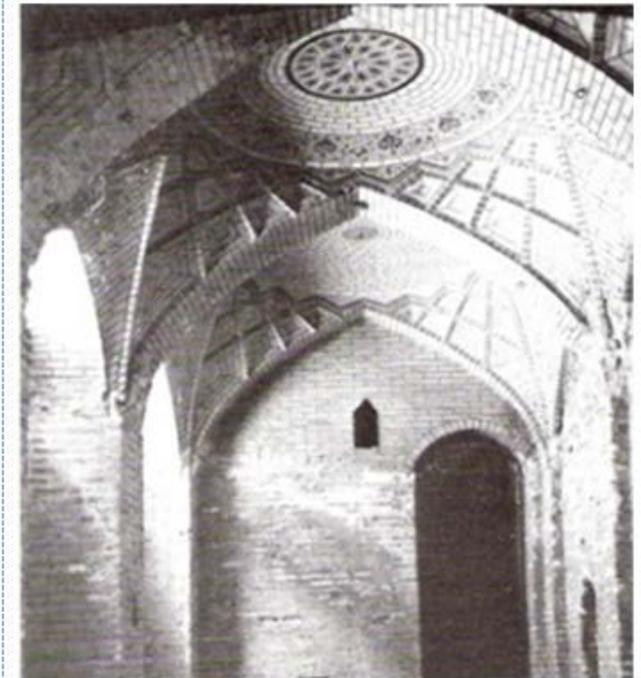
Diocleciano palace, Split, Albania.



Arizon house, Cadiz, Spain.



Persian house Rasodian, Yazd, Iran. Source: Stamatina Th Rassia, Sustainable Environmental Design in Architecture: Impacts on Health.



House in Bagdad, Iraq.

STORE ENERGY

In water

Reservoir Ice is collected in winter taking advantage of the cold temperatures and it accumulates in underground reservoirs where it is kept for consumption in the summer season.

In Rome, in the third century AD, snow was imported from the mountains, stored in straw-covered pits, and sold from the snow shops.

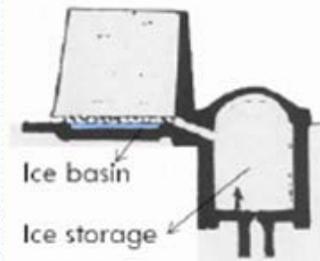


Underground icehouse, Malaga, Spain. Source: [web sierranieves](#)

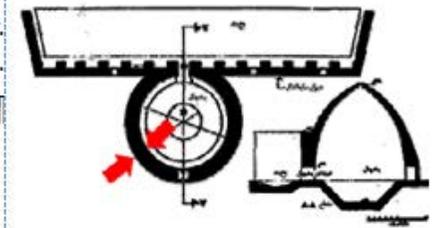


Traditional reservoir in Boboli gardens, Firenze, Italy. Source: [M. Zandieh](#), [I. Khaleghi](#), [R. Rahgoshay](#)

An inscription from 1700 BC in the northwest of Iran records the construction of icehouse.



Source: [M. Zandieh](#), [I. Khaleghi](#), [R. Rahgoshay](#)



Icehouse Pākdasht, Iran

COOL Radiation

Mass built

The built mass is filled with energy during the day by solar radiation and evening it begins to emit into the environment, they lose energy to reach room temperature. As a consequence of suffocating effect exerted by the emission of heat to the indoor environment at rooms, in the Eurasian area is customary to spend the summer nights outside on the deck or patio.

The vaulted roofs and domes are built with adobe or stone in areas with limited or no wood, it accumulates less heat during the day due to be less exposed and have more surface area for nocturnal radiation, this makes them more effective at cooling. The flat roof is constructed with wood and mats that form the support on which lies a layer of compacted clay, although they are more exposed to the sun, by its nature it accumulates little heat preferably acting as resistant elements to the heat transfer.

COOL
Evaporation

**Water
and
ventilate**

There is an ancient natural conditioning system that catch the dry air in the roof of the building and leads it to a humid area (source, reservoir, well) for cooling, from there is flowing through the house until go out on roof or courtyard.



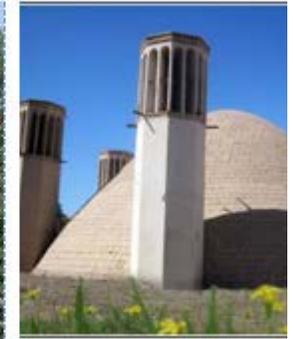
The Partal in La Alhambra, Granada, Spain ☐



Windcatchers in Ghardaia, Algeria ☐



Courtyard house, Kashan, Iran ☐



Rervoir with 6 windcatchers in Shahdad, Iran ☐

COOL
Convection

**Air from
cool
areas**

By the underground canals for water supply from natural sources to population, the fresh air also flows from the mountains and the highlands. This air keeps the temperature through the evaporation of water from the canal and arrives fresh to the supply points provided, dwellings or urban spaces. The ventilation system of the dwellings is connected to the water canal, where they get fresh air to cool the indoor environment.

Night air

The cool night air cools the atmosphere, but this effect is hardly noticeable inside homes or in their surroundings, because the building mass is sending out heat. Flat roofs, courtyard and gardens are favorite spots for night rest.

**Air from
reservoir**

The fresh air that form in water reservoirs or icehouse can flow through underground canals to dwellings and urban spaces.

COOL
Conduction

Basement

The basements are architectural elements in direct contact with the ground, which transmitted to ground ambient heat constantly, day and night, therefore constitute the most effective heat drain of buildings. The cool air mass that forms in the basement housing circulates by cross elements as the patio and stairs. Therefore, the ground provides environmental stability in the basement and in the whole house. In arid areas, the basement is used in the summer during the hottest hours of the day.

Basements spontaneously arise in buildings built on slopes and in the empty space left by remove the construction material of the land where the home is located.

The courtyard is an original element of the Mediterranean architectural culture where we find relevant information on the interaction between man and his environment. It is both the manifestation artistic stand and environmental mechanism, therefore it is a cultural reservoir that reaches excellence by the presence of environmental tactics. Each courtyard has its own atmosphere, different and somewhat isolated from the outside, conditioned by its formal and material characteristics, the items it contains and the use to which it applies. These circumstances that operating in the atmosphere of the courtyard, properly managed, are tactics of passive conditioning which still endures thanks to its presence in spontaneous awareness of the Mediterranean peoples

The shape, size, proportion and treatment of the facades of the courtyard (gap-mass relationship, materials, size and shape of the gaps) are decisive for indoor environmental conditions and environmentally the most significant items are the protection devices, mobile or fixed, vegetation and water.

The Persian tradition shows a tendency to large courtyards of horizontal ratio, sunny, well ventilated, where is usually the presence of vegetation and ponds with fountains. It is a recreational space whose main function is to illuminate and ventilate the dwelling. The courtyard atmosphere varies during the day due to solar heating and night cooling. The courtyard facades oriented north-northwest are usually opaque and massive, with few and narrow gaps, resistant to heat transfer. The facades oriented south-southeast tend to be porous and light, less resistant to heat transfer, constructed with lattice of wood and glass that close rooms warm by the greenhouse effect, protected by porticoes or iwans that are very sunny indoor spaces in winter. The courtyard elements permit conditioning its environment and controlling its relation to indoor environments, therefore constitute tactics of passive conditioning.

As example, show a typology of Persian house located in the city of Shiraz, southwest Iran, to 1,486 m above sea level on a plateau at the foot of the Zagros Mountains. The earliest reference to the city dates from 550 BC, was an administrative center in Sassanid period, was occupied by the Arabs in 641 AC and now is the economic center of southern Iran



Figure 4, Figure 5. The courtyard facades of a house in Shiraz.



Figure 6, Figure 7. The courtyard facades of a house in Shiraz.

The Moroccan tradition shows a tendency to small courtyards of vertical ratio, rather shadowy, less ventilated, it has usually water source in a wall and lacks of vegetation. The courtyard is the main room, the heart of the house, a estancial, family and social space, around which is organized the other rooms of the house and cross the internal circulations. It is by far, the largest room, better lit and ventilated the house. The other rooms of the house are illuminated through the courtyard but, due to its pronounced verticality, its small area and low solar radiation received, are shadowy. The courtyard facades are usually opaque, often protected by porticoes or galleries of circulation, with a door and a small gap over it than just illuminate and ventilate the room.

Overall the courtyard surfaces remain protected of solar radiation especially in winter when they accumulate little heat at day and cool down faster at night, the courtyard atmosphere is cold and you need to set fireplaces or stoves in some rooms. During the summer, although the courtyard is sunnier, its atmosphere is kept cool during the day and the rooms are dark. The ability to intervene in the courtyard atmosphere is limited and also the possibility to adapt indoor environments to seasonal weather conditions.

As example shows two traditional courtyards Fez, located in the neighborhood of the Qayrawanies. The city of Fez was founded in 789 AD, in an area with plenty of water and forest resources, occupying a strategic position at the crossroads of major land routes. Their culture is marked by the arrival, in 818 AD, of migrants from the southern suburb of Cordoba (Spain) and from Kairouan (Tunisia) that formed two populations with different traditions in walled neighborhoods and separated by a stream. The Art of Al Andalus confronts with that which comes from the Fatimid East. The neighborhood of Qayrawanies will become the heart of the medina and relegated to the background to the Andalusia city. The unification of the two cities, by the first Almoravid emir made it the s. XII in a large metropolis.



Figure 8, 9, 10

Riad Dar Bensouda, s. XVII AD, Fez, Morocco



Figure 11, 12, 13

Riad Dar Bouanania, Fez, Morocco

Both cities were born and prospered under the political action of the Arab caliphates, but in a background of different populations, Berber origin in Fez and Persian origin in Shiraz. Both have dwellings with the Mesopotamian cultural imprint, where is born the house around courtyard as basic type of domestic architecture. The Achaemenid Persian tribes contacted Mesopotamian civilization in the 9th century B.C., when they were settled in northern Iran near Lake Urmia and tributary to the Assyrians. In Fez, the Berbers learned about a Eastern civilization with the arrival of migrants from Fatimids in the 9th century A.C.

The environment of both cities is homogenized by xeric Mediterranean bioclimate, semi-arid with a ombrotype similar but different continentality index which means an annual amplitude of temperature higher in Shiraz (28,6°C a 6,1°C) than in Fez (26°C a 10°C). The absolute values of temperatures have substantial differences, in Fez it exceeds in summer 40 ° C and in Shiraz it falls in winter below 0 ° C. The Fez environment is warmer than Shiraz.

Both houses are the basic type of courtyard house of Mesopotamian origin; in their courtyards look different artistic traditions and environmental knowledge. Both courtyards accumulate heat by the solar radiation and they cool at night but the atmosphere quality of the courtyard is different in each case. The Persian courtyard atmosphere varies throughout the day and throughout the year; its design integrates mechanisms or tactics that allow us to intervene in their environment and in their relationship with the indoor environment of the rooms. By contrast, the courtyard atmosphere of the house of Fez is more stable, integrated tactics on it allow us limited participation in its atmosphere and the relationship with the indoor atmosphere of the rooms. Overall it is a cool and shady house throughout the year and fireplaces or stoves are used to heat the rooms in the coldest periods.

Conclusions

The tactics along with environmental strategies present in the Mediterranean domestic architecture are part of a cultural heritage resulting from the interaction between man and the Mediterranean environment. The presence of specific tactics hygrothermal conditioning on the architectural heritage is documented since ancient times and have endured for millennia in some territories. Both conditions, longevity and permanence, give them firmness and sufficient validity to be considered the basis for a sustainable and efficient cultural system. Despite the fact that the same tactics have spread throughout the region, for reasons of culture, or by the bioclimate, have been consolidated into various environmental strategies that maintain comparable levels of welfare.

Heat the built space is easy with the implementation of fireplaces and stoves, but advantage of greenhouse warming requires precise technical and environmental knowledge. The large rooms with wooden latticework and glass are very efficient in winter thanks to the sun radiation but must be used correctly in the Mediterranean summer season. Store energy has been possible through the use of the building mass, the confined air in spaces built and the water reservoir; basements and courtyard are the specific tactics that take an essential role in achieving this goal. But the use and effective management of this energy also require precise technical and environmental knowledge. To cool indoor environments there are simple tactics that act by controlling sources of cold, variations in humidity and wind catchment, and other more complex that lead the masses of fresh air from natural sources to the cities. Its proper use requires knowledge of the principles of natural cooling.

The architectural culture of the Mediterranean region has a unique set of specific tactics for heating, energy accumulation and hygrothermal conditioning with high efficiency and sustainable for its minimal environmental impact. But it is important that this culture is present in the consciousness of the peoples inhabiting the region, since the use of architectural tactics requires technical knowledge or habit behavioral at the inhabitant of the house. The lack of knowledge about the environment and architectural tactics prevents man from appreciate the integrated environmental strategies in buildings. The disuse of the tactics in areas where long ago was appreciated, not due to a functional or environmental reason, but rather to a loss of cultural and technical knowledge during periods of devastation, caused by internal and external conflicts that have devastated the Mediterranean region. This lack of architectural culture becomes an inability of disadvantaged groups in the region to meet the needs of natural conditioning in the dwelling.

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